Case study: Uganda

National Water Development Report: Uganda

Prepared for the
2nd UN World Water Development Report

"Water, a shared responsibility"
(2006)

PREAMBLE

This National Water Development Report (**NWDR, 2005**) is a comprehensive report that gives a broad overview of status of the water sector in Uganda and the progress made by government to address the challenges related to sustainable water resources management and efficient provision and delivery of water for different uses.

Preparation of this report was a collaborative effort between the Directorate of Water Development and the World Water Assessment Program (WWAP), which provided both technical and limited financial support.

WWAP is a United Nations (UN) programme bringing together 24 UN agencies to produce a triennial global evaluation of the world's freshwater resources and their management. Under this initiative, WWAP will be publishing a series of World Water Development Report (WWDR) every three years. The first report (WWDR I) was released in March 2003 and the second report (WWDR II) is under preparation and is planned to be released in March 2006. Five African countries were selected as case studies during the preparation of the WWDR II i.e. Uganda, Mali, Kenya, South Africa, Ethiopia.

The National Water Development Reports prepared by each case study country are meant to provide some useful practical experience and lessons to be captured in the preparation of the WWDR II. In addition, summaries of the case study reports will be published in the case study section of the WWDR II. This is a very unique opportunity for Uganda to share its experience in the water sector with the international community!

Preparation of the report was a collective effort of a National Working Group (NWG) comprising of several experts from different government institutions and agencies including: Directorate of Water Development; National Environment Management Authority; Ministry of Agriculture, Animal Industries and Fisheries; Ministry of Energy and Mineral Development; National Water and Sewerage Corporation; Ministry of Health; Ministry of Education and Sports; Wetlands Inspection Division; and the Meteorological Department. Details of the members of the NWG and their respective roles are given in **Tables A.6** in **Annex A**.

The report is a result of a highly consultative process, which involved several stakeholders and interested parties. The report preparation process involved extensive consultations at both national and local levels, collection of information and data, and holding of a number of consultative and brainstorming meetings, seminars and workshops.

The report comprises of 12 Chapters and is structured into three broad sections as follows:

Uganda National Water Development Report - 2005

Section 1 gives general socio-economic information about Uganda, presents an overview of Uganda's Water sector, and highlights the state of Uganda's Freshwater resources.

Section 2 discusses the major socio-economic uses of water including: Rural Water and Sanitation; Urban Water and Sanitation; Water for Food Security; Water for Energy; and Water for the Environment.

Section 3 discusses the broad water management challenges including Water Education, Research and Capacity Building; Valuing Water; and Coping with Water-related Disasters.

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LIST OF ABBREVIATIONS AND ACRONYMS

AHA	*Asset Holding Authority*
BOD	*Biological Oxygen Demand*
CAO	*Chief Administrative Officer*
CBO	*Community Based Organizations*
CIDA	*Canadian International Development Agency*
COM	*Council of Ministers*
CSD	*Commission for Sustainable Development*
CWP	*Country Water Partnership*
DANIDA	*Danish International Development Agency*
DC	*District Council*
DEO	*District Environmental Officer*
DEAP	*District Environmental Action Plan*
DfID	*Department for International Development – U.K*
DWD	*Directorate of Water Development*
DWO	*District Water Officer*
EAC	*East African Community*
ECWSP	*Eastern Centers Water and Sanitation Project*
EIA	*Environmental Impact Assessment*
ERA	*Electricity Regulatory Authority*
EU	*European Community*
FAO	*Food and Agricultural Organization*
GDP	*Gross Domestic Product*
GEF	*Global Environmental Fund*
GIS	*Geographical Information System*
GTZ	*German Technical Cooperation*
GoU	*Government of Uganda*
HEP	*Hydroelectric Power*
HRD	*Human Resource Development*
IDA	*International Development Agency*
IDPs	*Internally Displaced Persons*
IHP	*International Hydrological Program*
ILM	*Integrated Land Management*
IGAD	*Inter-Governmental; Authority on Development*
IUCN	*International Union for the Conservation of Nature*

IWRM	*Integrated Water Resources Management*
LC	*Local Council*
LG	*Local Government*
LGDP	*Local Government Development Program*
LVDP	*Lake Victoria Development Program*
LVEMP	*Lake Victoria Environmental Management Programme*
MAAIF	*Ministry of Agriculture, Animal Industries and Fisheries*
MDG	*Millennium Development Goals*
MEMD	*Ministry of Energy and Mineral Development*
MOLG	*Ministry of Local Government*
MoES	*Ministry of Education and Sports*
MIS	*Management Information System*
MoH	*Ministry of Health*
MTEF	*Medium Term Expenditure Framework*
MWLE	*Ministry of Water, Lands and Environment*
NBI	*Nile Basin Initiative*
NELSAP	*Nile Equatorial Lakes Subsidiary Action Program*
NEMA	*National Environment Management Authority*
NGO	*Non-Government Organization*
NWSC	*National Water and Sewage Corporation*
NGWD	*National Ground Water Data Base*
PEAP	*Poverty Eradication Action Plan*
QA	*Quality Assurance*
RGC	*Rural Growth Center*
RUWASA	*Rural Water and Sanitation East Uganda Project*
RWSD	*Rural Water Supply Department*
RWSS	*Rural Water Supply and Sanitation*
SIDA	*Swedish International Development Agency*
SIP	*Strategic Investment Plan*
SIP 15	*Sector Investment Plan for RWSS 2000 -2015*
SWRMD	*Support to Water Resources Development Department*
TAC	*Technical Advisory Committee*
TC	*Technical Committee*
TECCONILE	*Technical Committee for the promotion of the Development and Environmental Protection of the Nile Basin*
TLU	*Total Tropical Livestock Units*
ToR	*Terms of Reference*
TPC	*Technical Planning Committee*
TSU	*Technical Support Unit*
UK	*United Kingdom*
UMD	*Uganda Meteorological Department*

UNDP	*United Nations Development Programme*
UNESCO	*United Nations Education, Science and Cultural Organization*
USA	*United States of America*
USD	*United States dollar*
USH	*Uganda Shilling*
UWASNET	*Uganda Water and Sanitation Network of NGO's*
UWSD	*Urban Water Supply Department*
UWSS	*Urban Water Supply and Sanitation*
WAP	*Water Action Plan*
WID	*Wetland Inspection Division*
WRAP	*Water Resources Assessment Project*
WfP	*Water for Production*
WPC	*Water Policy Committee*
WPU	*Water Permit Unit*
WRM	*Water Resources Management*
WRMD	*Water Resources Management Department*
WRMS	*Water Resources Management Study*
WSPS	*Water Sector program Support*
WSRIC	*Water Sector Reform Implementation Committee*
WSS	*Water Supply and Sanitation*
WWAP	*World Water Assessment Program*

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EXECUTIVE SUMMARY

Uganda's Freshwater Resources

Uganda's fresh water resources are considered to be a key strategic resource, vital for sustaining life, promoting development and maintaining the environment. Access to clean and safe water and improved sanitation facilities and practices are pre-requisites to a health population and therefore have a direct impact on the quality of life and productivity of the population. Besides domestic water supply, water is also vital for: Livestock Water Supply, Industrial Water Supply, Hydropower generation, Agriculture, Marine Transport, Fisheries, Waste Discharge, Tourism, and Environmental Conservation. Water, therefore, significantly contributes to the national socio-economic development and thus poverty eradication.

Uganda's rivers and lakes, including wetlands, cover about 18% of the total surface area of the country, with rainfall being the greatest contributor to the surface and ground water resources. Almost the whole of Uganda lies within the Nile basin, which is shared by 10 countries[1]. The most significant hydrological feature in Uganda is Lake Victoria, the second largest freshwater lake in the world, which is also the source of the Nile, the longest river in the world. Lake Victoria is the lifeline to Uganda's fisheries industry, the source of almost all Uganda's hydropower, and a source of domestic and industrial water supply for the three biggest towns[2] in Uganda. Lake Victoria is also supporting an upcoming and very lucrative horticulture industry along its shores and not forgetting its strategic role as a key marine transport link between the three East African countries[3].

With total renewable water resources estimated at 66 Km^3/year, corresponding to about 2,800 m^3/person/year, Uganda may be considered to be endowed with significant freshwater resources. However, their uneven spatial and temporal distribution coupled with the ever increasing pressure on the resource due to rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution still remains a big challenge to the sustainable management and development of country's fresh water resources.

The country encompasses both humid and semi-arid areas with the average annual rainfall varying from 900mm in the north-eastern semi-arid areas of Kotido to 2000mm on Sese islands in Lake Victoria. There are considerable variations in the onset of rain seasons as well as significant differences between wet and dry years. It is also observed that the settlement and development patterns in Uganda are highly influenced by the rainfall distribution.

[1] Nile basin countries include: Burundi, DR Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda.

[2] Kampala, Jinja and Entebbe.

[3] Kenya, Tanzania and Uganda.

Overview of Uganda's Water Sector

The water sector is one of the priority sectors in Uganda, as it directly impacts on the quality of life of the people and overall productivity of the population. Water supply and sanitation are among the key issues emphasized under the national Poverty Eradication Action Plan (PEAP), which is the key government framework for ensuring poverty eradication through creation of an enabling environment for rapid economic development and social transformation.

The main goal of the water sector in Uganda is:

"To manage and develop the water resources of Uganda in an integrated and sustainable manner so as to secure and provide water of adequate quantity and quality for all social and economic needs for the present and future generations with the full participation of all stakeholders."

The national targets for water supply and sanitation in both urban and rural areas are:

1. ***Urban Areas***: Achieve 100% safe water coverage and 100% sanitation coverage in urban areas by 2015, with an 80%-90% effective use and functionality of facilities.
2. ***Rural Areas***: Achieve 77% safe water coverage and 95% sanitation coverage in rural areas by 2015, with an 80%-90% effective use and functionality of facilities.

Water Sector Legal and Institutional Framework

In order to meet the emerging water sector challenges, Uganda prepared a Water Action Plan (WAP) in 1993 – 1994 to provide a flexible and dynamic framework for development and management of country's water resources.

As a follow up to the WAP, Government put in place a comprehensive policy and legal framework for the management of the water sector. The framework comprises of a set of policies and laws the most notable of which include: The National Water Policy (1999); The Water Statute (1995); The National Water and Sewerage Corporation Statute (1995), and the Local Government Act (1997).

In order to address the water sector institutional challenges, Government undertook to establish a comprehensive institutional framework for the management and development of the country's water resources. This process took due cognizance of other national initiatives (i.e. Decentralization, Privatization, Gender Emancipation, etc) geared towards the redefinition of the roles of the different levels of government, with the central government creating the enabling environment for action by local governments, communities, and the private sector.

At a strategic level, government has also been vigorously promoting the principles of Integrated Water Resources Management (IWRM) as an integral part of its strategy to ensure sustainable water resources management and development.

Reform of the Water Sector

In order to ensure that water services are provided and managed with increased efficiency and cost effectiveness, government initiated reforms in the water sector in 1997. As part of the reform process, detailed situation analysis of the sector has been carried out resulting in the preparation of a comprehensive Water Sector Strategy, detailed sub-sectoral investment plans and clear definition of national targets for the sector.

One of the key strategic outcomes from the reform studies is the adoption of a 'Sector Wide Approach to Planning (SWAP)' for the sector. The SWAP framework, which has been embraced by both government and the water sector development partners, has already proved to be the most appropriate mechanism for resources mobilization and implementation of the action plans. The SWAP framework also guarantees the participation of all stakeholders in the planning and implementation of water sector activities. This openness has resulted in increased confidence from the development partners who have now agreed to finance water sector programs through the regular government budget, contrary to the project specific funding characteristic of the past.

Water Sector Financing

Funding for the water sector has been increasing steadily over the past 10 years. The water sector, being one of the key priority sectors, has benefited significantly from the Poverty Action Fund (PAF) to which government has committed significant resources for the Poverty Eradication Action Program (PEAP). Donor financing is still the major source of funding for the water sector, accounting for up to 75% of the total sector funding. This is expected to be gradually scaled downwards as government funding increases.

Under the SWAP framework, government and most development partners have agreed to finance the water sector through general budget support, which gives government a high degree of flexibility in allocating both local and donor financial resources according to the national priorities and development objectives

Preliminary estimates from the investment plans culminating from the Sector Reform Studies indicate total sector investment needs of about US$ 1.682 billion[4]. The biggest challenge is how to mobilize these funds.

Monitoring, Evaluation and Reporting

Government considers effective Monitoring, Evaluation and Reporting (ME&R) as a key pre-requisite for the successful and timely achievement of the water sector targets and goals. As part of the water sector reform process, government has put in place a very elaborate ME&R framework, which aims at ensuring coordinated and periodic reporting on all sector activities by the different stakeholders. This has greatly enhanced transparency and accountability in the water sector through improved information flow between the central

[4] The breakdown of this estimate is as follows: US$ 951 million for the RWSS, US$ 481 million for the UWSS, US$ 200 million for Water for Production, and US$ 50 million for WRMSS.

government, donors, local governments, NGOs and the private sector. In order to further strengthen the ME&R framework, Government has embarked on the process of defining clear indicators for the water sector against which the performance of the sector will be periodically reviewed.

Progress towards achieving the Millennium Development Goals

Results from household surveys conducted in 2002, and projected for the year 2003, indicate that nationwide, access to water supply is at 61.5% which indicates that Uganda is actually on course towards meeting the 2005 targets of 62%. Results from the survey also indicate access to water supply of 90% and 55% for the urban and rural areas, both of which are within the 2005 targets.

Results from the same surveys also indicate that Uganda is well ahead of its target for access to improved sanitation, which now stands at 90%, the national target for 2005.

Water Sector Challenges

Despite the significant progress made so far, the sector is still faced with a number of challenges. The major challenge is establishment of strong mechanisms for effective, efficient and sustainable delivery of water and sanitation services to the end users, on the basis of the strategies and funding mechanisms established under the SWAP framework. This challenge, coupled with the inherent financial and human resources constraints at both national and local levels pauses the greatest risk for the untimely achievement of the sector targets.

Improvement on the sector services will require enhanced capacity of the sector institutions, in particular the Directorate of Water Development (DWD), to assume its new role of planning, supporting and supervising water and sanitation programs through improvements in monitoring systems and procedures. Government is now focusing on building capacity of the water sector institutions and Local Governments as well as promoting increased private sector participation and effective community participation in all water sector activities. The policy of promoting community participation based on demand-driven approach is being emphasized. Hygiene and health education are actively being pursued as an integral part of the drive to improve household sanitation.

Challenges to Life and Well-being

Water for Human Consumption

Access to clean and safe water and improved sanitation facilities and practices leads to improved health and are essential investments in human capital and therefore have a direct and immediate impact on the quality of life, thus contributing to long-term socio- economic development of the country and eventual elimination of poverty.
The burden of water collection falls mainly on women and children who are the most vulnerable members of society. Owing to the long distances they travel to collect water, this significantly reduces their productive time and subsequent contribution to the economic development of the country.

Investments in water supply and sanitation services has direct socio-economic impacts by relieving the burden on women, improved hygienic conditions through better access to water and sanitation services, and reduced water pollution through the construction of wastewater treatment plants and other mitigation measures. Increasing access to safe water is equally vital to the health and welfare of the population.

The current safe water supply coverage (58% in rural areas and 60% in urban areas) is still low and there is a need for a concerted effort by the government to invest the necessary resources to ensure that all Ugandans have access to safe water supply.

A detailed description of water for domestic consumption is given in **Chapters 5** and **6.**

Water for Food Security

Water is a key factor in the production of adequate food for Uganda. Water resources are a prime factor in irrigation, livestock watering, aquaculture, fisheries, food processing and other agro-industry, and fishing industries, which provides opportunities for employment to a large proportion of the rural and urban populations. The provision of water for water supply and agriculture to the poor segments of the society is a development imperative, both for reasons of social equity as well as food security and economic development.

A detailed description of the role of water in ensuring food security is given in **Chapter 8**.

Water for Energy Generation

Hydropower is the major source of electrical power in Uganda. With a total estimated potential of 2,000 MW, it is the most abundant and cheapest electrical power source in the country. Uganda has a comparative advantage in hydropower resources in the region. Most of Uganda's hydropower potential is concentrated along the White Nile. In addition, there are also several small rivers in different parts of the country, with a potential for mini and micro hydropower development.

Uganda relies solely on hydropower for energy production needed for all socio-economic activities. The current installed capacity of only 260MW is grossly inadequate to meet the

national demands. The current low level of economic development in Uganda is partly attributed to the inadequate power, which cannot support large-scale manufacturing industries and agro-processing factories.

A detailed description of the role of water in energy production in Uganda is given in **Chapter 9**.

Water and the Environment

With the growing awareness of environmental issues in Uganda, the natural environment is slowly being considered a legitimate water user. It is, therefore, a requirement under the current Environment and Water legislation that any planned water use takes into consideration water requirements for the environment within its vicinity. This is being enforced through the mandatory Environment Impact Assessment conducted for all water related projects, which ensures that all environmental concerns are addressed during the planning and implementation of the projects.

In order to ensure the integrity of the environment, the Government has also introduced water abstraction and waste discharge permits, which are used to regulate water abstraction and discharge of waste into water bodies. These permits have proved to be very effective regulatory instruments whose use has greatly enhanced environmental conservation and management in Uganda.

Management Challenges

Ensuring the Knowledge Base: Water Education, Research and Capacity Building

Basic education is a fundamental right for all human beings and one of the essential elements for ensuring successful implementation and sustainability of water sector activities and for combating poverty in general.

The process of developing, maintaining and disseminating knowledge on water in such a way that all stakeholders benefit and feel part of the process remains a big challenge to the water sector. The government of Uganda has however recognized the seriousness of this challenge and has embarked on the process of implementation of appropriate intervention measures to address the issue.

One of the Government strategies to address the low levels of understanding of water and hygiene issues by the public is to integrate water, sanitation, hygiene and health education in the primary and secondary school curriculum as part of the basic science education at these levels. The aim of this initiative is to develop and inculcate positive knowledge and traits that will enhance healthy living and a sustainable environment not only in the schools but also at community level. In addition, there are two universities in Uganda (i.e. Makerere and Kyambogo) offering degree courses in Civil Engineering, with options for students to specialize in Water Resources Engineering and other Water related Sciences.

In addition to the above interventions, the water sector is also implementing a comprehensive sector-wide capacity building and sensitisation program. The sector-wide approach to capacity building mainly focuses on equipping the sector personnel with the relevant skills, knowledge and attitudes in the management of water and sanitation programs through specific tailor made training courses and formal graduate training.

The key challenge in this regard is the long time it takes to realize tangible benefits from investments in water education, research and capacity building. In addition, sensitisation of the public may not immediately translate into behavioural change and change in people's attitude. Learning is a very slow process that needs a lot of patience and dedication, which facts policy makers are not willing to accept since they are under pressure to deliver tangible results in a very short time.

Valuing Water

Access to clean and safe water and improved sanitation facilities and practices are pre-requisites to a health population and therefore have a direct impact on the quality of life and productivity of the population. Besides domestic water supply, water is also vital for: Livestock Water Supply, Industrial Water Supply, Hydropower generation, Agriculture, Marine Transport, Fisheries, Waste Discharge, Tourism, and Environmental Conservation. Water, therefore, significantly contributes to the national socio-economic development and thus poverty eradication.

However, despite the important role plays in the socio-economic development of the country, water has traditionally been considered as a public and social good, which is available in unlimited quantities and therefore should be available to everyone free of charge! This has led to misuse and pollution of water resources making it increasingly scarce. There has been very limited private sector involvement in the management and development of water resources in Uganda. The public good nature of the water resource discourages a private entity to invest in the preservation or improvement of the resource since it is difficult to recover costs from users.

In order to address the above issues, the Government prepared a National Water Action Plan (WAP) which embraced most of the Rio (UNCED, 1992) principles, the most important one of which being the recognition of water as an economic good with an economic value and that should be taken into account while allocating it among competing uses. The WAP principles were later embedded in the Water Statute, 1995, and the National Water Policy, 1999. These developments, coupled with the extensive sensitisation of the public on the value of water, have started yielding results as the general public has started recognizing water as a precious resource, which ought to be managed and used responsibly.

Sharing Water

Almost all of Uganda's water resources are transboundary in nature and shared with her neighbours. This poses the challenge of Uganda making maximum use of the water resources within its territory for her socio-economic development while not compromising the legitimate right by her neighbours to the same shared resources. As a result, Uganda has been very keen on fostering close collaboration with her neighbours in the joint planning, management and development of the shared water resources.

Uganda is interested in ensuring that all its shared waters are managed optimally and equitably to derive mutual benefits for all the riparian countries. Specifically, Uganda is keen on ensuring sustainable inflows of water of adequate quantity and quality from its upstream riparians and securing an equitable share of the shared waters to support its national economic and social objectives. Equitable use of the shared waters and utilization of the comparative advantages of the riparian countries, using water where it can most efficiently and cost-effectively produce power, grow food, and support industrialization, provides the greatest opportunities for sustainable growth and development in the region and sustainable use of the resource.

Uganda recognizes the fact that cooperative management and development of shared water resources can serve as a catalyst for a broader range of cooperation and economic integration. This is partly reflected in the significant number of regional water resources management and development initiatives that Uganda is involved in i.e. the Nile Basin Initiative, the Lake Victoria Development Program, the Lake Victoria Environmental Management Program, etc.

Copying with Water related Disasters

In Uganda water related disasters such as droughts, floods, landslides, windstorms and hailstorms contribute well over 70% of the natural disasters and destroy annually an average

of 800,000 hectares of crops making economic losses in excess of 120 billion shillings. Economic loses resulting from transport accidents and fires and other climate related disasters are estimated at shillings 50 billion annually.

The vulnerability of many Ugandan communities to water related disasters is growing by the day due to many undesirable human activities such as deforestation, ecosystem degradation, environmental pollution, social unrest, transport accidents, urban and wild fires and poor land use in many parts of the country.

Following recognition of the severe socio-economic impacts of both natural and man-made disasters, Government decided to establish a fully-fledged Ministry in charge of disaster preparedness and management. Government has also developed a Disaster Preparedness and Management Strategy whose key objective is to establish national and local capabilities to ensure that all the known natural and man-made hazards do not result into disasters and in the event that they do, the people affected can continue to meet their minimum needs for food, water, shelter, health, and security through their own efforts and minimal external appropriate assistance.

Based on the lessons learnt in the last five years, Government is now refocusing its efforts towards a more holistic approach to disaster management in Uganda. Government is in the process of further strengthening the enabling policy, legal and institutional framework required to address cross-sectoral disaster management issues. There are also plans to strengthen the national and local capacity for disaster preparedness and management in the country. This will go hand-in-hand with the enhancing the existing administrative and coordination mechanisms for disaster preparedness and management in the country.

CHAPTER ONE

BACKGROUND

1.1 Location and size

Uganda is a landlocked republic found in East Africa bordered to the North by Sudan, to the East by Kenya, to the South by Tanzania, to the Southwest by Rwanda and to the West by the Democratic Republic of Congo. The country shares a total length of 2,698 km of international borders with its neighbours and has a total area of 241,138 km^2 spread across the equator between latitude 1° 30' South and 4° North, and longitude 29° 30' East and 35° East. A former British Protectorate, Uganda became fully independent in 1962.

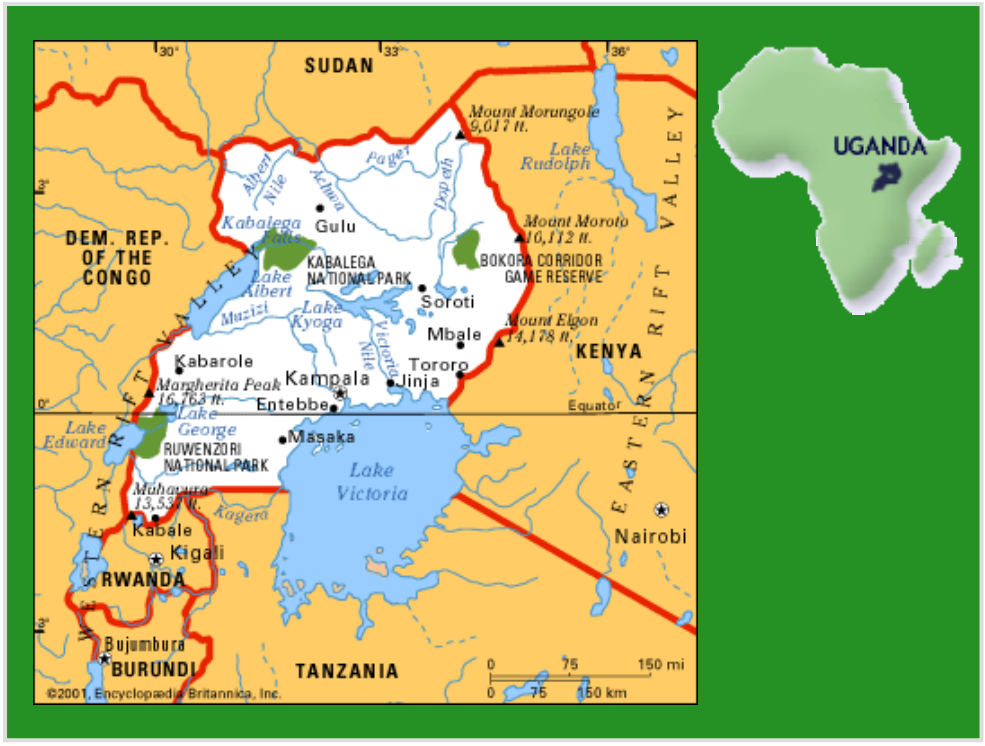

Figure 1.1 – Location and Physical Features of Uganda

1.2 Topography

Topographically, much of Uganda lies on what is known as the Great African Plateau – a raised landmass sandwiched between the eastern and western arms of the African rift valley. The plateau in Uganda has an average altitude of 1300 m above mean sea level (a.s.l) that is characterised by flat-topped hills with gently sloping sides and broad swamp-filled valleys. High-rise mountains on the eastern and western peripheries of the country contrast the relatively flat topography of central Uganda. On the eastern borders of the country is Mountain Elgon that rises to 4320 m while on the western borders are two mountain ranges: the Mufumbira (Virunga) mountains that rise to 4120 m a.s.l. and the Rwenzori Mountains that rise to 5100 m a.s.l. The Rwenzoris are Africa's third highest mountains: their highest point – Margherita peak (5100 m) – is Uganda's highest

point. Uganda's lowest point is Lake Albert (640 m a.s.l.) The northern part of the country has a sprinkling of mountains, the highest of which is Mount Kaddam (3100 m a.s.l.). With the exception of the Rwenzoris, the mountains of Uganda are all of volcanic origin. A few of them are dormant volcanoes while the rest are extinct volcanoes. The Rwenzoris are a host block elevated between faults.

1.3 Geology and Soils

Uganda is made up of predominantly old rocks from the Pre-Cambrian era (3000 – 6000 million years ago). There are also younger rocks, mainly of sedimentary and volcanic origin, from the cretaceous era (135 million years ago). The larger part of the country – more than two thirds – has poor ferralitic soils. These soils have nearly lost all their mineral content through prolonged weathering. They need proper management to give reasonable crop yields. The rest of the country has mostly richer ferruginous and highly productive volcanic soils.

1.4 Land

Uganda has a land area of 199,768 km^2 a large part (82.7%) of which is arable. Only 42.4% of the cultivable land was under cultivation in 1996, Large commercial farms accounted for only 0.8% of cultivated land in the same year, the rest being under small-scale holdings used for subsistence farming. Agriculture is heavily dependent on rainfall with the area of irrigated land estimated at only 90 km^2 in 1998.

Table 1.1: Land cover in Uganda

Cover type	Percent
Forests	3.8%
Woodlands	16.7%
Bushes and grasslands	27.0%
Swamps	2.0%
Farmland	35.0%
Built-up areas	0.2%
Open water	15.3%

Source: MWLE

1.5 Rivers and Lakes

With about 43,942 km^2 of wetlands and open water (16% of total area), Uganda is considered fairly well endowed with water resources. Major water bodies include lakes Victoria (the world's second largest freshwater lake), Kyoga, Albert, George and Edward while major rivers include the Nile (the world's longest river), Ruizi, Katonga, Kafu, Mpologoma and Aswa. The rivers and lakes of Uganda are, with the exception of those in the tiny Northeastern catchment of Kidepo, upper Nile basin. Uganda occupies a dual position in the Nile riparian context, being a lower riparian with respect to Rwanda, Burundi, Tanzania, Kenya and the Democratic Republic of Congo, and an upper riparian with respect to Sudan.

1.6 Climate

Uganda has a tropical climate characterised by strong seasonality in rainfall as a consequence of the influence of the seasonal latitudinal movement of the equatorial low-pressure trough and inter-tropical convergence zone (ITCZ). Mean annual rainfall for the country is 1300 mm but shows great spatial variability, averaging from as low as 100 mm in the semi-arid parts of Karamoja in Northeastern Uganda to over 3000 mm on the slopes of Mountain Elgon.

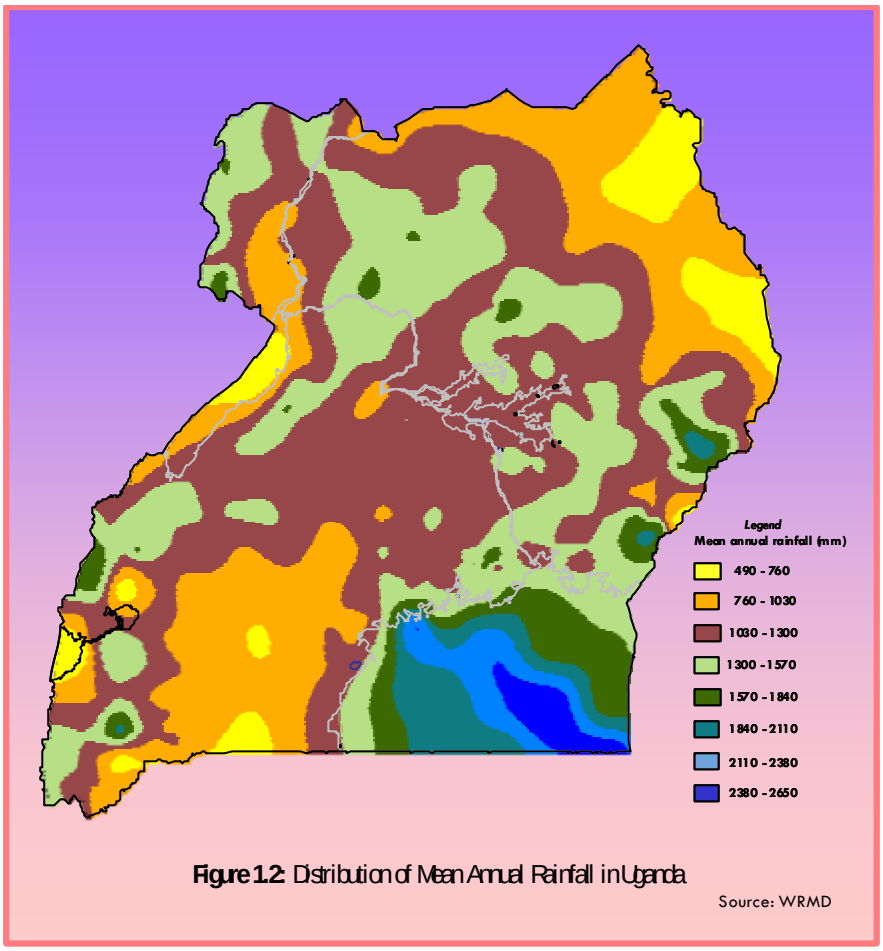

Figure 1.2: Distribution of Mean Annual Rainfall in Uganda

Source: WRMD

The country experiences two annual rainfall maximas between March to May and September to November. In the drier parts of the country, rainfall between the two maximas is not strikingly different thereby producing a unimodal type of distribution. These parts of the country are characterised by one long dry season followed by one long wet season. In the rest of the country, rainfall has a bi-modal (twin-peaked) pattern with a pronounced dry season between the two rainfall maximas.

The country is pleasantly cool with a long-term mean temperature of 21° C. Over a year, mean temperatures range from a minimum of 15° C in July to a maximum of 30° C in February. In the highlands and around mountains, the elevated landmass exerts a local influence in climate producing rainfall and temperatures that are unique from the lowlands.

1.7 Climate Change

Climate change, which is a term used to describe a gradual shift in one or more climatic elements from a long-term norm, manifests in Uganda in the form of global warming and climate variability.

The continent of Africa warmed up by 0.5°C in the past century. The five warmest years in Africa's recorded history all occurred after 1988. These changes are attributed to global warming. One impact of temperature rise has been the melting of ice and glaciers on mountaintops. The Rwenzoris are one of a few of permanently ice-capped mountains in Africa. Recent studies have shown that the glaciers and ice fields on this mountain have decreased markedly both in number

and size and that the rate of shrinkage has been greatest after 1990. The Rwenzori Mountains presently have 37 small glaciers and ice fields covering an area of 64 km^2.

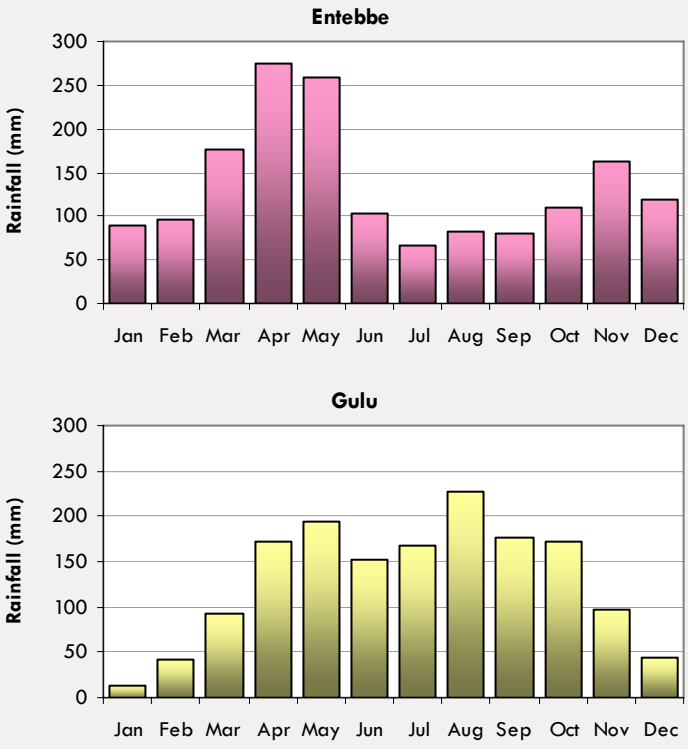

Figure 1.3: Long-term average monthly rainfall at Entebbe and Gulu showing the bi-modal and unimodal distribution patterns. These two patterns represent the dominant rainfall distribution modes in Uganda

Temperature rise is also thought to be behind the increase in morbidity and mortality of malaria in Africa. In Uganda today, malaria incidences in the highlands (1500-1800 m a.s.l.) are 30 times higher than at the beginning of the 20th Century. Malaria has for long been the leading cause of illness in Uganda and accounted for 38.7% of all morbidity cases in 2002. As a further illustration of Uganda's vulnerability to temperature rise, a modelling study by GRID-Geneva in 1989 showed that a 2°C rise in temperature would lead to an 85% shrinkage in the area suitable for growing rubusta coffee, a situation which spells economic doom for Uganda. mode

Climate in Uganda, particularly rainfall, has been erratic since early 1990s. The incidence, duration and amount of rainfall have all exhibited abnormal departures from long-term means. While rainfall in some years was far short of long-term means thereby causing droughts, in other years it was excessive and produced catastrophic floods.

The heaviest rains in recent years were recorded in 1994 and were associated with the El Niño phenomenon. The rains led to sharp rises in lake levels, widespread flooding, washing away of roads and bridges, extensive soil erosion and landslides. In Lake Kyoga, rising water levels caused detachment of previously firmly anchored floating papyrus swamps. The freed swamps drifted downstream and collected at the outlet of the Nile from the lake, causing a near total blockage there. The blockage cause a further rise in lake levels and led to partial inundation of marginal homesteads and farmlands, the spread of water-borne diseases and disruption of economic activities around the lakeshores. As water levels above the blockage continued to rise, levels (in the Nile) below the blockage dropped significantly. The blockage was cleared in 2001 through dredging with equipment provided by Egypt, a Nile riparian. The government in 2000 set up a programme "The Mitigation of Lake Kyoga Floods" aimed at alleviating the economic hardships brought upon the local communities in Kyoga basin by the floods and lake level rise.

Additional to the variability in rainfall amounts has been the confusing shifts in season since the early 1990s, with heavy rains falling in the months expected to be dry and persistent desiccating sunshine experienced in the months that are normally wet and cold. Since Uganda's agriculture is heavily dependent on rainfall, the erratic swings in season have caused an increase in frequency of food and water shortages in the country, with the worst hit area being the dry cattle corridor that stretches from the Uganda-Tanzania border to Karamoja region. Death of livestock from lack of water in the corridor has been common and has forced traditional pastoralists to migrate with their herds during hard times to neighbouring districts or game reserves. In Karamoja and Teso regions, several deaths from starvation have been recorded in recent years.

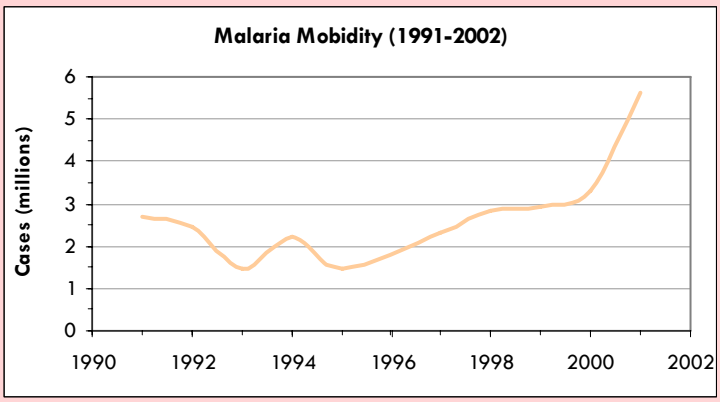

Figure 1.4: Malaria Morbidity Rates in Uganda. These rates are 30 times higher than in the 1900s and are attributed to heavy El Niño rains, local climate changes arising from wetland drainage, population growth and human migrations.

1.8 Economy

Once a strong thriving economy, Uganda shortly after attaining independence went through a period of neglect, mismanagement and political upheavals that sent the country's economy to the doldrums. The demise of the economy was catalysed not by internal factors alone but by also by certain external factors, notably the 1970s rise in price of petroleum products, the 1977 break-up of the East African Community and the 1980s slump in world coffee prices.

Since 1986, Uganda has been on a recovery path following the introduction of judicious macro-economic policy reforms that brought about fiscal discipline and led to restructuring of public expenditure and liberalisation of the economy. The reforms stabilised the economy and led to increased investments and faster economic growth. The country has maintained an average annual GDP growth rate of 6.9% since 1986 earning it praise from the IMF. Inflation has been brought down from an all time high of 200% in 1987 to an average of 5.25 since 1992. Tax revenue collection as a percentage of GDP has increased steadily from 6% in 1986 to 13.7%in the 2002/03 fiscal year. The government is working to steer the country away from an over-dependence on agriculture by increasing the contributions of industry and services to GDP. At the same time the dependence on coffee, which in the early 1990s accounted for more than 80% of Uganda's foreign earnings, is being gradually lessened by promoting investment in fish processing, horticulture and floriculture.

Uganda, despite the above impressive growth in economy, remains one of the world's poorest countries with close to 40% of her 24.7 million people living below the poverty line. The United Nations Development Programme in its Human Development Index for 2002 ranked Uganda in

the 142nd position out of 162 countries evaluated. The recovery has also been less striking on the international trade scene where the country continues to experience unfavourable balances with annual trade deficits running above 500 million dollars. Poor terms of trade, a narrow export product base and export of unprocessed materials are blamed for the dismal performance.

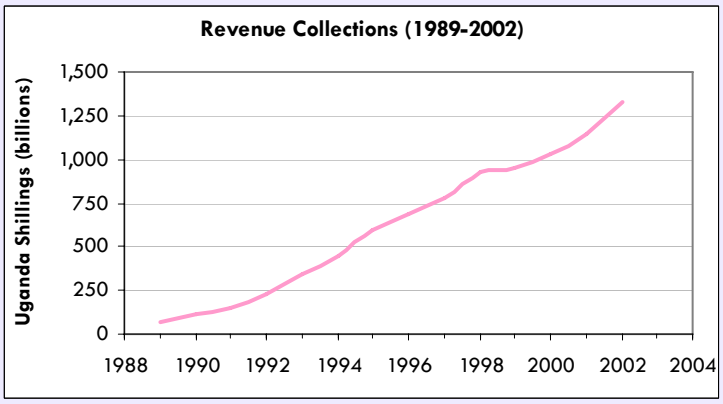

Figure 1.5: The growth in Uganda's revenue collections
Source: UBOS

Poverty reduction has since early 1990s been a leading objective of Uganda's development strategy. Government aspires to bring down poverty levels to 10% and 30% of the population living in absolute and relative poverty respectively by the year 2017. To guide its efforts in combating poverty, government prepared a Poverty Eradication Action Plan (PEAP) in 1997. The plan, which has since received two revisions, employs a multi-sectoral approach that is takes into consideration the multi-dimensional nature of poverty and the inter-linkages between influencing factors. In PEAP a four-pronged approach is pursued: poverty is brought down by a multiplicity of actions leading to (a) the forging of a framework for economic growth and transformation, (b) the promotion of good governance and security; (c) the direct improvement of poor people's ability to generate income; and (d) the direct improvement of poor people's quality of life. The government, in keeping with PEAP tenets and strategies, makes continuous interventions in the areas of rural feeder roads, agricultural modernisation, land management, rural credit and microfinance, rural market infrastructure, rural electrification, primary health care, primary education and water supply and sanitation.

One of PEAP's critical interventions is in the modernisation of agriculture. Considering that the agricultural sector employs over 80% of Uganda's labour force and is the main stay of the economy, the intervention has the potential of affecting and bettering the lives of most Ugandans. Government has prepared a Plan for Modernisation of Agriculture (PMA) through which it has initiated programs for boosting agricultural production and the marketing and processing of agricultural produce and products.

Uganda's elaborate plans and investments to combat poverty have already paid dividends. Income poverty levels declined from 50% in 1992 to 35% in 2000. The economic recession that hit many parts of the world after 2000 slowed down the steady progress and returned poverty levels to 38% in 2002.

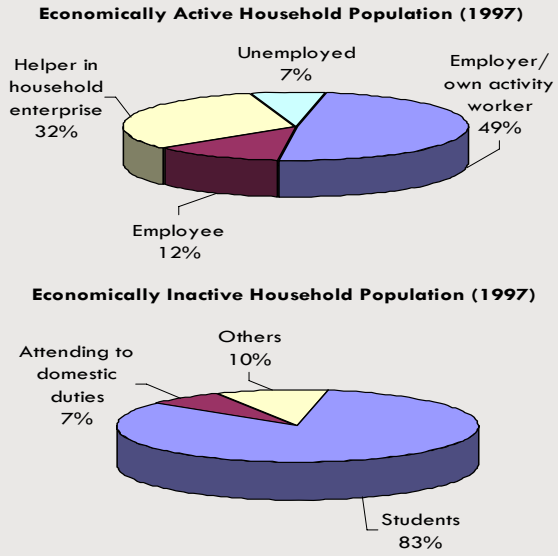

Figure 1.6: Distribution of the economically active and inactive household populations of Uganda.

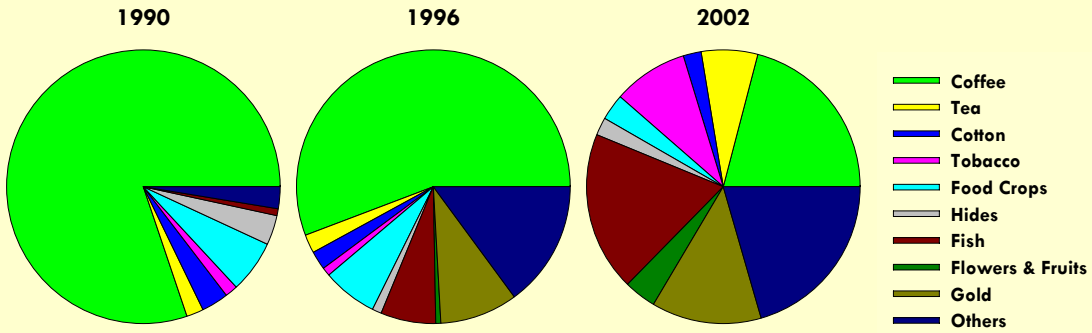

Figure 1.7: The changing contributions of major export products to Uganda's GDP. Between 1989 and 2002 the contributions of coffee, hides and food crops (maize, beans, sesame seeds, and groundnuts) dropped while those of fish, gold, fruits and flowers, tobacco and tea rose. Soap, electricity, live animals, hoes and hand tools that comprised the "others" category also rose significantly over the same period that

In recognition of the progress made by Uganda in implementing economic reforms and poverty reduction, and as an incentive for further economic growth, the international community, through the IMF Heavily Indebted Poor Countries (HIPC) Initiative and Enhanced HIPC Initiative, has cancelled a large part of Uganda's external debt. In 1998, Uganda obtained a 650 million dollars debt relief from the Heavily Indebted Poor Countries (HIPC) Initiative while in 2000,it obtain an additional 1.3 billion dollar relief from the Enhanced HIPC Programme. Total debt relief under this arrangement thus amounted to approximately US $ 2 billion – about three-fifths of Uganda's external debt. These measures have enabled the country to re-channel badly needed financial resources to the fight against poverty.

1.9 Population

Uganda's population in 2002 stood at 24.7 million and was projected to reach 25.4 million in 2003. Between 1991 and 2002, the population grew at an average annual growth rate of 3.4% - one of the highest rates in the world. The high growth rates are a result of high fertility levels (7.1 children per woman) and a decline in infant and child mortality over the years.

Uganda's populating is a young one with children under 15 years comprising more than 50% of the total population. The majority of the people are hence young dependants. People above the age of 65 make up only 2% of the total population. The average life expectancy for Uganda in 2002 was 43.8 years, a situation blamed on poverty and HIV/AIDS prevalence. AIDS is the leading cause of death among 15-49 years old and is responsible for 12% of all annual deaths. Social development indicators for Uganda are summarised in Table 2.1.

1.10 Millennium Development Goals - Status

Table 1.2 – Status of implementation of the Millennium Development Goals

GOAL	PROGRESS			TARGET
	1995	2000	2003	2015
GOAL 1: Eradicate Extreme Poverty and Hunger				
✓ Poverty Head Count (Po)	50.1	33.8	37.7	28.0
GOAL 2: Achieve Universal Primary Education				
✓ Net Enrolment Ratio in Primary Education		84.0	86.0	100.0
✓ Literacy Rate of 15-24 year olds	74.8	78.8	80.0	100.0
GOAL 3: Promote Gender Equality and Empower Women				
✓ Ratio of Girls to Boys in Primary Education		0.99	0.99	1.0
✓ Ratio of Girls to Boys in Secondary Education	0.67	0.79	0.82	1.0
✓ Ratio of Girls to Boys in Tertiary education			0.55	1.0
✓ Ratio of literate Women to Men (15-24 years)	0.8	0.84	0.9	1.0
✓ Proportion of Female Members of Parliament	0.18	0.19	0.25	0.5
✓ Share of Women in Wage Employment			0.39	0.5
GOAL 4: Reduce Child Mortality				
✓ Under 5yrs Mortality(per 100,000 live births)	147	152		56
✓ Infant Mortality Rate	81.5	88.4		31.0
GOAL 5: Improve Maternal Health				
✓ Maternal Mortality (per 100,000 births)	527	505		131
✓ Proportion of births attended by skilled health personnel	37.8	39.0		90.0
GOAL 6: Combat HIV/AIDS, Malaria & Other diseases				
✓ HIV/AIDS Orphans (thousands)				
✓ HIV Prevalence among 15-24 year olds				
GOAL 7: Ensure Environmental Sustainability				
✓ Proportion of Population (Urban) with access to an improved water source		87.0	84.0	100
✓ Proportion of Population (Rural) with access to an improved water source		57.0	59.0	62.0
✓ Proportion of Population with access to improved sanitation		82.0	87.0	100
GOAL 8: Develop a Global Partnership for Development				
✓ Debt Relief Committed under HIPC Initiative (US$ Million)		69.7	86.6	

(Source: Uganda Bureau of Statistics, 2005 Statistics Abstract)

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CHAPTER TWO

OVERVIEW OF THE WATER SECTOR

2.1 Introduction

The water sector is one of the priority sectors in Uganda, as it directly impacts on the quality of life of the people and overall productivity of the population. Water supply and sanitation are among the key issues emphasized under the national Poverty Eradication Action Plan (PEAP), which is the key government framework for ensuring poverty eradication through creation of an enabling environment for rapid economic development and social transformation.

Water is a key strategic resource, vital for sustaining life, promoting development and maintaining the environment. Access to clean and safe water and improved sanitation facilities and practices are pre-requisites to a health population and therefore have a direct impact on the quality of life and productivity of the population. Besides domestic water supply, water is also vital for: Livestock Water Supply, Industrial Water Supply, Hydropower generation, Agriculture, Marine Transport, Fisheries, Waste Discharge, Tourism, and Environmental Conservation. Water, therefore, significantly contributes to the national socio-economic development and thus poverty eradication.

Despite Uganda's being well endowed with significant freshwater resources, the challenges of rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution are leading to accelerated depletion and degradation of the available water resources. Uganda is also faced with the challenge of low safe water coverage (59% rural and 65% urban, as of December 2003).

In order to meet the above challenges, government initiated reforms in the water sector, in 1997, to ensure that water services are provided and managed with increased efficiency and cost effectiveness. Comprehensive sector reform studies have been going on since 1998 and are due to be completed by August 2004. During these studies, detailed situation analysis of the sector was carried out resulting in the preparation of a comprehensive water sector Strategy, investment plans and time bound national targets for the sector up to 2015. In demonstrating its commitment to the reform process, government has already embarked on the process of implementing some of the strategic recommendations from these studies.

One of the key strategic outcomes from the reform studies is the adoption of a 'Sector Wide Approach to Planning (SWAP)' for the sector. The SWAP framework, which has been embraced by both government and the water sector development partners, has already proved to be the most appropriate mechanism for resources mobilization and implementation of the action plans. The SWAP framework also guarantees the participation of all stakeholders in the planning and implementation of water sector activities. This openness has resulted in increased confidence from the development partners who have

now agreed to finance water sector programs through the regular government budget, contrary to the project specific funding characteristic of the past.

Despite the significant progress highlighted above, the sector is still faced with a number of challenges. The major challenge is establishment of strong mechanisms for effective, efficient and sustainable delivery of water and sanitation services to the end users, on the basis of the strategies and funding mechanisms established under the SWAP framework. This challenge, coupled with the inherent financial and human resources constraints at both national and local levels pauses the greatest risk for the untimely achievement of the sector targets.

Improvement on the sector services will require enhanced capacity of the sector institutions, in particular the Directorate of Water Development (DWD), to assume its new role of planning, supporting and supervising water and sanitation programs through improvements in monitoring systems and procedures. Government is now focusing on building capacity of the water sector institutions and Local Governments as well as promoting increased private sector participation and effective community participation in all water sector activities. The policy of promoting community participation based on demand-driven approach is being emphasized. Hygiene and health education are actively being pursued as an integral part of the drive to improve household sanitation.

At a strategic level, government is also actively promoting the principles of Integrated Water Resources Management (IWRM) as an integral part of its strategy to ensure sustainable water resources management and development.

2.2 Water Sector Goal, Objectives and Targets

GOAL

The goal of the water sector in Uganda is:

"To manage and develop the water resources of Uganda in an integrated and sustainable manner so as to secure and provide water of adequate quantity and quality for all social and economic needs for the present and future generations with the full participation of all stakeholders."

OBJECTIVES

The key water sector objectives include:

1) To promote coordinated, integrated and sustainable water resources management to ensure conservation of water resources and provision of water for all social and economic activities.
2) To achieve sustainable safe water supply and sanitation facilities, based on management responsibility and ownership by the users, to 100% of both the rural and urban population in Uganda.

3) To promote the development of water supply for agricultural production in order to modernize agriculture and mitigate effects of climatic variations on rain-fed agriculture.

TARGETS

The national targets for water supply and sanitation in both urban and rural areas are shown in **Box 2.1** below:

	Box 2.1 - National Targets for Water Supply and Sanitation
Urban Areas	Achieve 100% safe water coverage and 100% sanitation coverage in urban areas by 2015, with an 80%-90% effective use and functionality of facilities.
Rural Areas	Achieve 77% safe water coverage and 95% sanitation coverage in rural areas by 2015, with an 80%-90% effective use and functionality of facilities.

Definition of Coverage:

The definition of coverage relates to percentage of the population with access to an improved water source with in a walking distance of 1.5 Km in a rural area and 0.2 Km in the urban area. For sanitation, coverage refers to the percentage of the population with sanitation facilities in their place of residence.

2.3 Water Sector Policy and Legal Framework

The government has put in place a comprehensive policy and legal framework for the management of the water sector. The framework comprises of a set of policies and laws the most notable of which include: The National Water Policy (1999); The Water Statute (1995); The National Water and Sewerage Corporation Statute (1995), and the Local Government Act (1997).

Though most of the above policies and legislation have been in force for more than five years, a number of provisions are not yet fully operational, especially at the local government and local community levels. Further more, some of the legislation need to be revised to address the emerging issues in the sector like Private Sector Participation, Decentralization, and the SWAP.

2.3.1 National Water Policy

The National Water Policy (NWP), adopted in 1999, provides the overall policy framework for the water sector. The National Water Policy promotes the principles of integrated water resources management as a means to ensuring sustainable management and utilization of Uganda's water resources.

The policy also emphasizes the recognition of water as being both a social and economic good, whose allocation should give first priority to domestic use. The Policy is based on the principle of **"some for all, rather than all for some"** adopted from the 1990 "New Delhi Statement". It anchors operation and maintenance as an important and integral part of all

water and sanitation programs to ensure their sustainability. The policy also highlights the key role played by women in all water management and development activities.

Guiding Principles

The National Water Policy adopts the guiding principles for water resources management emanating from the United Nations Conference on the Environment and Development (UNCED, Agenda 21, Chapter 18) as detailed in **Box 2.2** below.

BOX 2.2: National Water Policy Guiding Principles
✓ Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.
✓ Management of water resources at the lowest appropriate level.
✓ The role of Government as an enabler in a participatory, demand-driven approach to development.
✓ Recognition of water as a social and economic good with a value reflecting its most valuable potential use.
✓ Integration of water and land use management
✓ Recognition of the central role played by women in the provision, management and safe - guarding of water.
✓ The important role of the private sector in water management.

The National Water Policy also re-emphasizes the water resources management strategy as stipulated in the Water Action Plan (WAP)[1] whose preparation was based on the same objective and guiding principles. The key strategy elements are grouped into those supporting an enabling environment, those guiding institutional development and those supporting the upgrading of planning capacity and prioritization of water allocation and use.

Other Relevant Policies:

Other relevant policies include:

- ✓ The National Environment Management Policy (See chapter 6 for details);
- ✓ The National Wetlands Management Policy (See chapter 6 for details)
- ✓ The Fish Farming Policy (See Chapter 7 for details)
- ✓ ***The National Gender Policy, 1999*** – which recognizes women and children as the main carriers and users of water. It anchors the importance of gender responsiveness in terms of planning, implementation and management of water and sanitation initiatives.

[1] The Water Action Plan provides the overall guidelines and strategies for the protection and development of Uganda's water resources and a structure for their management at national, district and local levels. It also provided important inputs to the new water legislation and to formulation of the National Water Policy.

- ✓ ***The Health Policy*** – which reiterates that sanitation lies within the mandate of the health ministry, and notes that the war against poor sanitation has to be intensified and maintained in order to consolidate and improve on the gains made in this area. Key priorities include support to local governments and authorities to improve sanitation and general hygiene. The Policy recommends a review of the Public Health Act in order to enhance enforcement of public health regulations in the country.

2.3.2 Water Sector Legislation

The instruments that provide the enabling legal framework for the water resources management and development in Uganda are summarized in **Table 2.1** below:

Table 2.1: Major Legal Instruments relevant to the Water Sector

INSTRUMENT	*OBJECTIVE*
The Constitution of the Republic of Uganda, 1995	Provides the broad legal and policy framework within which all water sector legislation, policies and development plans are developed.
The National Water Policy, 1999	Provides the policy framework for water resources management and development in Uganda.
The Water Statute, 1995	Provides the legal framework for the use, protection and management of water resources and water supply.
The National Environment Statute, 1995	Provides the framework for coordinated and sound management of the environment including environmental impact assessment of water resources related projects and setting water quality and effluent standards.
The Water Resources Regulations and Waste Water Discharge Regulations, 1998	Provide for the regulation of water abstraction and waster water discharge through the use of permits.
The local Government Act, 1997	Provides for the decentralisation of functions, powers, responsibilities and services to Local Governments.

(1) THE CONSTITUTION OF THE REPUBLIC OF UGANDA, 1995

The Constitution of the Republic of Uganda lays the premise for all the laws that have a bearing on the water sector. The Constitution provides for the national objectives and principles of State Policy.

Generally, the Constitution makes provision for natural resources of which water forms an integral part. It clarifies that water resources management is the duty of the state unless otherwise decreed by parliament. Government, local or central, holds natural resources in trust for the people of Uganda in accordance with the provisions of the Constitutions. As trustee, government only has powers to grant concessions, licenses or permits in respect of the natural resources listed.

The specific constitutional requirements with a direct bearing on the water sector include:

(a) Taking all practical measures to promote good water management systems at all levels;

(b) Promoting sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations, and utilization of natural resources in such a way as to meet the development and environmental needs of present and future generations; and

(2) *WATER STATUTE, 1995*

The Water Statute, enacted in 1995, is the principle law for the water sector, which incorporates legislation for both water resources management and water supply and sanitation. The Water Statute is a modern water law, in that it is flexible, deferring details to regulations that can more easily be changed as conditions change and provides for delegation of powers and broad exemptions from regulation.

At the outset the Statute confirms that all water in Uganda is vested in the government and that rights to use water; to construct or operate any works; or to pollute water can only be conferred under the provisions of the Statute. Besides general rights to use water for domestic purposes, fire-fighting, subsistence garden irrigation, the Statute does not authorize allocation of permanent water rights, but rather provides for the issuance of time-bound permits to abstract water, to construct hydraulic works and to discharge waste.

The basic foundation of most of the Statute's provisions is the reconciliation between protecting the environment and ensuring the availability to the population of water of sufficient quality and quantity.

The main objectives of the statute are:

(a) To promote the rational management and use of the waters of Uganda through:

- ✓ Progressive introduction and application of appropriate standards and techniques for the investigation, use, control, protection, management and administration of water resources,
- ✓ Co-ordination of all public and private activities which may influence the quality, quantity, distribution, use or management of water resources, and
- ✓ Co-ordination, allocation and delegation of responsibilities among Ministers and public authorities for the investigation, use, control, protection, management or administration of water resources;

(b) To promote the provision of a clean, safe and sufficient supply of water for domestic purposes to all persons;

(c) To allow for the orderly development and use of water resources for animals, irrigation, industrial, commercial and mining uses, energy, navigation, fisheries, preservation of flora and fauna and recreation in ways which minimise harmful effects to the environment; and

(d) To control pollution and to promote the safe storage treatment, discharge and disposal of waste which may pollute water or otherwise harm the environment and human health.

The Water Resources Regulations (1998), Waste Discharge Regulations (1998), Water Supply Regulations (1999) and the Sewerage Regulations (1999) give effect to the provisions of the Water Statute.

(3) *NATIONAL WATER AND SEWERAGE CORPORATION STATUTE, 1995*

The National Water and Sewerage Corporation (NWSC) Statute establishes the NWSC as a Water and Sewerage Authority and gives it the mandate to operate and provide water and sewerage services in areas entrusted to it on a sound commercial and viable basis. The Statute requires the Minister responsible for Water Affairs to enter into a performance contract with NWSC in relation to its operations in accordance with the provisions of the Water Statute. The Statute empowers the NWSC to own assets in its areas where it provides services without the need of compensation in respect of the transfer of such assets.

(4) *NATIONAL ENVIRONMENT STATUTE, 1995*

This National Environment Statute establishes the National Environment Management Authority (NEMA) as the overall body, charged with responsibility of coordinating, and monitoring all environment management issues in the country. The Statute empowers NEMA, in consultation with lead agencies, to issue guidelines and prescribe measures and standards for the sustainable management and conservation of natural resources and the environment in general. The Statute also provides for mandatory Environment Impact Assessments (EIA) to be conducted for any activity likely to have a significant effect on the environment.

(5) *WATER ABSTRACTION & WASTEWATER DISCHARGE REGULATIONS, 1998*

The Water Statute, 1995, provides for the establishment of regulations for controlling water abstraction and wastewater discharge through use of permits. The permit system ensures that use of water resources is environmentally friendly and promotes sustainable development. These controls also ensure that water is not treated as a free good but as a good with a value to be paid for. The different types of Permits provided for under the Regulations are given in **Box 2.3** below.

BOX 2.3: Types of Water Permits issued
✓ Surface water Abstraction Permit.
✓ Groundwater Abstraction Permit.
✓ Drilling Permit – For persons involved in drilling of Boreholes.
✓ Construction Permit - for a person who wishes to engage a driller to construct a borehole on his land for the purpose of using water or recharging an aquifer or fitting a motorised pump or borehole.
✓ Construction Permit - for impounding, damming, diverting or conveying any surface water and or draining any lands.

(6) *LOCAL GOVERNMENT ACT, 1997*

The Local Governments Act defines roles for different levels of government in provision and management of water and sanitation related activities. The Act stipulates that provision of water and maintenance of facilities is a role of Local Governments in liaison with the Ministry responsible for Water Affairs. The Act empowers the different levels of government to plan and implement development interventions according to identified local priorities.

(7) *LAND ACT, 1998*

The Land Act vests all rights to water resources in the Government. It empowers the Minister responsible for water to regulate the management and utilization of such water. The Act allows for reasonable use by the occupier or owner of a piece of land, of water for domestic and small-scale agricultural purposes.

The Act provides that the government or local government holds land in trust for the people and protects environmentally sensitive areas such as natural lakes, rivers, groundwater, natural ponds, natural streams, wetlands, forest reserves, national parks and any other land reserved for ecological and tourist purposes for a common good of the citizens of Uganda.

2.4 Water Sector Institutional Framework

Since the mid 1980s, Uganda has taken vigorous steps to revamp the water sector and establish a comprehensive institutional framework for the management and development of the country's water resources. This has gone hand in hand with other national initiatives (i.e. Decentralization, Privatization, Gender Emancipation, etc) geared towards the redefinition of the roles of the different levels of government, with the central government creating the enabling environment for action by local governments, communities, and the private sector.

The National Water Policy provides for a dynamic framework for the management and development of the country's water resources by providing for both short term and long

term strategies for the development of management capacity for the sector, based on an analysis of current sector priorities and management capacity levels.

As part of the overall water sector institutional framework, the Water Statute, provides for the establishment of an eleven-member multi-sectoral Water Policy Committee (WPC) as a principal advisory organ to the Minister responsible for water affairs and whose role also includes setting national policies, standards and priorities, including coordinating revisions to sector legislation and regulations.

The water statute also provides for the formation of Water and Sanitation Committees, Water User Groups, and Water User Associations, as local community level organizations, to ensure the sustainability of the water supply and sanitation facilities through proper management, operation and maintenance by the user communities.

Non Governmental Organizations (NGOs) involved in water sector activities have formed a network called Uganda Water and Sanitation Network (UWASNET) for improved coordination of their activities in the water sector. The network also provides a platform for constructive engagement with government and donors in the water sector and serves to promote sharing of experience between the members. There are currently (2004) over 180 NGOs and Community Based Organizations (CBOs) involved in water supply and sanitation activities in different parts of the country. **Table 2.2** shows the roles of the different institutions involved in water sector activities.

Table 2.2 – Institutions involved in the Water Sector

INSTITUTION	ROLE
Ministry of Water, Lands and Environment	Policy formulation, setting standards, strategic planning, coordination, quality assurance, provision of technical assistance, and capacity building.
Directorate of Water Development (DWD)	Lead agency responsible for policy guidance, coordination and regulation of all water sector activities including provision of oversight and support services to the local governments and other water supply service providers.
National Water and Sewerage Corporation (NWSC)	Autonomous entity responsible for the delivery of water supply and sewerage services in the major towns and large urban centers (a total of 16 service centers by June 2004).
Ministry of Finance, Planning and Economic Development	Mobilization and allocation of financial resources including co-ordination of donor inputs and the privatization process.
Ministry of Local Government	Establish, develop and facilitate the management of efficient and effective decentralized government systems capable of delivering the required services to the local people.
Ministry of Health	Promotion of hygiene and household sanitation.
Ministry of Education and Sports	Promotion of sanitation and hygiene education in schools.
Ministry of Gender, Labor and Social Development	Coordination of gender responsive development and community mobilization.
Ministry of Agriculture, Animal Industries and Fisheries	Planning, coordination and implementation of all agriculture development in the country including irrigation development, aquaculture, and livestock development.
Local Governments	Responsible for the provision and management of water and sanitation services in rural areas and urban areas outside the jurisdiction of NWSC, in liaison with DWD;
User Communities	Planning, implementation and operation and maintenance of the rural water and sanitation facilities. User communities are also obliged to pay for urban water and sanitation services provided by NWSC and other service providers.
Donors	Provide financial resources for implementation of water sector activities.
Private Sector	✓ Valuable resource for design, construction, operation and maintenance of water and sanitation facilities. ✓ Conduct training and capacity building for both central and local government staff. ✓ Provision of other commercial services including mobilization of financial resources for water sector development activities.
Non Governmental Organizations (NGOs) and Community Based Organizations (CBOs)	✓ Supplement the public sector efforts and ensure that concerns of the underprivileged/poor are catered for. ✓ Provision of financial and planning support to communities and local governments.

2.4.1 Directorate of Water Development

The Directorate of Water Development (DWD) is the government lead agency responsible for the oversight and coordination of all water sector activities.

MANDATE

DWD's mandate is to promote the provision of clean and safe water to all persons, and to investigate, control, protect and manage water in Uganda for any use in accordance with the provisions of the Water Statute, 1995.

FUNCTIONS

The major functions of DWD include:

a) To promote the rational management and use of the waters of Uganda through:

- ✓ Progressive introduction and application of appropriate standards and techniques for the investigation, use, control, protection, management of water resources;
- ✓ Co-ordination of all public and private activities which may influence the quality, quantity, distribution, use or management of water resources;
- ✓ Co-ordination of responsibilities for the investigation, use, control, protection, and management of water resources;

b) To promote the provision of clean, safe and sufficient supply of water for domestic purposes to all persons;

c) To allow for the orderly development and use of water resources for purposes other than domestic use, such as, the watering of stock, irrigation and agriculture, industrial, commercial and mining uses, the generation of hydroelectric or geothermal energy, navigation, fishing, preservation of flora and fauna and recreation in ways which minimise harmful effects to the environment;

d) To control pollution and promote the safe storage, treatment, discharge and disposal of waste, which may pollute water or otherwise harm the environment and human health.

SET-UP

The Directorate of Water Development (DWD) consists of three technical Departments i.e. Urban Water Supply Department, Rural Water Supply Department, and Water Resources Management Department.

Urban Water Supply Department

The functions of the Urban Water Supply Department include:

- ✓ Supervision of Urban Water Authorities and provision of technical support to utility management through drafting of private operators' performance contracts and performance assessment of the contract holders;
- ✓ Planning, design, and development of urban water and sewage systems country wide; and
- ✓ Regulation of urban water supply and sanitation services development.

Rural Water Supply Department

The functions of the Rural Water Supply Department include:

- ✓ Strategic planning, regulation and quality assurance of rural water and sanitation interventions to ensure adherence to national policy, strategies, and development targets.
- ✓ Supervision and provision of technical support for implementation of water for production interventions (i.e. construction of valley dams and valley tanks);

Water Resources Management Department

The main goal of the department is to promote sustainable management of Uganda's water resources to ensure availability of water of adequate quantity and quality for domestic water supply, agriculture, industry, fisheries and other uses for both present and future generations.

The key functions of the department include:

- ✓ Monitoring the quantity and quality of surface and ground water resources in the country;
- ✓ Storing, processing and disseminating water resources data and information to all users;
- ✓ Conducting water resources assessment studies and providing guidance to water development programmes and to government based on study findings;
- ✓ Regulating water resources use through processing, issuing, monitoring and enforcing permits for water abstraction, waste water discharge, bore hole drilling and construction of hydraulic works;
- ✓ Formulating and reviewing national water resources management plans and frameworks.
- ✓ Providing advice to the Water Policy Committee (WPC) on transboundary water resources management issues to ensure their equitable use and adequate protection;
- ✓ Providing advice to the National Environmental Management Authority (NEMA) on standards for water quality and effluent discharge and through the review of environmental impact studies on water resources related projects and developments;
- ✓ Providing reference water quality analytical services.

2.4.2 Co-ordination of Water Sector Activities

The water supply and sanitation sector is coordinated through a number of committees and working groups, as shown in **Table 2.3** below:

Table 2.3: Water Sector Coordination Framework

COMMITTEE	COMPOSITION	ROLE
Water Sector Working Group	MWLE, NWSC, MFPED, MOH, MOLG, MOES, Development Partners and NGOs.	Established by the Ministry of Finance as a mechanism to promote a more consultative and participatory approach in the management of public funds, and to increase transparency and accountability in the planning and utilization of resources in the water sector.
District Water and Sanitation Committees	Representatives from Local Governments, NGOs, CBOs, and the private sector.	To improve co-ordination and management of RWSS programs at the local government level, including the interaction between the relevant departments and also with the private sector, NGOs and local communities.
Inter-district Co-ordination Committees	Local government officials from different districts.	To review progress of implementation of water supply and sanitation activities in neighboring districts and share experiences.

2.5 Emerging Sector Issues

The water sector, like other sectors of government, is faced with a number of challenges associated with the overall socio-economic situation in the country. Rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution are leading to accelerated depletion and degradation of the available water resources.

The challenge of providing safe water and sanitation services to all Ugandans is not only immense but also requires significant financial resources which cannot be met by the government alone. In order to meet these challenges, government has in the recent years embarked on the process of reforming the water sector not only to increase on efficiency of service delivery but also to provide an enabling environment to attract the required funding for the sector and to also enhance private sector participation in the sector.

2.5.1 Water Sector Reform

Government initiated reforms in the water sector, in 1997, to ensure that water services are provided and managed with increased efficiency and cost effectiveness, and to decrease the government's burden while maintaining its commitment to sustainable and equitable development.

In order to address the challenges the sector was faced with, the Ministry of Water, Lands and Environment, in consultation and collaboration with line Ministries, agencies and Development Partners agreed to undertake reform studies in the four sub-sectors

comprising (i) Rural Water and Sanitation, (ii) Urban Water Supply and Sanitation, (iii) Water for Production, and (iv) Water Resources Management.

The reform studies have been going on since 1998 and are due to be completed by August 2004. During these studies, detailed situation analysis of the four sub-sectors was carried out leading to the preparation of comprehensive investment plans and time bound national targets for the sector up to 2015. In demonstrating its commitment to the reform process, government has already embarked on the process of implementing some of the strategic recommendations from these studies.

RURAL WATER AND SANITATION (RWS) SUB-SECTOR REFORM STUDY

The rural water and sanitation sub-sector reform study was completed in 2001. The study established rural water and sanitation coverage and demand and also set short-, medium- and long-term targets for the sub-sector. One of the key outcomes of the study was a 15-year Strategic Investment Plan (SIP-15) for the sub-sector for the period 2001-2015. The SIP-15 has since undergone reviews and become the guiding document for the implementation of activities under the sub-sector. The 15-year investment requirements for the sub-sector are estimated to be about US$ 951 million.

The reform study identified a number of constraints in the sub-sector as shown in **Box 2.4**:

	BOX 2.4: Key Constraints in the RWS Sub-sector
1	Low technical and functional capacities at District level.
2	Planning and budgets for water and sanitation are being done in isolation.
3	Community mobilization and capacity building gender mainstreaming is weak.
4	Full private sector participation is yet to be realised especially for simple technologies. Spare parts distribution through the private sector is reported as problematic. Borehole drilling capacity, whilst limited, is growing.
5	District level tendering, contract management, financial management as well as reporting were found to be under developed, thus leading to very substantial sector programme implementation delays and under-utilisation of allocated funds.
6	Operation and maintenance structures were found to be weak or non-existent and most Districts lacked back-up support for community based Operation and Maintenance especially for boreholes and Gravity Flow Schemes (GFS).

In order to address the above constraints the study among other things recommended adoption of a Sector Wide Approach (SWAP) towards implementation of the sub-sector activities. Implementation of the SWAP approach commenced in 2000 when a large proportion of the sub-sector funding, under the Poverty Action Fund (PAF), was transferred directly to the Districts as conditional grants for implementation of rural water and sanitation activities in their respective local governments.

Despite the significant progress made in the implementation of the reform recommendations, the sub-sector is still faced with a number of challenges as highlighted in **Box 2.5** below:

	BOX 2.5: Key Challenges in the RWS Sub-sector
1	Inadequate capacity of institutions involved in the sub-sector, particularly the local governments and DWD.
2	Poor hygiene practices and low sanitation coverage at household level and in schools.
3	Inadequate funding for the sub-sector.
4	Reducing 'value-for-money' due to increasing per capita investment costs due to low economies of scale characteristic of local government contracts.
5	District level tendering, contract management, financial management as well as reporting were found to be under developed, thus leading to very substantial sector programme implementation delays and under-utilisation of allocated funds.
6	Low sustainability of the installed infrastructure due to inadequate operation and maintenance provisions put in place by the user communities.

As part of the implementation of the SIP-15, a 5-year Operational Plan (OP5) has been developed for the RWS sub-sector for the period 2002 – 2007. The OP5 presents a detailed 5-year investment plan for the RWS sub-sector highlighting the technical and financial requirements to meet the set targets and the role to be played by the different stakeholders.

URBAN WATER AND SANITATION (UWS) SUB-SECTOR REFORM STUDY

The urban water and sanitation sub-sector reform study was completed in 2001. The study established urban water and sanitation coverage and demand and also set short-, medium- and long-term targets for the sub-sector. The key outcomes of the study include a proposed institutional framework for the sub-sector and a comprehensive Strategy and 15 year investment plan of the sub-sector. The 15-year investment requirements for the sub-sector are estimated to be about US$ 481 million. Some of the key recommendations arising from the UWS sub-sector reform study are given in the **Box 2.6** below:

	BOX 2.6: Key Recommendations from the UWS Sub-sector Reform Study
1	Lumping of a number of small towns into one lease contract to be awarded to a private operator for a 10-year period. The lease is to be reviewed every five years.
2	Responsibility for water and sanitation service provision in the smaller towns should continue to be vested in the Local Governments (LGs). MWLE will enter into performance contracts with respective LGs. The contracts are to specify the performance standards and conditions for accessing central government subsidies. The LGs will in turn contract Local Private Operators to run the facilities on their behalf.
3	All water and sanitation assets established using public funds are to remain public property. Government is to set up a semi-autonomous Asset Holding Authority (AHA) for assets in larger towns, while the Local Governments shall hold the assets in smaller towns in trust for the public.
4	An independent regulatory body is to be established by government to set tariffs, protect consumers' interests and resolve any disputes that may arise between the private operators and the contracting parties.
5	Technical regulation will be delegated to DWD, AHA, and other relevant agencies with the necessary technical competence.

The study also recommended mechanisms for implementation of the proposed reforms and specifically for cross-subsdization and transition of towns from the non-lease to the lease group.

WATER FOR PRODUCTION SUB-SECTOR REFORM STUDY

The Water for Production (WfP) sub-sector reform study was completed in November 2003. The key outcomes of the study include a comprehensive Strategy for the sub-sector focusing mainly on improving rural household incomes through use of water for increased agricultural productivity and food security. The strategic interventions proposed by the WfP sub-sector reform study are given in the **Box 2.7** below:

	BOX 2.7: Key Strategic Interventions proposed under the WfP Reform Study
1	Improved access to water for livestock, especially in the cattle corridor.
2	Promotion of water harvesting for small-scale supplementary irrigation.
3	Promotion of small-scale aquaculture and culture-based fisheries in existing reservoirs.
4	Creation of an enabling environment for private sector investment in the sub-sector.

WATER RESOURCES MANAGEMENT SUB-SECTOR REFORM STUDY

The Water Resources Management (WRM) sub-sector reform study is expected to be completed in December 2004. The main objective of the study is "to establish an effective framework for water resources management in Uganda to ensure that water resources are managed in an integrated and sustainable manner." During the study, a comprehensive analysis of the recommendations from the other three sub-sector reform studies will be carried out to ascertain their implications on the sustainable management and utilization of the country's water resources.

The key expected outcome from the study is a Strategic (Investment) Plan for the transformation of the Water Resources Management sub-sector into a viable entity capable of meeting the existing water resources management challenges at national and regional level in an efficient and timely manner.

2.5.2 The SWAP Framework

The Sector Wide Approach (SWAP) is a mechanism where Government and development partners agree on a strategy to achieve improvement in sector performance and more effective use of financial resources through programs rather than projects. The SWAP is characterized by a highly consultative process where all stakeholders fully participate in the planning and implementation of all sector programs.

The SWAP framework, which has been embraced by the water sector, has already proved to be the most appropriate mechanism for resources mobilization and implementation of the agreed action plans. The SWAP framework has enhanced the participation of all stakeholders in the planning and implementation of water sector activities. This openness has resulted in increased confidence from the development partners who have now agreed to finance water sector programs through the regular government budget, contrary to the

project specific funding characteristic of the past. **Box 2.8** shows some of the key features of the water sector SWAP framework:

	BOX 2.8: Key Features of the Water SWAP Framework
1	Harmonised strategy for the sector and framework for common approaches.
2	A clearly defined institutional framework for all stakeholders to work in.
3	Use of existing government systems, thus increasing the capacity of government.
4	Improved value for money of services provided.
5	Improved monitoring, evaluation and reporting of sector activities and performance.
6	Improved sustainability of service delivery.

2.5.3 Gender Mainstreaming in the Water Sector

The Water Sector Gender Strategy encompasses the mainstreaming of gender and addressing women specific issues in all aspects related to water and sanitation and sets out clearly the way forward to mainstreaming gender in all the water sector activities.
The Strategy specifically addresses the plight of women who are faced, by among other constraints, the following: walking long distances to fetch water; inadequate participation in the decision making process e.g. low representation on Water User Committees; lack of access to relevant information, say regarding the possible technology options, rationale for levying of water user fees, etc; inadequate security at and to the water points for children and women who are vulnerable to rape, harassment and torture.

With regards to sanitation, particularly the issue on household latrines, there is a large aspect of cultural and traditional norms and values, which affect men and women differently. Men tend to have greater involvement in putting up latrines, because of their labor in digging the pits and procuring the slabs and constructing the physical structure. In addition, some cultural practices influence the use of sanitation facilities by women and children.

2.6 Financing of the Water Sector

Funding for the water sector has been increasing steadily over the past 10 years. The water sector, being one of the key priority sectors, has benefited significantly from the Poverty Action Fund (PAF) to which government has committed significant resources for the Poverty Eradication Action Program (PEAP). The key development partners in the water sector include DANIDA, World Bank, EU, France (AFD), Germany (GTZ/KFW), AUSTRIA, Sida, UNICEF, DfID, the Netherlands, Japan (JICA).

The past, current and projected funding for the water sector is shown in **Table 2.4** below.

Table 2.4: Water Sector Budget Projections (US$ Millions)

		99/00	*2000/01*	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*
Central Gov't	Wage	0.26	0.22	0.26	0.29	0.29	0.29	0.29
	Non Wage	0.30	0.25	0.27	0.29	0.24	0.28	0.30
	Dev't grants	8.96	7.56	16.21	11.87	14.89	15.39	15.54
	Donor Proj.	41.89	25.97	29.36	41.89	23.67	21.66	11.24
	Sub Total	***51.40***	***33.99***	***40.85***	***54.34***	***39.09***	***37.62***	***27.37***
	Gov't input	9.51	8.02	11.49	12.45	15.42	15.96	16.13
Local Gov't	O&M Grant	2.73	0.67	0.76	0.70	0.79	0.86	0.92
	Dev. Grant	0.00	11.87	14.04	13.27	14.02	14.82	16.83
	Sub Total	***2.73***	***12.54***	***14.80***	***13.97***	***14.80***	***15.68***	***17.76***
Total financing		54.13	46.54	55.06	68.31	53.89	53.30	45.13
Government Contribution (%)		23%	27%	29%	39%	54%	59%	75%
Donor Contribution (%)		77%	73%	71%	61%	44%	41%	25%

(Source: DWD and National Budget)

Table 2.4 shows that donor financing, through direct project interventions, is still the major source of funding for the water sector though it is expected to go down to 25% by the year 2005. The table also shows that government funding is increasing significantly and is expected to reach 75% of the total water sector budget by 2005. This increased government funding for the sector is part of government's long-term commitment to fund most of the sector activities through locally generated resources as the economy improves. Most of the government funding to the sector is being channeled directly to the local governments as conditional grants for implementation of water supply and sanitation activities.

2.6.1 Funding under the SWAP Framework

Under the adopted SWAP framework, government and most development partners have agreed to finance the water sector through general budget support, which gives government a high degree of flexibility in allocating both local and donor financial resources according to the national priorities and development objectives. Whilst the SWAP framework does not explicitly stipulate financing through budget support, the current funding trends show that the primary instrument for sector financing over the medium and long-term will be budget support directly to the local governments.

Rural Water Supply and Sanitation Sub-sector - Funding for rural water supply and sanitation activities is provided to the local governments by the central government as unconditional, conditional and equalization grants. The unconditional grants cater for the local government staff salaries and operational costs, while the conditional grants are for the actual delivery of water supply and sanitation services agreed upon between the different local governments and the sector ministry (MWLE). The equalization grants are special funds meant for the least developed local governments, with inadequate revenue sources and where service levels are still very low.

Based on the experience from the above funding mechanism, government has developed a Fiscal Decentralization Strategy (FDS) aimed at streamlining the transfer of funds to the local governments using two systems i.e. Recurrent Transfer System (RTS) for recurrent expenditures and a Development Transfer System (DTS) for all development activities.

Urban Water Supply and Sanitation Sub-sector – Funding for the small towns water supply and sanitation development activities is still project based, though the central government provides the local governments with conditional grants for operation and maintenance of the systems. Government is also in the process of establishing a joint small towns development funding mechanism, where all government and donor funds are pooled for the development of all the small towns water supply and sanitation systems in the country. In the long-term, funding for small towns water supply and sanitation development activities will be made available through budget support.

The development funds for large towns are channeled directly to NWSC as government loans or grants.

Water Resources Management Sub-sector – Funding for water resources management activities is program based channeled directly as support to the sub-sector. However, there are still a few project based funding arrangements (e.g. LVEMP, MLKF, NBWRP), which are expected to phase out as the program based funding takes root.

Water for Production Sub-sector – Currently, all activities under the water for production sub-sector are wholly funded by the government through annual recurrent and development budget allocations by the Ministry of Finance.

2.7 Monitoring, Evaluation and Reporting

2.7.1 Monitoring, Evaluation and Reporting Framework

Government considers monitoring, evaluation and reporting (ME&R) as a key component of all national development programs. As part of the institutional set-up for the MWLE, a department of Planning and Quality Assurance was established to, among other functions, carry out periodic monitoring, evaluation and quality assurance of all ministry activities including water supply and sanitation. The department issues periodic quality assurance reports highlighting the performance of the different departments in the ministry against set targets and recommendations on corrective measures to be implemented during the next reporting period.

In addition to the above arrangement, the water sector has also established a joint Government/Development Partners Sector Review (JSR) held annually in September/October and attended by sector ministries, civil and political leaders, local government staff and representatives of development partners. During these reviews, a comprehensive review of the performance of the sector is carried out, shortcomings discussed and undertakings for addressing priority issues during the following year agreed upon. As part of performance monitoring process, mid-term joint technical reviews are also

carried out to assess the technical and financial performance of the sector. More detailed field visits are carried out during the technical review. Annual water sector performance reports are prepared and circulated to all stakeholders for review and information

The current reporting and monitoring framework has ensured coordinated and periodic reporting on all sector activities by the different stakeholders and has greatly improved on information flow between the central government, donors, local governments, NGOs and the private sector.

Besides the periodic reporting by different stakeholders, the framework also provides for periodic service delivery surveys, and specific independent surveys that are often conducted by different stakeholders. As part of this framework, the central government periodically issues policy benchmarks, national and local targets, performance indicators and monitoring and reporting guidelines and standards that have to be followed by all stakeholders in the water sector.

The key features of the current water sector monitoring and reporting framework are given in **Box 2.9** below.

	BOX 2.9: Key Features of the Water Sector Monitoring and Reporting Framework
1	Set short-, medium-, and long-term national and local targets based on national development priorities and objectives.
2	Establish performance targets and measurable indicators for the different stakeholders.
3	Submission of quarterly and annual progress reports by the District Water Offices and Urban Water Supply authorities, to respective local governments and DWD.
4	Submission of consolidated quarterly and annual progress reports by DWD to MWLE for onward transmission to Ministry of Finance and Office of the Prime Minister.
5	Submission of annual Policy Statement by MWLE to Parliament.
6	Quarterly monitoring and quality assurance visits to all local governments to get on-the-spot assessment of their performance and quality of outputs.
7	Submission of bi-annual reports by sector regulator to DWD, MWLE and Parliament.
8	Conduct annual service delivery surveys and periodic participatory poverty assessments and impacts.
9	Conduct comprehensive joint government/donor technical reviews and monitoring.
10	Conduct annual joint government/donor sector performance reviews.
11	Conduct (using independent consultants) independent service delivery audits, and special audits like "Value for money", "Tracking Studies", etc

2.7.2 Water Sector Monitoring Indicators

Some of the currently used monitoring indicators in the water sector are given in **Box 2.10** below.

	BOX 2.10: Key Water Sector Monitoring Indicators
	Golden Indicators
1	Percentage of people within 1.5 km (rural) and 0.2 km (urban) of an improved water source.
2	Percentage of improved water sources that are functional at time of spot check.
3	Average investment cost per beneficiary of new water and sanitation schemes.
4	Percentage of people with access to improved sanitation (households and schools).
5	Percentage increase in cumulative storage capacity available for water for production.
6	Percentage of water samples taken at point of collection that comply with national standards.
7	Mean Parish deviation from district average in persons per improved water point.
8	Percentage of people with access to hand-washing facilities.
	Specific Indicators for Urban Water Supply and Sanitation
9	Percentage of unaccounted for water.
10	Staff productivity (staff per 1,000 connections).
11	Collection/billing ratio.
12	Number of water and sewage connections.
13	Percentage of the urban population with on site sanitation facilities (septic tanks, Ecosan, pit latrines, etc).
14	Percentage of effective response to customer complaints within 24 hours.
	Other Water Sector Indicators
15	Average % of household expenditure paid for water and sanitation services.
16	Percentage of people that use improved sanitation (households and schools).
17	Percentage of men and women who are satisfied with water and sanitation services.
18	Average daily per capita total water consumption.
19	Percentage change in average ground and surface water levels.
20	Percentage of sector annual approved budgets that are actually spent on water and sanitation investment programs.
21	Percentage of staff positions in central and local government that are filled.

Source: MWLE (2004)

2.8 Progress Towards Achieving National Targets and MDGs

2.8.1 Progress towards achieving National WSS Targets

Considerable progress has been made in implementing the national policy and attaining national targets. In the water resources management sub-sector, the licensing of water withdrawals and effluent discharges has began, water resources monitoring networks and assessment activities have been expanded and strengthened, a national water testing laboratory has been set up and national databases and information systems on water resources have been established.

In the rural and urban water and sanitation sub-sectors, there has been a steady improvement in service coverage over the years. Access to improved water sources in rural areas where over 80% of the population lives rose from 20.3 % in 1990 to 55% in 2002. Over the same period, access to improved sanitation in rural areas rose from to 85% from 55.1%. Average annual growth rates in service coverage for the period 1990-2002 were 3.1% for improved water and 2.3% for improved sanitation.

Urban areas where only 12% of the population resides have for long had better social infrastructure and services than rural areas. Access to safe water fell from 72% in 1990 to 63% in 2002 while access to improved sanitation rose from 71.2% in 1990 to 96% in 2002. The trend with respect to safe water neither reflects zero investments in this sub-sector nor the breakdown of existing facilities. Rather, it shows that efforts to raise coverage have not matched the influx rate of people to town centres. Urban populations have been burgeoning owing to rural-urban migrations driven by biting poverty and unemployment in the countryside and the seemingly easy life in cities.

The above remarkable achievements have been made possible by substantial increments in government's financial allocations to the water sector. Funds for the water sector come from government's priority Poverty Action Fund (PAF). The achievements are also attributed to growing donor confidence in and support for Uganda. Uganda's development partners who have been active in the water sector are Denmark (through Danida), France (AFD), Germany (GTZ and KFW), Austria, Sweden (SIDA), Britain (DfID), The Netherlands and Japan (JICA). External funds have also been received from the World Bank, European Union, UNICEF and a number of NGOs. The figure below shows that financial flows to the sector doubled from 30 million dollars in 1998/99 fiscal year to 68.3 million dollars in 2002/03 fiscal year.

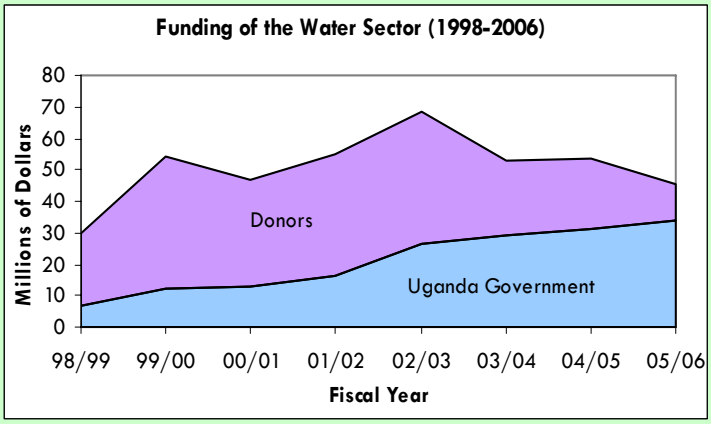


Figure 2.1: Past and projected financial flows to the Ugandan water sector

The mobilization of required resources for planned actions has been made easier by the adoption of a Sector Wide Approach to Planning (SWAP). Estimates of total funds required to meet national targets for water supply and sanitation in the period 200-2015 are in the range of 1,100-1400 million US dollars.

2.8.2 Progress towards achieving MDGs

In September 2000 at the UN Millennium Summit, world leaders agreed to a set of time bound and measurable goals and targets for combating poverty, hunger disease, illiteracy, environmental degradation and discrimination against women. Placed at the heart of the global agenda, these goals (eight in number) are now called the Millennium Development Goals (MDGs). Progress towards attainment of the MDGs is measured with the aid of 18 quantitative targets and 48 performance indicators. One of the targets – target 10 – addresses water supply and sanitation and calls upon member states to "halve by 2015 the proportion of people without access to safe drinking water and basic sanitation". Target 10 is monitored through indicators 30 and 31, which are the proportions of people with sustainable access to safe water sources and improved sanitation respectively. Using 1990 coverage levels, the MDGs for Uganda are 61.8% if the population with access to improved water, and 84% with access to improved sanitation by the year 2015. Water availability is also key to realisation of three other targets besides Target 10 (Box 2.11).

Box 2.11: MDGs Requiring Water

Target 2: Halve, between 1990-2015 the proportion of people who suffer from hunger.

Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.

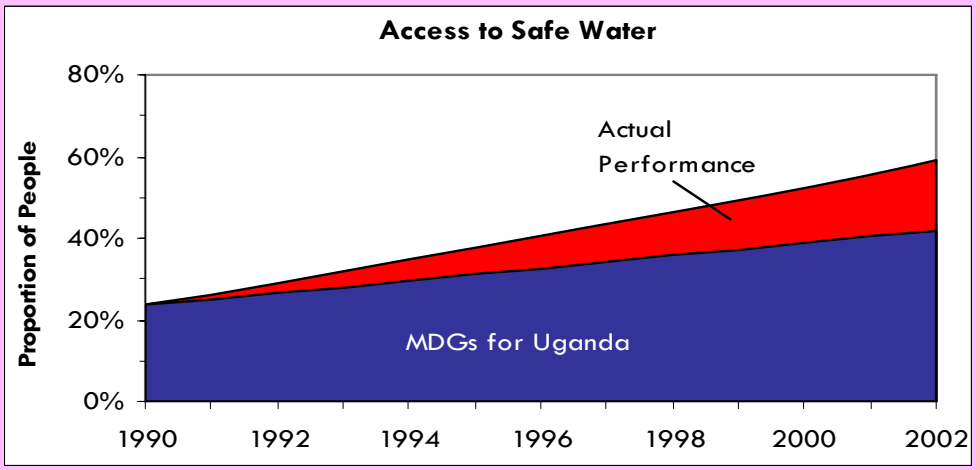
Target 10: Halve, by 2025, the proportion of people without access to safe drinking water and basic sanitation.

Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers.

Source: UNDP

Uganda endorsed the MDGs and committed itself to attainment of the 18 targets, which are in harmony with the country's prime goal of eradicating poverty and improving lives.

Uganda's national targets for water supply and sanitation are higher than Target 10 in the MDGs. The country recorded improvements in safe water and sanitation coverage between 1990 and 2002 that exceeded interim MDG targets for that period. There is likelihood of both national targets and MDGs being realized given past successes.



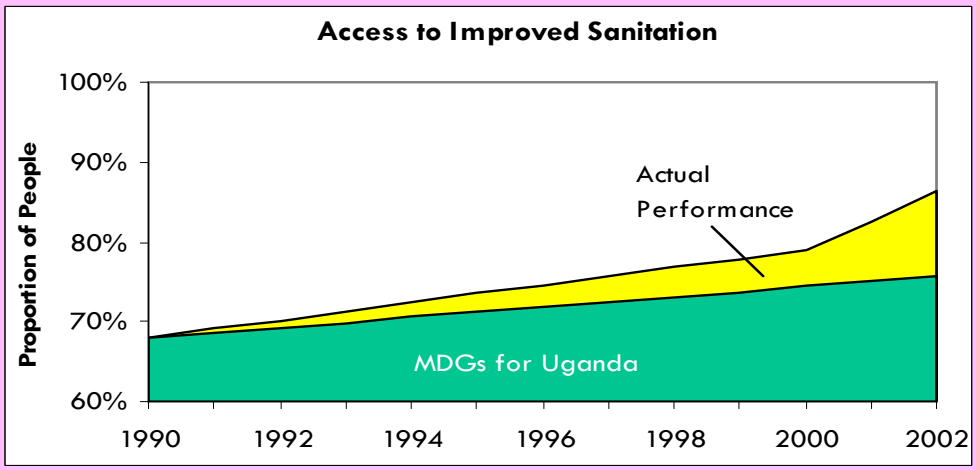


Figure 2.2 Progress towards the MDGs in water supply and sanitation in Ugandan. Trends have been constructed using 1990, 1996 and 2002 coverage data

2.9 Issues, Challenges and Opportunities

2.9.1 Issues

Key issues affecting the sector performance include:

a) Inadequate financial resources: The investment requirement for rural water supply and sanitation, to meet the 2015 target, is about US$ 951 million. The corresponding investment for the urban water supply and sanitation is estimated to be US$ 481 million. The Government cannot finance this level of investment from local limited resources. The issue here, therefore, is how to raise the required financial resources to meet the 2015 targets for the water sector.
b) Inadequate capacity at district and lower levels to plan and implement sector activities. This has consequently resulted in low absorption of funds by the local governments.
c) Limited Private sector capacity to cope with the increased water and sanitation activities.
d) Weak coordination and management at both national and local governments level.
e) Inadequate involvement of local communities in the planning, financing, implementation, monitoring and management of community based water and sanitation developments.

2.9.2 Challenges

Despite Uganda's being well endowed with significant freshwater resources, the challenges of rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution are leading to accelerated depletion and degradation of the available water resources.

In addition, the major operational challenge for the water sector is establishment of strong mechanisms for effective, efficient and sustainable delivery of water and sanitation services to the end users, on the basis of the established strategies and funding mechanisms.

2.9.3 Opportunities

In order to cope with the above challenges, government has taken steps to revamp the water sector through comprehensive policy, legal and institutional reforms aimed at increasing the performance of the sector in terms of outputs but also the efficiency in service delivery.

The opportunities available to ensure this transformation of the water sector include:

a) Poverty Eradication Action Plan (PEAP) – Which gives high priority to water supply and sanitation as one of the key intervention areas for poverty eradication.
b) Water Sector Reform – whose objective is to ensure that services are provided and managed with increased performance, efficiency and effectiveness, while maintaining the government's commitment to equitable and sustainable provision of domestic water supply and sanitation services.
c) Comprehensive Policy and Legal Framework – which guides the planning, implementation and monitoring of water supply and sanitation activities.

d) Good governance in both the management of public resources (through multi-annual financial planning and budgeting under the MTEF) committed to water supply and sanitation activities.
e) Private Sector Participation (PSP) which has brought in expertise and financing from the private sector to support government in the planning and implementation of water supply and sanitation activities.
f) Commitment from government and development partners for continued support of water supply and sanitation activities.

2.10 Future Outlook for the Sector

Given the achievements made so far, the water sector is on the right track to meet both its medium-term and long-term objectives and targets. With the Sector Reforms expected to be completed in December 2004, the sector is bracing itself for a period of intensive activity as the reform recommendations begin to be implemented.

Implementation of the reform recommendations will not only be challenging but will also inevitably have heavy financial, technical and legal implications all of which have to be addressed to ensure successful and timely realization of set targets. All these pre-requisites have been addressed in details in the different sub-sector strategies and investment plans.

The biggest challenge to the future of the water sector is mobilizing the necessary financial resources as stipulated in the sub-sector investment plans and putting in place the necessary implementation and coordination mechanisms for the efficient delivery of services to the end users.

It is envisaged that the private sector and the Local Governments will play a more active role in the delivery of water and sanitation services in the new liberalized and decentralized water sector. The challenge in this case will be building the capacity of both the Local Governments and the private sector to enable them play their role effectively.

Increased stakeholder participation in the sector activities will also call for more effective coordination mechanisms and a coherent ME&R framework to ensure transparency and accountability in the sector and to minimize duplication of efforts and wastage of resources.

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CHAPTER THREE

UGANDA'S FRESHWATER RESOURSES

3.1 Introduction

Uganda's freshwater resources are considered a key strategic resource, which is vital for sustaining life, promoting development and maintaining the environment. Rapid population growth, increased agricultural production, urbanisation and industrialisation are leading to depletion and degradation of the available water resources. Uganda is heavily dependent on its water resources for most of its socio-economic development activities. These include among others: Domestic Water Supply, Livestock Water Supply, Industrial Water Supply, Hydropower generation, Agriculture, Marine Transport, Fisheries, Waste Discharge, Tourism, and Environmental Conservation. In order to satisfy all the above water demands in a sustainable manner, government has adopted a holistic approach to water resources management based on the internationally recognized Integrated Water Resources Management (IWRM) principles.

Despite Uganda's being well endowed with significant freshwater resources, the challenges of rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution are leading to accelerated depletion and degradation of the available water resources.

3.2 Rainfall

Direct rainfall is the most important source of water in Uganda. The rainfall pattern greatly influences the local land use potential and thus the population distribution. The mean annual rainfall distribution in Uganda is shown in **Figure 1.2** in **Chapter 1**. The average annual rainfall varies from 900mm in the north-eastern semi-arid areas of Kotido to 2000mm on Sese islands in Lake Victoria.

Uganda's rainfall pattern has two peaks(bimodal). This pattern is linked to the double passage of the inter tropical convergence zone(ITCZ). The spatial distribution is also influenced by the presence of Lake Victoria as well as the local topography. Generally rainfall tends to decrease with the distance from the lake. The effect of the local topography is such that the highest rainfall is received in mountainous areas.The highest annual maximum rainfall is experienced around the lakeshore and on the slopes of Mt Elgon and to a certain extent over the northwestern areas and lowest over the north eastern and southwestern areas.

The other rather elongated area of low rainfall is along the western rift valley running through Lake Albert. On the other hand the main areas of relatively high rainfall are over the central and western parts of the Lake Victoria basin and over Mountain Elgon.

3.2.1 Rainfall Seasonality

March to May is the main stable rain season over most parts of the country. The probability of normal range of rainfall is generally over 80% except over the extreme north-eastern areas where the probability drops below 70%. The probability of below normal rainfall is low, around 10% over most parts of the country except over the extreme north-eastern areas where it goes up 20%. The probability of above normal rainfall is low, just around 10%, over most areas of the country.

October to December is the most variable rain season over most parts of the country. The probability of getting the normal range of rainfall is between 70 to about 80% over the western areas where the main rainy belt for this season is centred but drops to around 50% over most areas of the eastern region and extending into the central parts of the country. The probability of below normal rainfall is fairly high, over 20% over most parts of the eastern region and to above 40% over the north-eastern areas. The probability of above normal rainfall is also fairly high (over 20%) over most parts of the eastern areas. The high variability of rainfall during this season results in high incidences of droughts and floods especially over the Eastern parts of the country.

3.3 Surface Water Resources

3.3.1 Surface Water Hydrology

Most of Uganda lies within the upper part of the White Nile Basin and is nearly wholly drained by the White Nile, save for a small portion to the northeast that drains into the Lake Turkana basin in Kenya. Uganda is subdivided into eight sub-basins which drain into the Nile, as shown in **Figure 3.1** below. The eight sub-basins include: L. Victoria, L. Kyoga, R. Kafu, Lakes George and Edward, L. Albert, R. Aswa, Albert Nile and Kidepo Valley. The yield from these sub-basins, though small compared with the total Nile flow, dominate the water resources potential within Uganda.

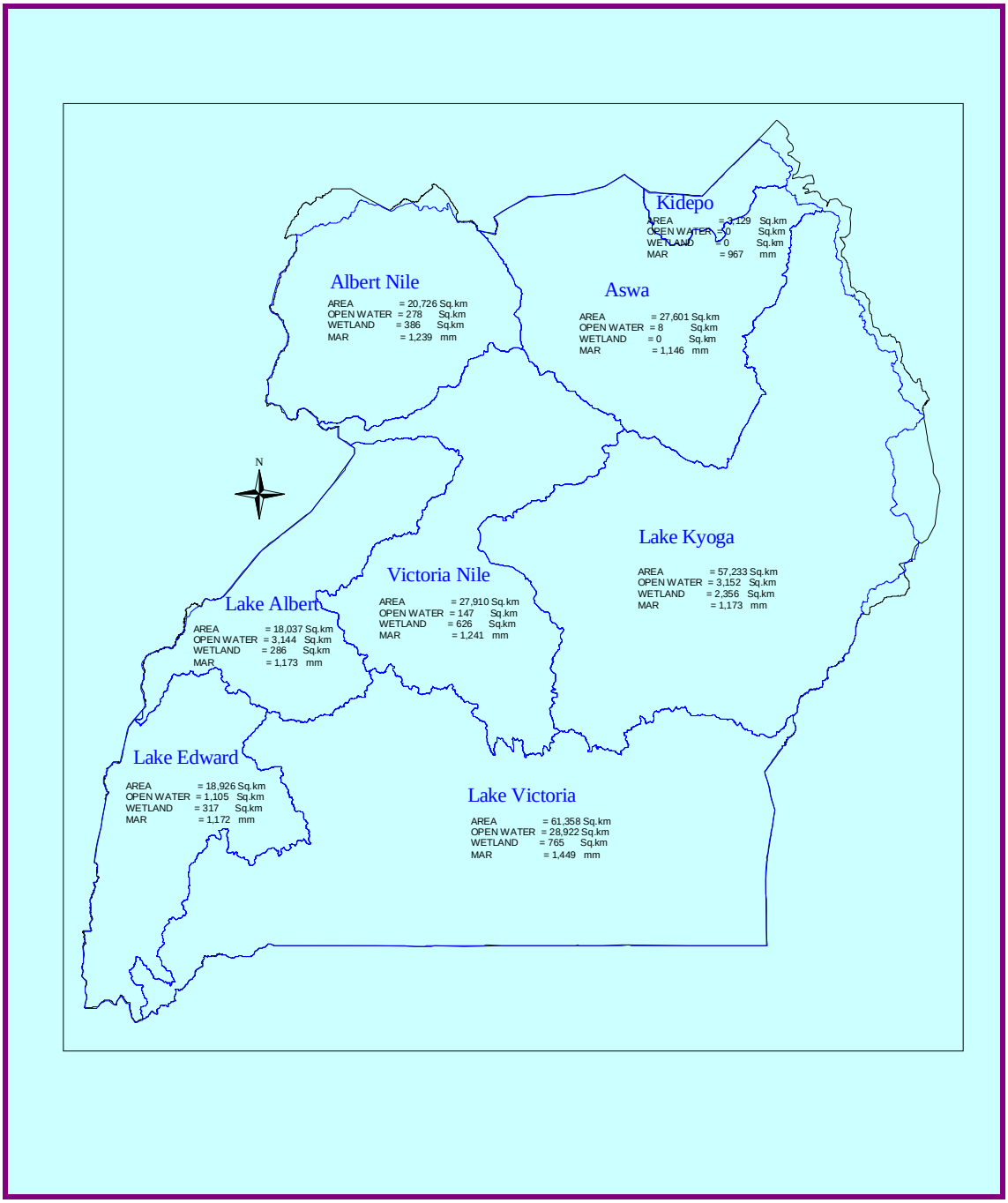

Figure 3.1: Main drainage sub-basins in Uganda

Just over 15% of the total surface area of Uganda is covered by open water and there is an annual water supply of 66 Km^3 in the form of rain and inflows. The open water sources are mainly in the form of rivers and lakes. **Table 3.1** shows the major lakes in Uganda.

Table 3.1: Major Lakes in Uganda

Lakes	Total Area (Km^2)	Area in Uganda (Km^2)	Mean Elevation above Sea level (m)	Maximum Depth (m)
Victoria	68,457	28,665	1,123	82
Albert	5,335	2,913	621	51
Edward	2,203	645	913	117
Kyoga	2,047	2,047	1,033	7
Salisbury	308	308	1,047	-
George	246	246	914	3

Source: NEAP (1992)

The most prominent hydrological feature in Uganda is Lake Victoria, which is the second largest fresh water lake in the world. The lake covers an area of 69,000 Km^2. River Nile, which is the only outflow from the lake, has its source at the point where Lake Victoria spills over Ripon Falls (now submerged due to the construction of the Owen Falls Dam). The 130 Km stretch of the Nile from Lake Victoria to lake Kyoga is termed the Victoria Nile. Lake Kyoga is drained through the Kyoga Nile which, after a relatively flat reach downstream from the lake, enters a series of rapids and falls before it flows into Lake Albert at a level 410 m lower than Lake Kyoga. In Lake Albert, the Nile is joined by River Semiliki which drains Lakes George & Edward found in the rift valley and high rainfall area of the Rwenzori mountains. Lakes George & Edward are connected through the Kazinga Channel. The Nile flows from Lake Albert with a gentle slope to the Sudanese boarder. This reach of the river is called the Albert Nile.

LAKE LEVEL VARIATIONS

The long-term variations in levels of Lakes Victoria, Kyoga and Albert is Shown in **Figure 3.2**. Historical levels of Lake Victoria varied between a minimum of 10.22 m and a maximum of 13.33 m on the Jinja gauge. The figure also shows that significant level variations can occur over a short period of time. Between October 1961 and May 1964, the water level in Lake Victoria rose rapidly by 2.5 m as a consequence of extraordinary high rainfall. Since that time the levels have remained high, but appear to be on a declining trend. The variations in levels of Lakes Kyoga and Albert follow the same pattern as Lake Victoria, the main source of inflow into the Lakes.

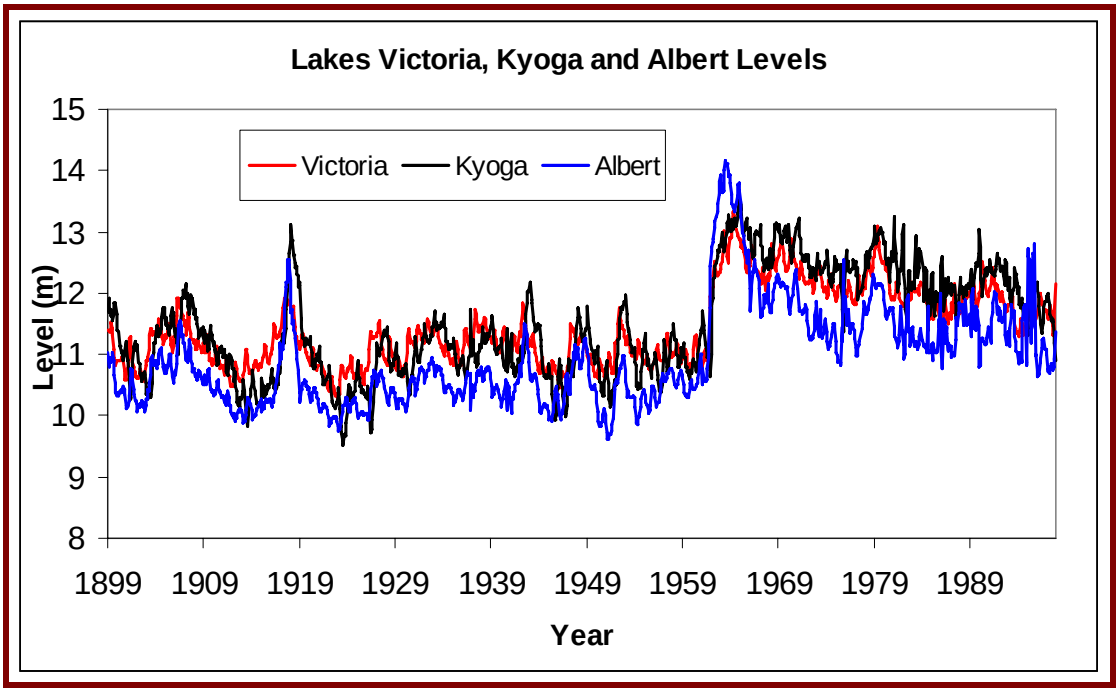

Figure 3.2: Water level variations of Lakes Victoria, Kyoga and Albert

RIVER NILE FLOWS

The flows of the Nile are highly variable from year to year. **Figure 3.3** shows the long-term variations in flows of Victoria Nile at Jinja, Kyoga Nile at Masindi Port and Albert Nile at Panyango. The long term average outflow from Lake Victoria has been 840 m^3/s and the range of outflows is between a minimum of 345 m^3/s and a maximum of 1720 m^3/s. At the 95% monthly reliability level, the flow of the Victoria Nile is of the order of 495 m^3/s.

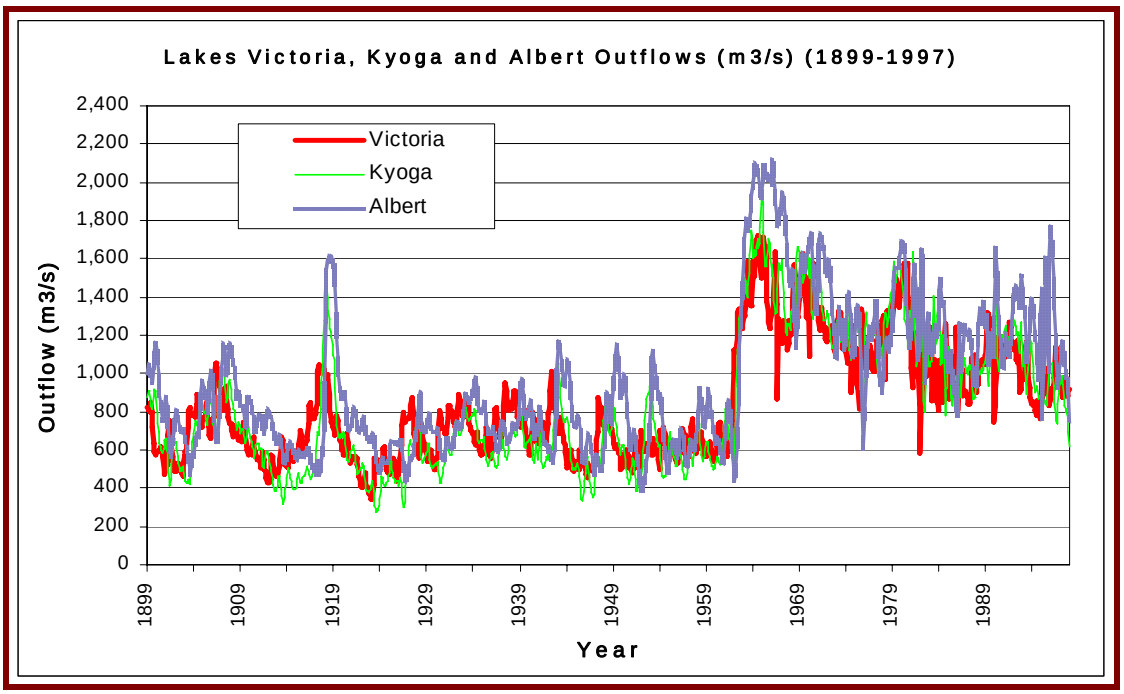

Figure 3.3: Long-term variations in River Nile Flows

3.3.2 Surface Water Distribution

Despite Uganda's significant water resources, their spatial and temporal variability often renders many parts of the country water stressed over long periods of the year. The country encompasses both humid and semi-arid areas and there are not only significant differences between wet and dry years, but also considerable variations in the onset of rain seasons. **Figure 3.4** shows the current and projected (2015) spatial distribution of water in Uganda.

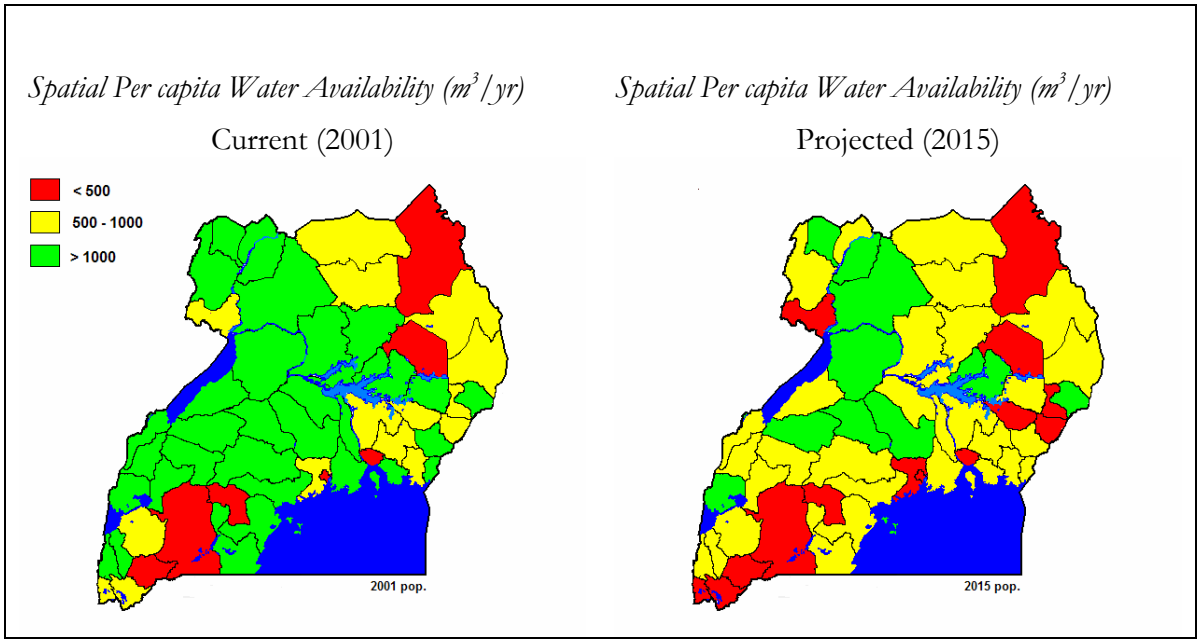

Figure 3.4: Spatial Per capita Surface Water Distribution (m³/yr)
(Source: WRM Sub-sector Reform Study Report, 2004)

Figure 3.4 shows that districts in the North-eastern and South-western parts of the country have the least per capita water availability and that by 2015 more than 75% of the country will be water stressed. The methodology used in computing the water availability only considers the runoff generated within each district.

SURFACE WATER RUN-OFF

Runoff, expressed in millimetres depth is an appreciation of river flow expressed as a depth of water if the entire flow was spread over the catchment. It is a useful parameter used to compare catchment yield. It is used here to give a picture of the average yield of major catchments in Uganda. **Figure 3.5** shows the spatial variation of annual runoff in Uganda. The figure shows that the south-western and north-eastern parts of the country have the lowest annual run off (<1litre/s/km^2). These areas are typically semi-arid receiving very low rainfall. The Lake Victoria basin has the highest run-off (> 10 litres/s/km^2).

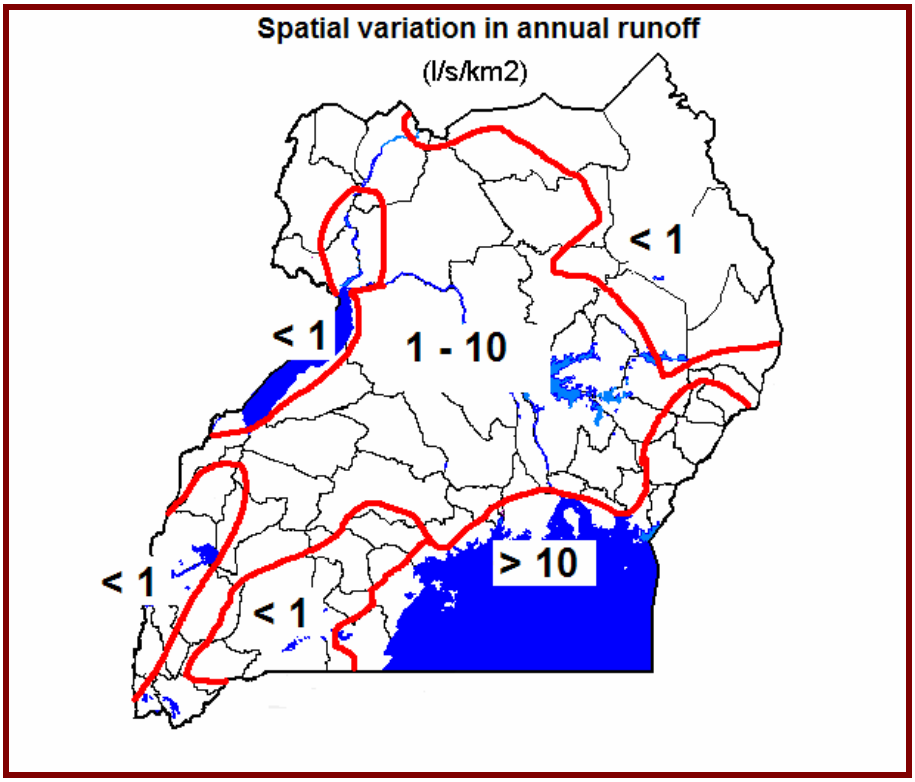

Figure 3.5: Spatial Distribution of Surface Water Runoff
(Source: WRM Sub-sector Reform Study Report, 2004)

SNOW AND GLACIERS

Snows and glaciers are mostly found in the Rwenzori Mountains whose altitude ranges from 1,700m to 5,109m (698 km^2 above 2,500m). Snowfields and glaciers cover the highest reaches of the mountains. The Rwenzori Mountains are a vital water catchment area, feeding the economically important Lakes Edward and George, and constituting the highest and most permanent sources of the River Nile. The Rwenzori Mountains are extremely wet, with rain falling on most days, including the dryer months (Howard, 1991).

3.3.3 Surface Water Quality

The quality of surface water in Uganda has been deteriorating over time during the last decades. Increasing urbanization, population growth and anthropogenic activities have resulted in significant deterioration in the quality of both surface and groundwater in many parts of the country. There are increasing incidences of surface water pollution from both domestic and industrial waste discharges, and run-off from agricultural fields. The major causes of pollution of surface water bodies include:

(i) *Poor Agricultural Practices* – These contribute significantly to the pollution of surface water bodies in Uganda through increased sediment loads to the rivers due to soil degradation, increased nutrient run-off due to application of agro-chemicals, and contamination by toxic chemicals used for control of weeds and pests. The chemicals either cause eutrophication or are toxic to flora and fauna. Lake Victoria, for example, has become the recipient of increased concentrations of nitrogen and phosphorus, washed down from surrounding plantations of tea, sugarcane and

coffee. This has led to the invasion and rapid proliferation of aquatic weeds, especially the water hyacinth, in the lake (UNEP, 2002).

(ii) *Poor Sanitation Practices* - Poor on-site sanitation (pit latrines) and dilapidated sewerage systems significantly contribute to the contamination of both surface and groundwater. The most common sanitation hazard is the poorly constructed pit latrines, which are widely used in the rural and peri-urban areas.

(iii) *Industrial Waste Discharge* - The industrial sector, though still small, is another source of pollution of surface water bodies due to the discharge of untreated or partially treated industrial effluent into nearby water bodies. The major industries include; breweries, soft drink industries, sugar industries, food processing industries, textile industries, diary processing industries, soap industries, fish processing industries, paper industries and tobacco processing industries. As an example, it is estimated that the two breweries on the Ugandan shores of Lake Victoria discharge a total of 18 tonnes of BOD5 per day into Lake Victoria (NEAP, 1993).

(iv) *Mining Activities* - General mining activities in the country are still low and as such do not threaten the general quality of both surface and groundwater. However, the possibility for localized pollution still exists in the areas where the mining is taking place.

3.4 Groundwater Resources

3.4.1 Geological Formation

The geology of Uganda is dominated by crystalline Basement Complex rocks of pre-Cambrian age that underlie over 90% of the country. These consist of predominantly granites, granitoid gneisses and gneisses, which are sometimes migmatised. These rocks, normally classified as undifferentiated gneisses and granites, are the oldest in age and are overlain by the so-called Buganda series and Karagwe–Ankolean series. These are characterised by pellitic rocks, which have been metamorphosed to form rocks varying from slightly cleaved phyllitic mudstone and shales to mica schists. Cenozoic rift valley sediments and tertiary and Pleistocene volcanics occur in a few areas and cover less than 10% of the country. The western part of the country is bounded by the rift valley, which is underlain by sediments made up of a mixture of sand, silts and clay. Other recent sediments are found in various places as a result of erosion to valleys and magmatic outflows from volcanic eruptions.

3.4.2 Groundwater Occurrence

The occurrence of aquifers in different parts of Uganda is related to the respective geological characteristics of the areas. The productive aquifers are mainly found in in-situ weathered bedrock, the regolith overlying the bedrock and in faults and fractures in the basement. The highest yielding wells are found in the weathered- fractured bedrock where the permeability is rather high and where the storage can be provided by the overlying regolith. The number and distribution of fractures, and the effective porosity in each geological material control aquifer characteristics respectively. **Figure 3.6** below illustrates the presence of aquifers in granites, gneisses and schists.

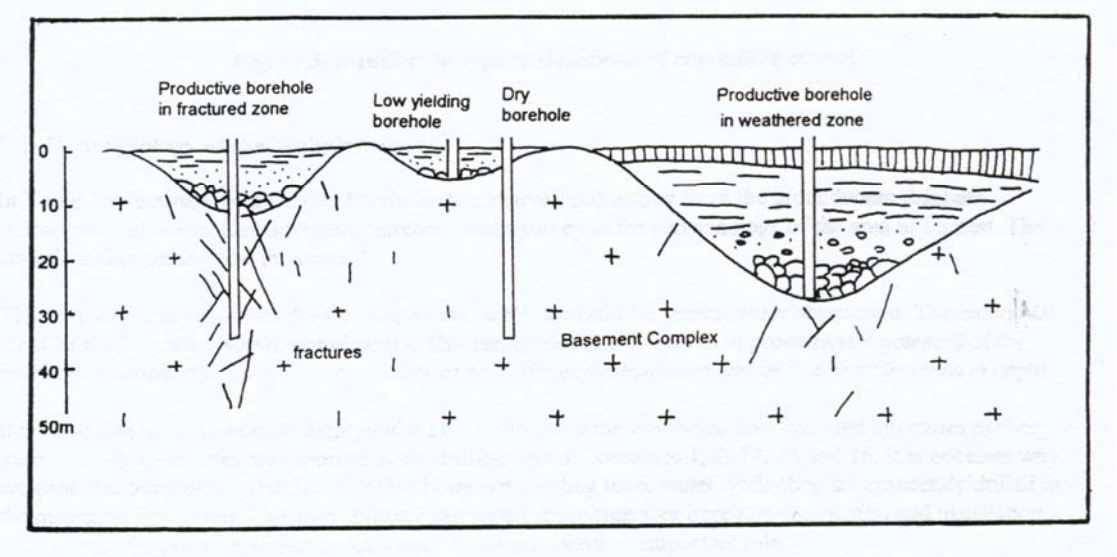

Figure 3.6: Presence of aquifers in granites, gneisses and schists

GROUNDWATER RECHARGE

Groundwater recharge varies considerably across the country and is extremely sensitive to land use and the amount and intensity of precipitation falling in a given area. However, due to inadequate data and resources, very few groundwater recharge assessments have been carried out in Uganda and thus recharge estimates for most areas remain unknown. Recharge assessments have recently been carried out in Apac in northern Uganda, Mbarara in Western Uganda, Wobulenzi in Central Uganda, Nkokonjeru in Eastern Uganda and Hoima in Midwestern Uganda. The recharge assessment methods used have ranged from soil moisture balance using spreadsheet and the model, EARTH to water level fluctuation, isotope techniques and hydrograph separation. Groundwater recharge estimates obtained using the various methods range between 90 and 220 mm per annum and accounts for between 7 and 20% of the average annual precipitation in Uganda.

From the above figures it can be stated that groundwater recharge in Uganda is quite high compared to current abstraction volumes and will not be a limiting factor in groundwater development for a few years to come. However, there is a need to carry out more detailed recharge and water balance studies in the country to ensure that groundwater development is carried out in a sustainable manner.

GROUNDWATER POTENTIAL

The potential of groundwater in various areas of the country is exhibited by presence of deep boreholes, shallow wells and springs.

a) *Deep Boreholes*

Deep borehole potential can be assessed by a means of a number of borehole parameters as discussed below.

(i) *Regolith Thickness* - The regolith in most of Uganda is clayey especially in the upper layers where relatively low permeability dominates. Medium to high regolith thickness (> 30m) leads to high groundwater potential through provision of storage for the deeper fractured aquifer. The regolith thickness

across the country can be described as low to medium varying between 20 - 45m.

Figure 3.7 shows a schematic profile of a typical basement regolith aquifer system.

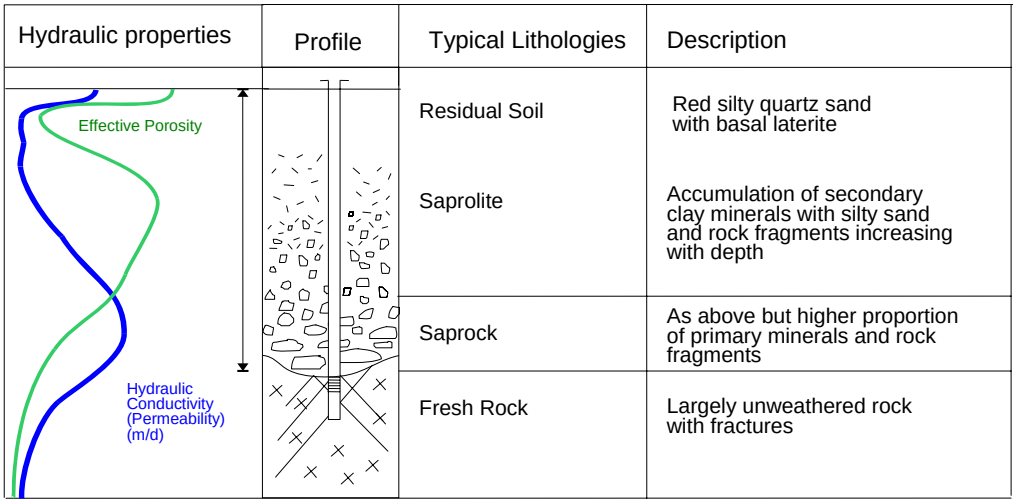

Figure 3.7: Schematic profile of a typical basement regolith aquifer system

(ii) *Aquifer Yields* - The borehole yields in the country vary significantly according to the formation in which they are drilled and their degree of fracturing and weathering. Borehole yields vary from 0.5 - 12 m^3/hr. High yielding boreholes are normally found in granites and gneisses which are easily fractured while low yielding boreholes are found in the phyllites and schists which exhibit a medium degree of metamorphism. Transmissivity values vary from as low as 0.1 m^2/day to as high as over 30 m^2/day.

(iii) *Rest Water Levels* - Rest water levels also give an indication of the groundwater potential of an area. Shallow water levels (<20m) indicate that the aquifer has high potential for yielding groundwater while deeper water levels indicate the reverse. Rest water levels (static water levels) in the country vary between 1 and 45 m below ground level.

b) *Springs*

Springs occur either where the flow of unconfined groundwater is interrupted by an impermeable formation or where the head of confined groundwater is released by flow to the surface. There are 2 major types of springs in Uganda namely: Contact and Fracture springs. Fracture springs are usually very susceptible to contamination and drying up while contact springs are more reliable.

c) *Shallow Wells*

The potential of shallow wells is quite high, especially in the valleys. Their potential is favoured by the thick regolith that is fairly coarse grained. From Uganda's experience, shallow wells are a very reliable source of water supply to the communities although precautions need to be taken to ensure that they are not contaminated.

3.4.3 Groundwater Quality

Generally, the quality of groundwater in most parts of the country is of acceptable quality, especially with respect to its inorganic water quality. However, in several areas, groundwater has been observed to contain excess levels of aluminium, chloride, iron, manganese, zinc and hardness. Groundwater in a few areas also exhibits high levels of nitrate and chromium.

Most groundwater problems are attributed to among other factors; corrosion of borehole casings and raising mains and seepage of sewage waste. Sewage wastes are generally responsible for elevated concentrations of chloride and nitrate, while corroded pipe work is responsible for the high concentrations of iron, zinc and manganese. In some areas, high concentrations of aluminium, iron, manganese and chromium are also associated with natural weathering of the aquifer matrix.

With regard to total dissolved solids, iron and manganese, the quality of groundwater in the regolith aquifer appears to be slightly better than that in the fractured bedrock aquifer.

There is also generally a presence of very high Coliform counts in unprotected springs and open shallow wells, which is an indication of contamination. Coliform counts well above the national and WHO guideline values are usually found in some protected springs and shallow wells. This is attributed to poor sanitary conditions around the sources and lack of protection of the sources.

3.4.4 Groundwater Development

Groundwater is the major source of water supply in the rural, semi-arid and arid areas in Uganda. Groundwater development has been ongoing since the 1930s through construction of deep boreholes, shallow wells and protected springs. There are approximately 20,000 deep boreholes, 3000 shallow wells and 12,000 protected springs in the country constructed mainly for rural domestic water supply.

Deep boreholes are small diameter wells that are deeper than 30m while shallow wells are wells that are shallower than 30m and constructed in the unconsolidated formation. The average depth of boreholes in Uganda is 60m while shallow wells are on average 15m deep. Boreholes and shallow wells are normally installed with hand-pumps with capacity of $1m^3$/hour and their yields are usually low.

There has been an increase in groundwater development for town water supply since early 1990s due to the need to have water supply systems that can easily be operated and managed by the users. In addition, groundwater normally has good quality and requires little or no treatment unlike surface water. This therefore makes investment and operational costs of groundwater based systems much lower than those of surface water based systems. Boreholes with yields greater than $3m^3$/hour are thus normally considered for installation with motorized pumps for piped water supply.

Under the Rural Water Supply Investment Plan, it is intended to improve significantly the safe water supply coverage in the whole country to at least 95 percent by 2015. The focus is on groundwater development using low-cost, simple water-supply technologies. In order to achieve this it is planned to construct an additional 40,000 hand pumped boreholes, 30,000 shallow wells and protect a few thousand remaining springs. In addition, under the

Urban Water Supply Investment Plan, it is planned to supply piped water to over 250 small towns and most of these will be based on groundwater through deep boreholes.

Despite all the above planned developments, there is still very limited knowledge of the country's groundwater resources, making it difficult to guarantee sustainable groundwater development for the current and future needs. In order to address this issue, government initiated groundwater assessment studies, in 1996, to fully understand the nature, extent and reliability of the country's groundwater resources. Information so far obtained includes distribution and behavior of aquifers, groundwater recharge, aquifer vulnerability to pollution, impact of motorized abstraction on groundwater resources and conceptual model of groundwater dynamics. This information, though still scanty, forms the basis for the current groundwater resources planning and management in the country.

3.4.5 Groundwater Management and Development Issues

(a) ***Inadequate Groundwater Information***- One of the challenges to sustainable groundwater resources management and development in Uganda is inadequate data and information to guide the planning process. As a result, it is unclear how close production boreholes can be sited to one another to prevent competitive abstraction and how far potential sources of pollution should be from groundwater abstraction points. **Figure 3.8** gives a pictorial description of the problem.

There are thus key practical questions concerning the protection and development of groundwater resources for water supplies, which need to be addressed namely:

- ✓ What area around wells and springs must be restricted from competitive abstraction by other wells under different pumping conditions so that either over development of the resource or undesirable reduction in the pumping water level does not occur?
- ✓ How many wells can be constructed in one area (i.e., a well-field) without reducing pumping water levels to unacceptable levels through competitive pumping?

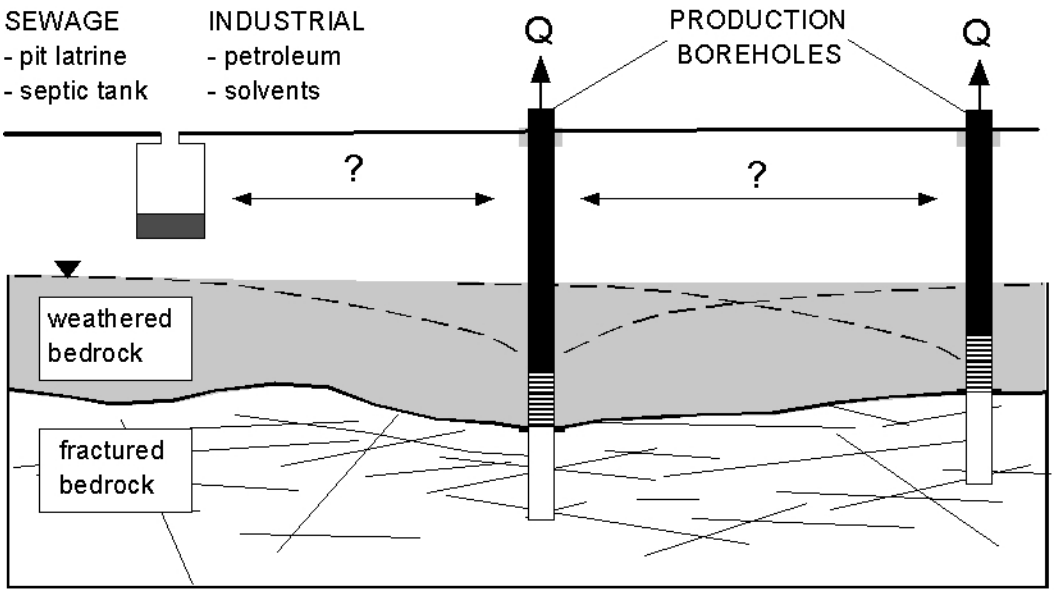

Figure 3.8: Cross-sectional representation of the regolith and fissured bedrock aquifers

(b) ***Groundwater Pollution*** – There are increasing incidences of reported outbreaks of water borne diseases resulting from the consumption of contaminated groundwater in both urban and rural areas. This is attributed to poor location of sanitary facilities, especially pit latrines, whose contents infiltrate and mix up with groundwater. Pollution of groundwater in urban areas is also attributed to dilapidated sewerage systems and solid waste disposal sites whose contents easily infiltrate and mix up with groundwater.

(c) ***Complex Geology*** - Groundwater in Uganda occurs in fractures and weathered zones found in complex geological formations. The complex geology makes understanding of the nature of groundwater occurrence and movement very difficult. This, in turn, presents a serious challenge to sustainable groundwater management and development.

(d) ***Inadequate Technical Capacity*** - Technical capacity for sustainable groundwater development in Uganda is limited. The number of hydrogeologists is not only small but also their expertise is low due to the nature of training they receive. There are currently slightly over 10 hydrogeologists in the country with postgraduate training in hydrogeology while most of the hydrogeologists (currently over 50) have undergraduate education in geology where they have only done a hydrogeology course of about 8 hours. This state of affairs inevitably results in poor quality professional work and hence unsustainable groundwater development.

3.5 Water Resources Monitoring

A National Water Resources Monitoring network has been established to monitor the temporal and spatial variation of both surface- and groundwater quantity and quality in Uganda. The monitoring stations are fairly evenly distributed around the country except for some of the insecure areas in the northern part of the country. The network is fully operational and data is collected, quality controlled, analyzed and stored in databases on a regular basis. The Operation and maintenance of the monitoring network is the responsibility of the Water Resources Management Department (WRMD) with support from locally hired hydrological and hydrogeological observers. The monitoring stations are visited periodically (monthly or quarterly, depending on the nature and use of the station). In addition, a network of climatic and meteorological stations is operated and maintained by the Uganda Meteorological Department (UMD) with whom WRMD has signed a memorandum of understanding of the exchange of meteorological and climatic data and information. The monitoring network is reviewed periodically to assess its capacity to satisfy the national data and information needs and based on these reviews, decisions are made whether or not and when to add more stations.

3.5.1 Surface Water Monitoring Network

The surface-water monitoring network comprises of 62 hydrological stations equipped with water level monitoring equipment. The stations are looked after by locally hired observers, who reside close to the stations, and are visited by WRMD staff either monthly or quarterly depending on the stability of the rating curve control for the station. The more stable the rating curve control section, the less frequently the station is visited.. Spot discharge measurements are taken every time a station is visited. The discharge

measurements are used for generating and updating rating curves that relate water levels to corresponding river discharges.

All the stations are equipped with simple staff gauges, which are read twice a day by the local observers, who in turn record the readings on specially designed forms provided by WRMD. In addition to the staff gauges, most of the stations are also equipped with Automatic Water Level Chart Recorders (AWLR) and a few with Automatic Digital Data Loggers (ADL's). A German Company, A. OTT Hydrometrie has been the main source of the AWLRs and ADL's.

Discharge measurements are carried out using conventional Current Meters (CM) or the Acoustic Doppler Current Profiler (ADCP).

Figure 3.9 shows the distribution of surface water monitoring stations in the country. There are fewer stations in the Northern part of the country due to insecurity that has prevailed in the region since the mid 1980s. Details of the surface water monitoring stations are contained in **Table A.1** in **Annex A**.

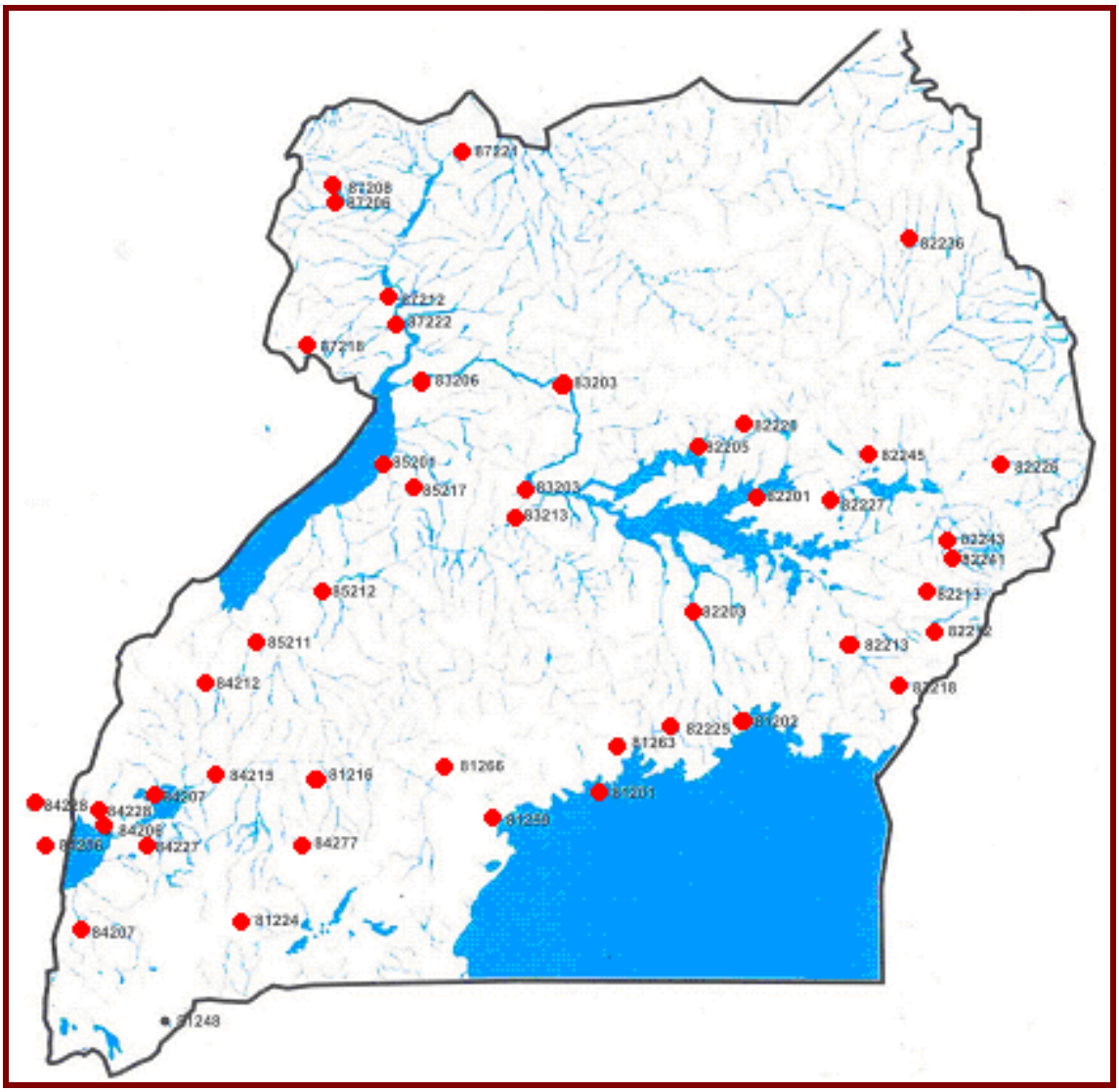

Figure 3.9 – Surface Water Monitoring Network

WRMD also operates a network of 6 Automatic Weather Stations (AWS) (see **Figure 3.10** below) and 6 standard rain gauges in different parts of the country. These stations were set up for specific studies conducted under some of the WRMD projects and have since been taken over by the department. This small network is parallel to the more elaborate one under UMD and is meant to provide very specific climatic data required for some of the water resources assessment studies conducted by WRMD.

The AWS consist of battery-powered electronic weather gauges, linked to a central data logger on which all the data is saved. Downloading of data from the loggers and transfer to the database is done electronically. The standard rain gauges are manually read and the cards sent to the office for data entry. The manual gauges are visited monthly, while the AWS may be visited in 3-month cycles, though to minimise breakdowns they are also visited monthly.

Figure 3.10 – Typical Automatic Weather Station

3.5.2 Rainfall Monitoring Network

Rainfall monitoring is a function of the Uganda Meteorological Department (UMD). The meteorological network has been operational for over 100 years in Uganda. Before 1977 there were over 1000 rainfall stations, the number went down to 200 during the war, presently there are 300 stations reporting regularly. UMD also operates 17 climatological stations that measure rainfall, temperature, humidity, sunshine hours, wind speed, and pan evaporation. UMD collaborates with DWD in providing relevant climatic data required for water resource management. **Figure 3.11** shows the UMD Rainfall monitoring network.

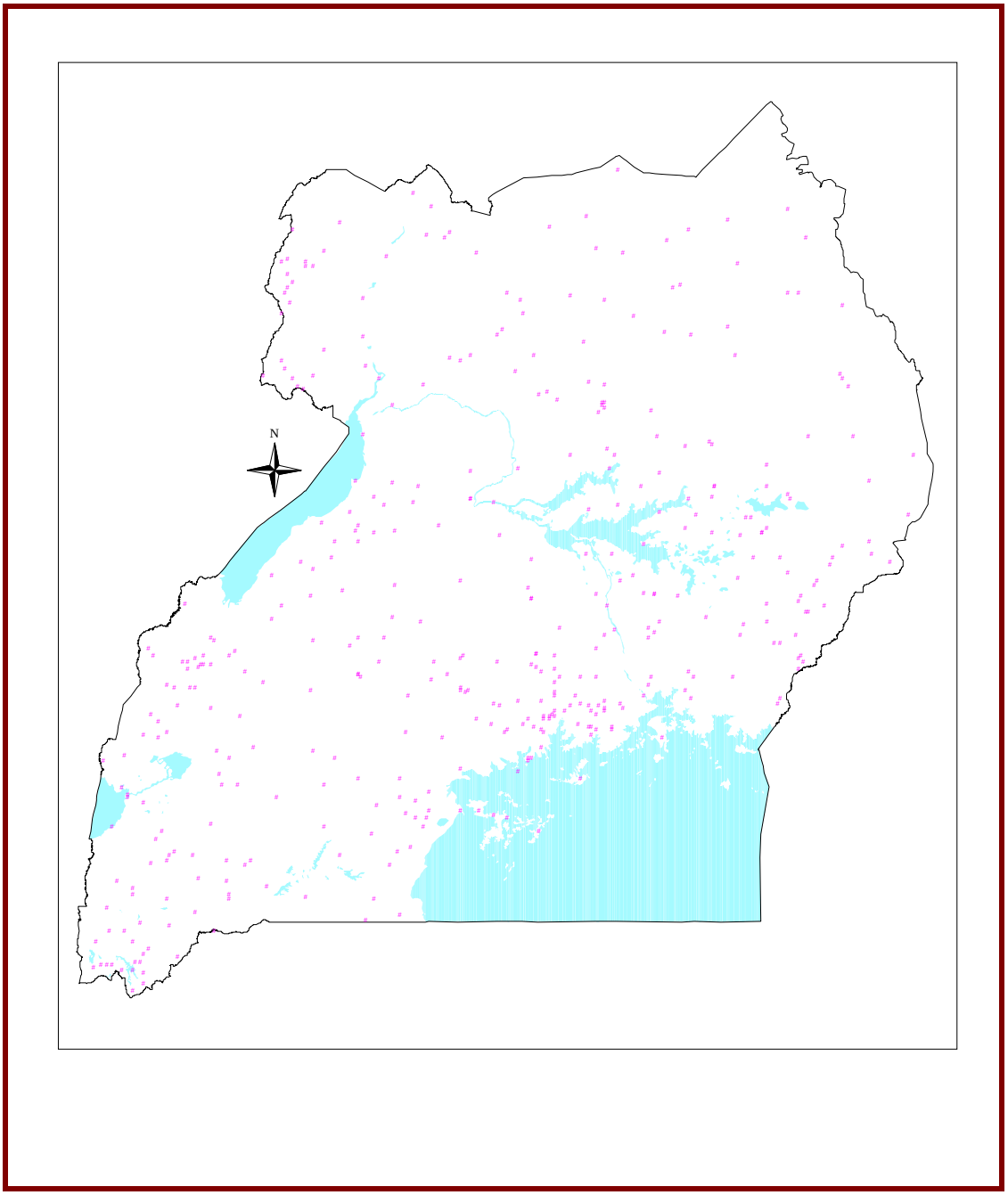

Figure 3.11 - UMD Rainfall Monitoring Network

3.5.3 Groundwater Monitoring Network

Uganda prepared a Groundwater Monitoring Strategy in 1998 with the prime objective of understanding how water levels in aquifers respond to climatic changes and to groundwater abstraction in order to provide quantitative information for effective water resources management. The monitoring strategy recommended that initial monitoring sites be restricted to areas where significant groundwater development is likely to take place, drought prone areas to detect the impact on the groundwater regime and areas where the aquifer is likely to be polluted.

The national groundwater monitoring network consists of 15 monitoring stations whose main aim is to monitor the effects of groundwater abstraction and regional changes in groundwater both in the regolith and fractured bedrock. At each of the stations a rain gauge has been installed to measure daily amounts of rainfall. These measurements assist in establishing the relationship between rainfall and groundwater recharge. In addition, a monitoring well database for the storage of water level and rainfall data has been established. The updating of the database is ongoing as the data is received from the field. Quality assurance and quality control checks on the incoming data have been instituted.

TYPES OF STATIONS

The national groundwater monitoring network consisits of wells scattered throughout the country. Nine of these wells monitor the impact of climatic variations on groundwater resources and thus serve as basic monitoring stations. The remaining six monitor the impact of abstraction on groundwater resources and thus serve as specific monitoring stations. In addition, there are 4 temporary monitoring wells constructed in Wobulenzi Catchment for use in groundwater assessment. Details of the groundwater monitoring stations are given in **Table A.2** in **Annex A.**

The location of the groundwater monitoring wells is shown in **Figure 3.12** below.

Insecurity in the north and north-western parts of Uganda has precluded the establishment of network stations in those areas.

INSTRUMENTATION

Some stations are installed with R16 automatic water level recorders, which automatically register the groundwater level on a graphical paper wound on a drum in form of a plot. This allows for reliable and frequent measurements to be done. Other stations have manual water level meters read every morning by locally hired observers.

MODE OF OPERATION

Day to day operation and maintenance of the monitoring network is the responsibility of the locally recruited observers. They are responsible for taking daily groundwater levels and rainfall measurements, keeping the stations clean, servicing of equipment and general safeguard of the monitoring installations. In addition, quarterly visits are made by the central level staff to each of the 15 monitoring stations with the aim of providing technical support and quality assurance of the work of the local observers, carrying out major servicing and repairs of the instrumentation and collection of the data gathered by the observers. For purposes of quarterly monitoring visits, the monitoring network is

categorized into 3 regions (central, eastern and western) with each of the regions having 5 stations.

Regular review of the monitoring network is often carried out with the aim of removing and replacing those stations that are found not to be suitable for the purpose. It is planned to expand network to 30 stations by the end of 2005 and efforts will be made set up stations in the north and north east of the country if the security situation improves.

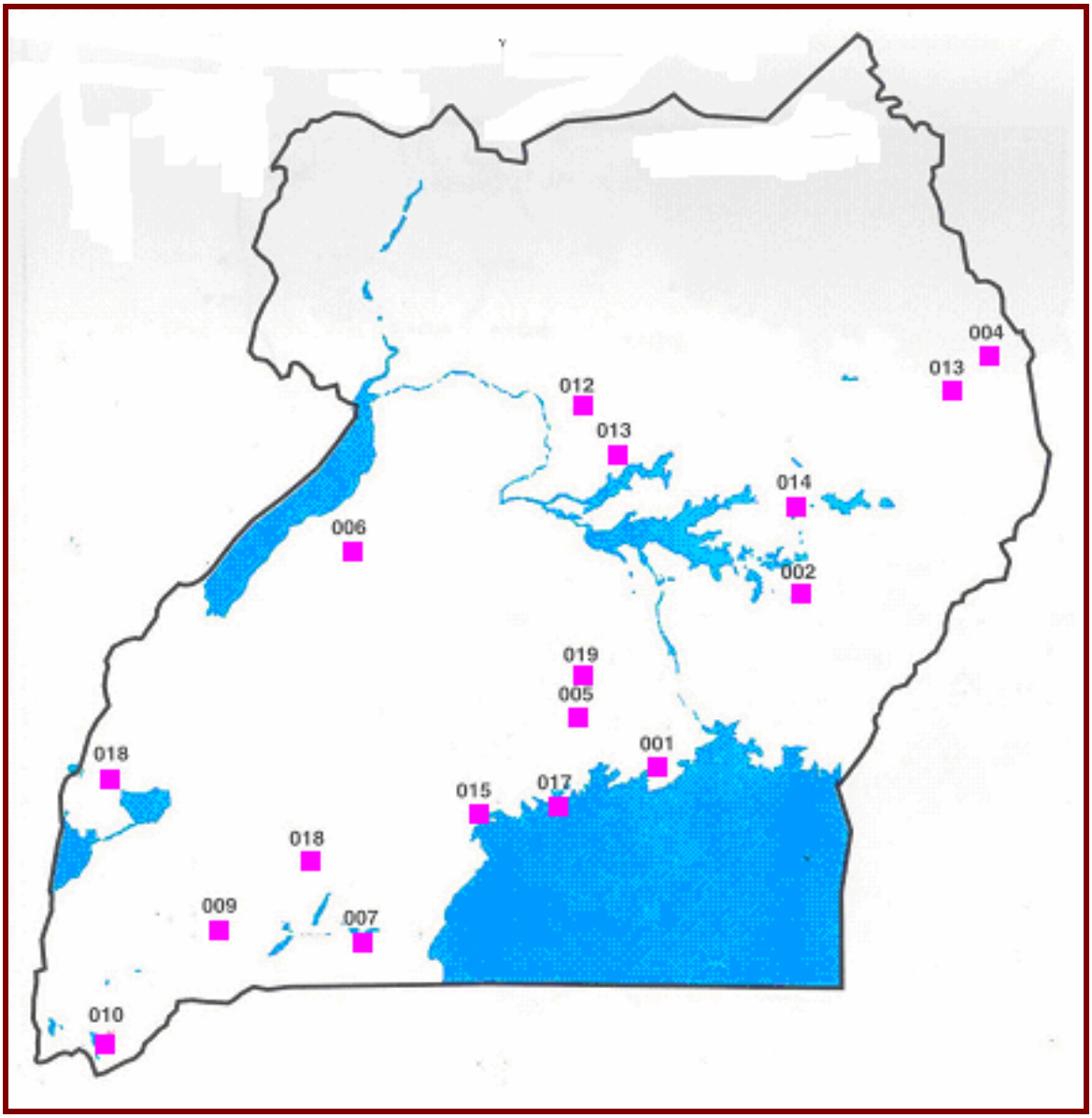

Figure 3.12 – Groundwater Monitoring Network

LENGTH OF RECORDS

Groundwater monitoring in Uganda was initiated in 1998 and thus the length of record is quite short being only about 5 years.

It is not possible at the moment to draw useful conclusions from results of groundwater monitoring because the data is still of a very short duration. The collection of water level and rainfall data is continuous but once a fairly long record is available it will be possible to fully assess the effects of seasonal changes and motorised abstraction on groundwater levels. It will also be possible to differentiate between water level fluctuations due to seasonal changes and those due to groundwater abstraction. An example plot of results of groundwater level monitoring is shown in **Figure 3.13** below.

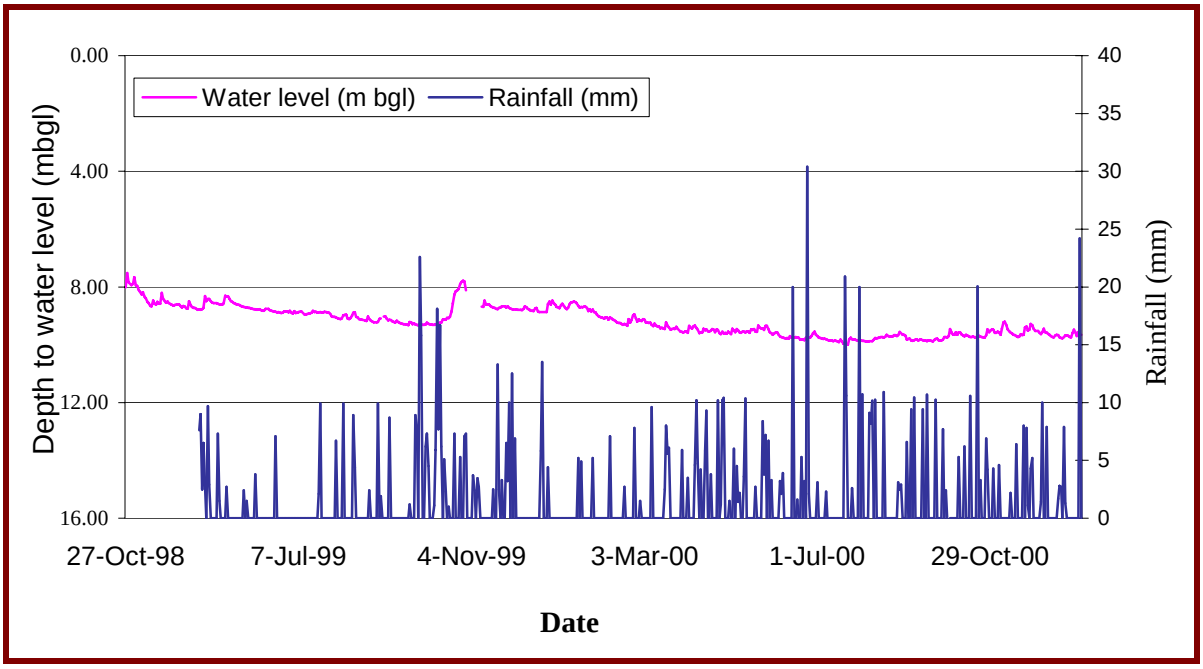

Figure 3.13: Typical Groundwater fluctuation (in Bombo)

3.5.4 Water Quality Monitoring Network

The Water Quality monitoring network consists of 105 stations comprising of:

- ✓ 36 stations for monitoring trends in river and lake water quality
- ✓ 18 stations for monitoring trends in ground water quality
- ✓ 34 stations for monitoring impact of on receiving waters of industrial and municipal effluent discharges
- ✓ 12 stations for monitoring performance and providing technical back-up to water treatment operations in upcountry urban centres.
- ✓ 5 stations for monitoring performance of upcountry sewage treatment plants

Figure 3.14 shows the national water quality monitoring network, whose details are given in **Table A.3** in **Annex A**.

A number of water quality parameters are measured in the field and/or the laboratory depending on the issue, with frequencies of three to six times annually. Field water quality monitoring is conducted with support of mobile laboratory vans, which enable the field teams to carry out some on site water quality tests.

WRMD also operates a state of the art Water Quality Laboratory where the more elaborate (physico-chemical, microbiological, heavy metals, etc) water quality testing is carried out.

The Laboratory uses a quality system conforming to ISO/IEC/17025 standards and is in the process of acquiring international accreditation with SANAS.

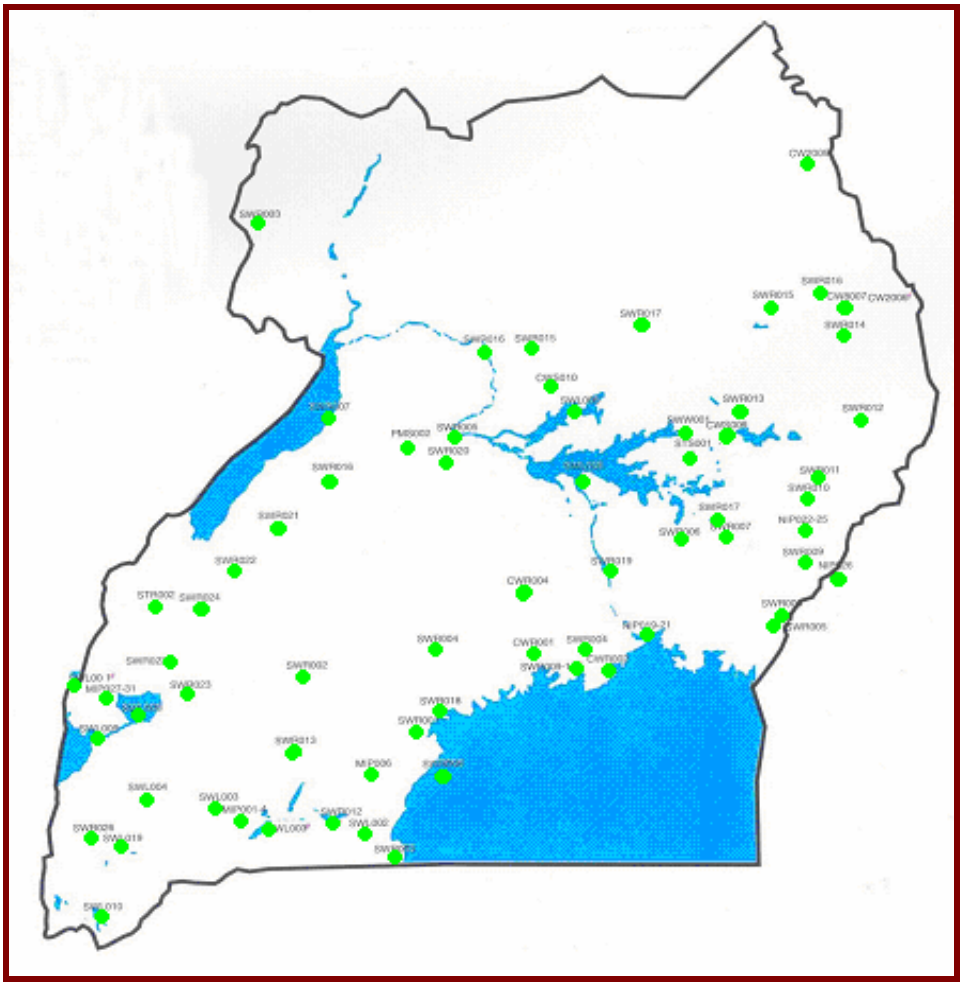

Figure 3.14: Water Quality Monitoring Network.

3.6 Water Resources Management Challenges and Issues

3.6.1 Challenges

With total renewable water resources estimated at 66 Km^3/year, corresponding to about 2,800 m^3/person/year, Uganda may be considered to be endowed with significant freshwater resources. However, their uneven spatial and temporal distribution pauses a big challenge to their management. There are increasing incidences of water use conflicts in the water scarce parts of the country, particularly the cattle corridor. The frequent migration of pastrolists from place to place in search of water not only pauses a security threat but is also a major health hazard as diseases are transferred from one part of the country to other in this process.

There is also increasing pressure on the freshwater resources due to rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution still remains a big challenge to the sustainable management and development of country's fresh water resources.

The frequent recurrence of extreme weather events (floods and droughts) also pauses a big challenge to the management of Uganda's freshwater resources. This coupled with the increasingly erratic rainfall and considerable variations in the onset of rain seasons has significantly affected the different socio-economic activities that are heavily dependent on rainfall.

Ground water is presently the major source of rural domestic water supply and is planned as the main source of water for small towns (40 completed and 80 new ones) and Rural Growth Centres (which number around 800) up to 2015. Some of the aquifers are however, limited in yield, extent, hydraulic characteristics, and recharge is low in certain parts of the country. The availability and quality of groundwater for larger rural water supply projects is a significant future challenge. Given the limitations of ground water supplies, it would appear that groundwater abstractions for many large projects in say irrigation and municipal water supplies may not be sustainable.

3.6.2 Issues

(a) Soil Erosion – Soil erosion is one of the leading causes of surface water pollution in Uganda's freshwater bodies. This is attributed to the rampant deforestation and poor agricultural practices which result in increased sediment and nutrient loads to the rivers and lakes as a result of soil degradation, increased nutrient run-off due to application of agro-chemicals, and contamination by toxic chemicals used for control of weeds and pests. Lake Victoria, for example, has become the recipient of increased concentrations of nitrogen and phosphorus, washed down from surrounding plantations of tea, sugarcane and coffee. This has led to the invasion and rapid proliferation of aquatic weeds, especially the water hyacinth, in the lake (UNEP, 2002).

(b) Drainage of Wetlands – Drainage of wetlands in many parts of the country for agricultural purposes has greatly undermined the usefulness of these wetlands as natural buffers and filters for water entering lakes and rivers. This has greatly contributed to the heavy pollution observed in lakes and rivers in many parts of the country. There has also been observed reduction in base flows in many rivers and streams as a result of the rampant drainage of wetlands.

(c) Industrial and Municipal Waste Discharge – Discharge of raw sewage and untreated industrial effluent into rivers and lakes is a common occurrence in many major towns in Uganda. This is mainly attributed to the lack of or existence of poor sewerage treatment facilities in these towns. This has greatly contributed to the observed poor quality of water in many surface water bodies around these towns.

(d) Poor onsite sanitation - Many people in rural areas and to a large extent, peri-urban slum areas, depend on onsite sanitation, predominantly pit latrines, which has contributed to ground water contamination in many parts of the country, especially in Kampala. There have been a number of reported incidences of polluted springs and shallow wells in both rural and urban areas due to faecal contamination. Due to land shortage in the urban areas, some people have also been reported to have emptied their filled-up latrines directly into nearby water bodies and drainage channels.

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CHAPTER FOUR

BASIC WATER AND SANITATION

4.1 Introduction

For purposes of this report, the use of the phrase "provision of basic water and sanitation" should be interpreted as implying provision of water supply and sanitation services to the rural communities.

The Local Government Act (1997) entrusts the responsibility for provision of basic water supply and sanitation services in rural areas and maintenance of the relevant facilities with the Local Governments in liaison with the Ministry responsible for Water Affairs. The Ministry of Water, Lands and Environment, through the Directorate of Water Development is responsible for the strategic planning, regulation and quality assurance of rural water and sanitation interventions to ensure adherence to national policy, strategies, and development targets.

Though rural water coverage has increased considerably over the last decade (from 18% in 1990 to 59% in 2003), significant investment is still required to raise the coverage to meet the national targets (and indeed the MDGs) for 2015.

Basic water and sanitation is a pre-requisite for the socio-economic development of the country since it targets the poorest and most vulnerable members of our society. The burden of water collection falls mainly on women and children who spend most of their productive time walking long distances to collect water, which is often of inadequate quantity and quality to meet their basic human needs! As a consequence, the average water use per capita in most rural areas is by far less than the minimum recommended amount required for drinking, cooking and adequate hygiene. As if that is not bad enough, owing to the long distances travelled, even the little water collected from a would be safe source ends up becoming contaminated by the time it is consumed due to unhygienic water handling and storage practices. In some rural areas basic sanitation still remains a luxury due to poverty, backward cultural practices and low awareness on hygiene and sanitation. As a result, construction of excreta management and disposal facilities in households and institutions (schools, health centres, offices etc.), public places (markets, eating places, parks etc.) is not accorded the deserved priority.

4.2 National Goal and Targets for RWSS

4.2.1 National Goal

The national goal for Rural Water Supply and Sanitation (RWSS) is:

"***To achieve sustainable safe water supply and sanitation facilities, based on management responsibility and ownership by the users, within easy reach of 100% of the rural population with effective use and functionality of the facilities."***

4.2.2 National Targets

The national target for rural water supply and sanitation coverage is to achieve 77% safe water coverage and 95% sanitation coverage in rural areas by 2015, with an 80%-90% effective use and functionality of facilities.

Definition of Coverage - Rural water coverage is defined as the percentage of the rural population with access to an improved water source with in a walking distance of 1.5 Km. For sanitation, coverage refers to the percentage of the population with sanitation facilities in their place of residence

4.3 Situation Analysis

The RWSS sub-sector addresses water supply and sanitation service delivery for the rural communities with a population of up to 500 people and rural growth centres with a population of up to 5000 people.

Box 4.1 below gives the description of improved water supply and sanitation service.

Box 4.1: Definition of "Improved Water Supply and Sanitation"

Improved Water Supply Service	Improved Sanitation Service
✓ Household connection ✓ Public standpipe ✓ Borehole ✓ Protected dug well ✓ Protected spring ✓ Rainwater collection	✓ Connection to a public sewer ✓ Connection to septic system ✓ Pour-flush latrine ✓ Simple pit latrine ✓ Ventilated improved pit latrine

4.3.1 Rural Water Supply

RURAL WATER COVERAGE

The national rural water supply coverage level rose from about 18% in 1991 to 59% in 2003. The trend, over the period 1991 - 2003, for the rural water and sanitation coverage is shown in **Figure 4.1** below.

The overall district service coverage for water ranges from 25%-74% as shown in **Table A.4** in **Annex A**. Two districts (Pallisa and Sembabule) have the lowest coverage, below 30%. 19 districts have water supply coverage between 30-50%, which is below the national average.

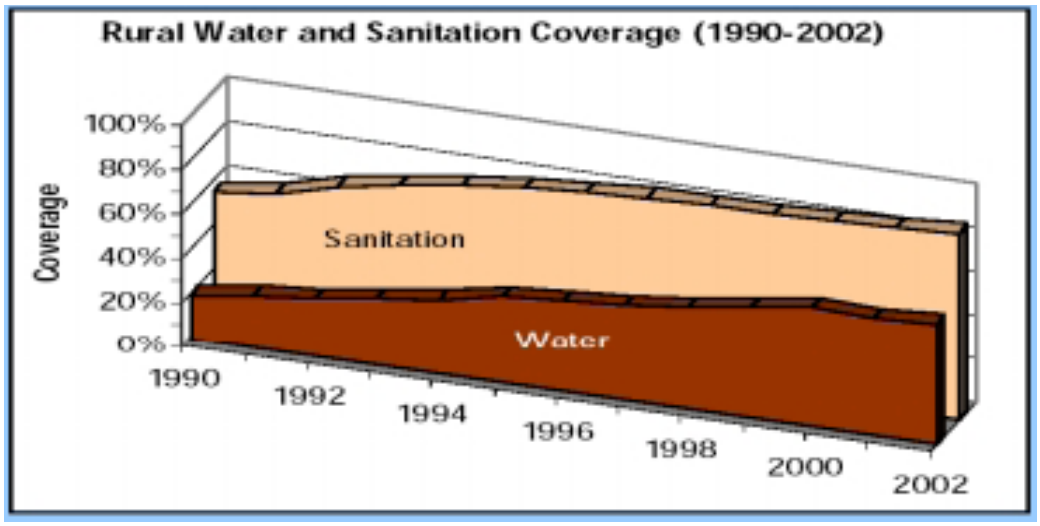

Figure 4.1: Rural Water Supply and Sanitation Coverage Trend
(Source: DWD, 2004)

PER CAPITA WATER CONSUMPTION IN RURAL AREAS

The national basic per capita consumption target is 20 liters/day. This is considered to be the minimum quantity of water that a person needs to meet the basic health requirements. Consuming inadequate water contributes to malnutrition, which is a major cause of disease and death. According to the National Surveys conducted in 1996 and 1999, the average rural per capita water consumption was found to be about 13 liters/day, well below the national target!

RURAL WATER SUPPLY TECHNOLOGY OPTIONS

The major technology options adopted for rural water supply include: Bore holes, Gravity flow schemes (GFS), and protected wells and springs. Choice of these options is based on their cost effectiveness and sustainability. The trends of the water services by technology are presented in **Figure 4.2** below. The figure shows that, in the recent years, considerable emphasis has been placed on the construction of technologies with low capital and recurrent costs such as protected springs and shallow wells. Deep wells or boreholes, however, are the most predominant technology in some areas without shallow aquifer potential

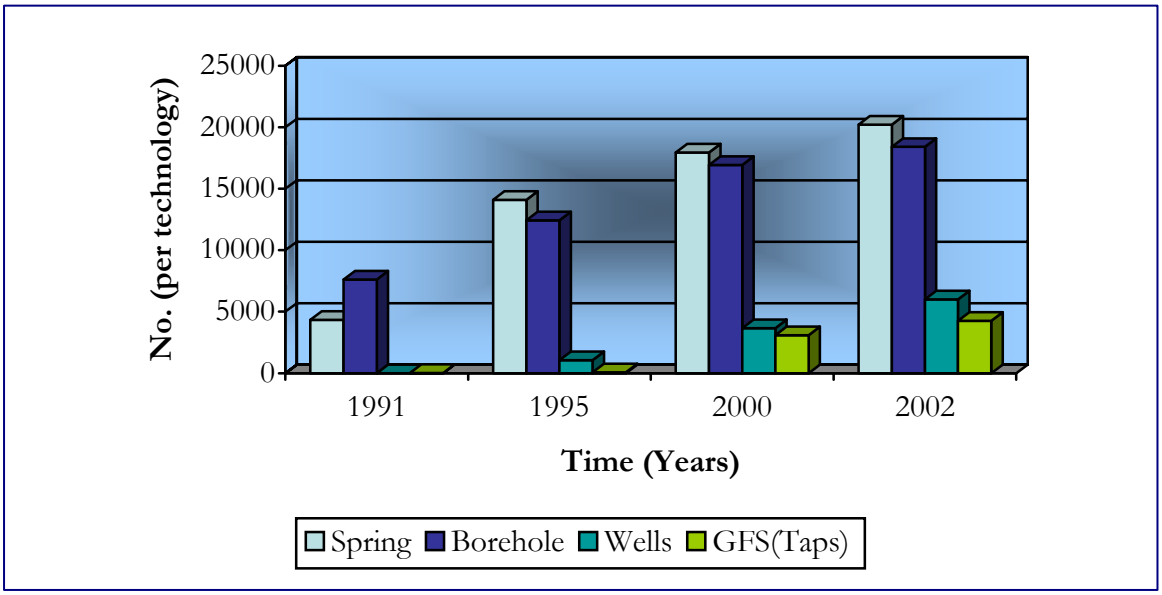

Figure 4.2: Rural Water Supply Technology Options

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Borehole: *One of the commonest sources of water in rural areas*

In order to increase on sustainability and functionality of the installed water facilities, the government has adopted a strategy aimed at promoting technologies which are affordable, socially acceptable, potentially sustainable and technically suited to local conditions. These technologies are appropriate for the poor, an example of which is shown in the adjacent picture.

This strategy emphasizes, among other things, improvement of siting techniques for shallow wells, developing rock catchment systems and introduction of ecological sanitation. In addition, rainwater harvesting, especially at household and communal level is being promoted. DWD has commissioned a rain water harvesting strategy study in order to "look into rainwater as a valuable tool for poverty reduction"

WATER SUPPLY IN SCHOOLS

One of the major challenges in the water sector is water supply in schools. **Table 4.1** below shows the water supply situation in primary schools, the majority of which are based in rural areas.

Table 4.1: Water Supply in Primary Schools

Piped water	1,133	9.2
Borehole	3,587	29.2
Well/Spring	4,718	38.4
Rain water tanks	902	7.3
Lake/river	731	6.0
Other	556	4.5
Unknown	653	5.3
Total (Schools)	12,280	100.0

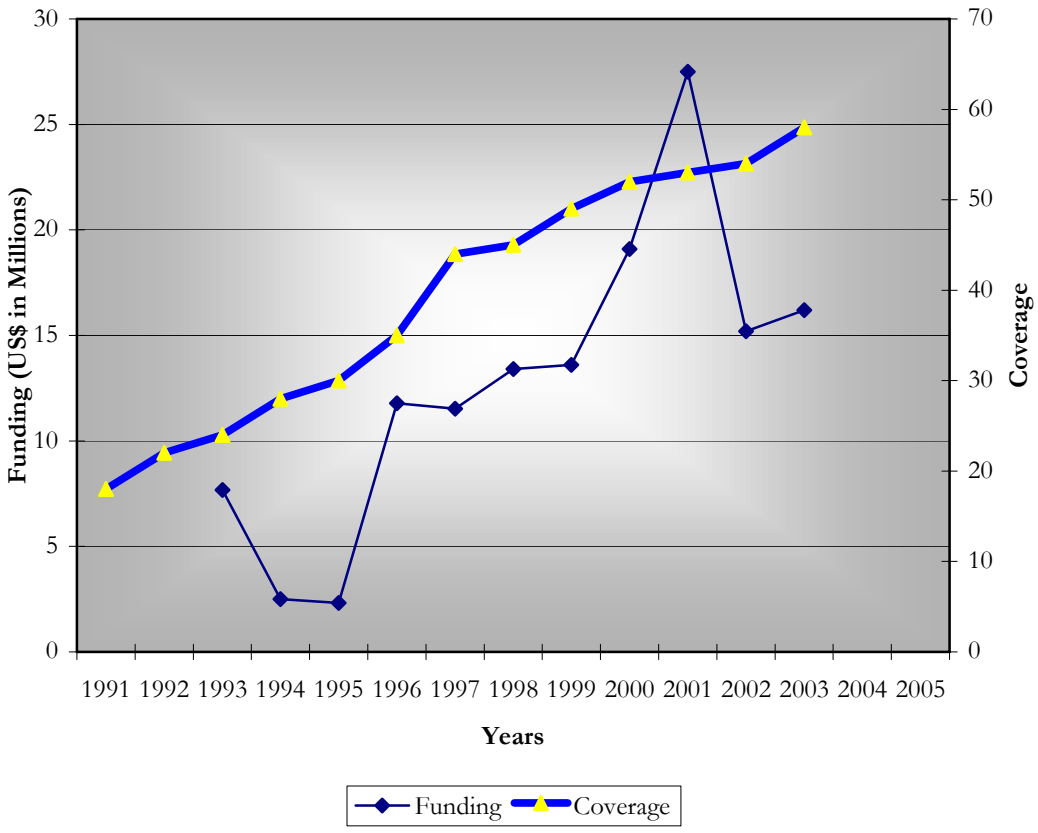
Source: Uganda Bureau of Statistics, 2003

According to the table, 40% of primary schools have access to piped water or boreholes. Taking these two sources as the most protected and therefore safe water sources, a total of 7,560 primary schools do not have access to safe water.

FUNDING FOR RURAL WATER SUPPLY

Figure 4.3 shows a comparison between the trends in the funding levels and coverage for the rural water sub-sector. The Figure indicates general increase in funding for the rural water sub-sector over the period 1991 – 2003. However, it should also be noted that despite the significant increase in funding levels, which almost more than doubled over the period 1997-2001, the increase in coverage was only been modest over the same period. This is attributed to a number of factors experienced during this period i.e. significant investment in capacity building for districts, use of more expensive technologies, rehabilitation of non-functioning facilities, and high overhead costs resulting from inadequate technical capacity of both the districts and the private sector.

Fig 4.3: Trend in Rural Water Supply Funding and Coverage



4.3.2 Rural Sanitation

RURAL SANITATION COVERAGE

Government has put a lot of emphasis on improving household sanitation as one of the key intervention areas to address disease and poverty. The percentage of rural population with

access to improved sanitation increased from 68% in 1991 to 85% in 2002. The government strategy has been to include sanitation as an integral part of all water supply programs in the country. Though still a challenge, sanitation coverage has significantly improved in rural areas and has greatly contributed towards the improved standard of living of people in the rural areas. However, there still remains an issue of unclear institutional arrangements related to sanitation at central level, and that has hampered service delivery efforts by local governments. In order to address this shortcoming, the relevant ministries signed a memorandum of understanding (MoU) on ministerial responsibilities for sanitation/hygiene promotion activities in 2001. The MoU stipulates the following:

- ✓ MWLE is responsible for planning investments in sewerage services and public facilities in towns and rural growth centers;
- ✓ Ministry of Health is responsible for household hygiene and sanitation; and
- ✓ Ministry of Education is responsible for school sanitation and hygiene education.

SANITATION IN RURAL SCHOOLS

Following the introduction of Universal Primary Education, there was a dramatic increase in primary school enrolment, thereby overloading existing sanitation facilities, with some schools having over 800 pupils per stance, well beyond the recommended national target of 40 pupils per stance. Government responded immediately and initiated school sanitation programs to address this problem. According to a study carried out by UNICEF in 2003, the mean pupil:stance ratio has reduced significantly from a national average of about 300:1in 1997 to 64:1 in 2002. Improvements in school sanitation have been quite successfully, especially when directly linked with community water supply projects.

4.3.3 Rural Water Quality Issues

The quality of water consumed in most rural areas in Uganda is poor and falls short of the National Drinking Water Standards. An assessment of shallow wells carried out by DWD in 2002 found 23% of the 123 sampled wells to be contaminated with E.Coli (values above 50/100ml, which is the maximum acceptable value according to the '*Provisional National Guidelines*' for untreated drinking water). This was mostly attributed to the poor construction and siting of water facilities (i.e. location within densely populated areas like trading centers, or settlements located upstream of water sources and/or close proximity to on-site human excreta disposal facilities like pit latrines, which are predominantly used in the rural areas).

Studies carried out by DWD (RUWASA project, 1990) consistently established that in over 90% of the cases, there was progressive contamination of water from a safe protected or improved water source to the point of consumption at the household. This contamination was mostly attributed to the use of dirty water collection/storage containers.

Water quality management at household level is closely linked to the hygiene practices. It is generally difficult to guarantee good water quality beyond the water source, due to the poor hygiene practices, which result in significant deterioration of the quality of water from the time it is collected from the source to the time it is finally consumed. Most water users are often more interested in aesthetic quality of the water (especially taste and color) and pay little attention to the bacteriological quality. Government is trying to address this problem through intensified hygiene education at community level.

4.3.4 Operation and Maintenance Plan of RWSS Facilities

Results from a study carried out by DWD in 2002 on the Operation and Maintenance (O&M) of RWSS facilities, indicated that O&M is the weakest aspect in the provision of sustainable rural water supply and sanitation facilities. In order to address this weakness, the study recommended that, as an integral part of the planning process and prior to commencement of any construction, there must be an approved O&M plan for sustainability of the completed facility, i.e. a realistic, viable plan to ensure continuous, reliable operation of the completed facility for at least 8 years.

It is a requirement that the O&M plan be prepared by the community, facilitated by District and Sub-country officials and in particular the DWO.

The Plan deals with issues such as: full coverage of O&M costs by the community for a minimum of 8 years; remuneration of attendants/mechanics; estimated life of capital equipment and parts; availability of spare parts and their costs; maintenance costs; equipment replacement costs and, backup support and services to be provided by the District. Especially important is that if the community cannot cover fully the anticipated costs, there must be identification of who will.

The plan must also include a plan for how the community will increase household latrines coverage and usage to 95 percent within four years after water facilities have been installed. A format for such O&M Plans was prepared by DWD and has been distributed to all local governments.

4.3.5 Technical Support to the Local Governments

Following decentralization of rural water supply and sanitation service delivery to the local governments, the central government had to come up with a mechanism to provide technical support to the local governments to enable them cope with this new challenge.

This support is being offered through eight Technical Support Units (TSU) located in all regions of the country. Each TSU supports a cluster of 8-12 local governments in a specific region. The TSUs are staffed with highly qualified professionals from the private sector with extensive experience in the provision of RWSS services.

The main aim of the TSUs is to complement the Ministry of Local Government's effort to provide guidance and support to local governments on a demand-driven basis to facilitate the building of local government capacity to handle water and sanitation development.

The TSUs are a temporary support measure and will be phased out as the local government capacity increases.

4.4 Rural Water Related Health Issues

The main health impact of improved water supply and sanitation is measured in terms of the prevalence of water-borne diseases (including cholera, dysentery and intestinal worms). According to a study carried out in 2002 (Katende and Tumwesigye, 2002), diarrhea alone

accounted for approximately 19% of infant mortality in Uganda! It is, therefore, clear that increasing access to water and sanitation services can go a long way in reducing the infant mortality. This is the main reason why government has continued to commit significant resources towards implementation of rural water and sanitation programs in different parts of the country.

4.4.1 The Infant Mortality Rate (IMR)

According to a study conducted by the Ministry of Health in 2002, the birth and under-five mortality rates in Uganda are still very high (88/1000 live births and 152/1000 respectively). Analysis of relevant data for the period 1995-2000 showed that IMR for households without access to safe water is twice as high as those households with adequate access (MFPED, 2002). In addition, IMR was found to be higher for household with no sanitation facilities vis-à-vis households with a pit latrine or flush toilet.

4.4.2 Diarrhoea Diseases

According to a study conducted by the Ministry of Health in 2001, diarrhea was found to be more serious in young children than grown-ups and accounted for 6% of all illness cases for children under 4 years in 1995. In addition, diarrhea was seventh in the top ten outpatient diagnoses for patients of all ages in 2001, accounting for 3.9% of diagnosis (HMIS, 2001). Intestinal worms were the third most frequent diagnosis, accounting for 9.4% of diagnoses.

Results from the Ugandan Demographic Health Surveys (UDHS) (UNHS, 1995; UNHS, 2001) show that despite increase in safe water coverage there has been an increase in diarrhea disease prevalence during the period 1995 to 2000. This was attributed to the low sanitation coverage during the same period.

4.4.3 Malaria

Statistics from the Ministry of Health indicate that Malaria is the leading cause of child morbidity in Uganda. Approximately 70,000 to 100,000 children die every year from malaria, amounting to 30% children's (2 to 4 years) deaths and accounting for 23% of total discounted life years lost. In addition to acute ill health caused by clinical malaria, there is considerable morbidity from reported low level febrile infections from the malaria parasites. Most of Uganda is endemic (50-70% parasite rates in children between 2-9 years) and most of the population experiences moderate to very high malaria transmission. Its impact on social and economic development is significant. According to the National Health Survey (NHS) conducted in 2003, about 55% of the households report sickness every month and spend 3% of their income on health care. The survey also indicated that malaria accounts for 25% of all illness in Uganda. Estimates from the Ministry of Health indicate an average expenditure on malaria related treatment to be as much as US$300 million annually!

4.4.4 Guinea Worm Disease

The prevalence of Guinea worm disease in Uganda has reduced significantly from 126,700 cases reported in 1991 to 24 cases reported in 2002, 18 of which were imported. The government is committed to the complete eradication of Guinea worm disease by the end of 2004.

NOTE - Due to lack of adequate and systematic data during the period 1990 – 2003, it was not possible to establish meaningful trends in most of the health issues discussed above. It is therefore important that regular surveys are carried out with immediate effect to establish these trends for future monitoring and evaluation.

4.5 Challenges and Opportunities

4.5.1 Challenges

The major challenges affecting the performance of the RWSS sub-sector include:

a) Inadequate financial resources: The investment requirement for rural water supply and sanitation, to meet the 2015 target, is about US$ 600- and 950 million.
b) Inadequate capacity at district and lower levels to plan and implement sector activities. This has consequently resulted in low absorption of funds by the local governments.
c) Limited Private sector capacity to cope with the increased water and sanitation activities.
d) Weak coordination and management at both national and local governments level.
e) Inadequate involvement of local communities in the planning, financing, implementation, monitoring and management of community based water and sanitation developments.

4.5.2 Opportunities

In order to cope with the above challenges, government has taken steps to revamp the water sector through comprehensive policy, legal and institutional reforms aimed at increasing the performance of the sector in terms of outputs but also the efficiency in service delivery.

The opportunities available to ensure this transformation of the water sector include:

a) Poverty Eradication Action Plan (PEAP) – Which gives high priority to water supply and sanitation as one of the key intervention areas for poverty eradication.
b) Water Sector Reform – whose objective is to ensure that services are provided and managed with increased performance, efficiency and effectiveness, while maintaining the government's commitment to equitable and sustainable provision of domestic water supply and sanitation services.
c) Comprehensive Policy and Legal Framework – which guides the planning, implementation and monitoring of water supply and sanitation activities.
d) Good governance in both the management of public resources (through multi-annual financial planning and budgeting under the MTEF) committed to water supply and sanitation activities.
e) Private Sector Participation (PSP) which has brought in expertise and financing from the private sector to support government in the planning and implementation of water supply and sanitation activities.
f) Commitment from government and development partners for continued support of water supply and sanitation activities.

4.6 RWSS Sub-sector Investment Plan

4.6.1 Overview

One of the key outcomes of the RWSS sub-sector reform study is the Rural Water Supply and Sanitation Sub-sector Investment Plan for 2000-2015 (SIP 15). SIP 15 is recognized as one of the key government strategies aimed at addressing poverty eradication through provision of improved water and sanitation services to the rural population.

The plan shows that rural water supply is the largest consumptive water user in the country. SIP 15, therefore, focuses on addressing the following key issues:

(i) Development of institutional capacities at both national and local levels including the private sector;
(ii) Enhancement of stakeholder participation in the planning and implementation of water supply and sanitation activities;
(iii) Ensuring sustainability of installed facilities through use of appropriate technologies, promotion of community ownership of facilities, creation of Water User Associations and preparation of comprehensive O&M plans for the installed facilities;

According to SIP 15, the main source of water in the rural areas will continue to be groundwater. The plan also emphasizes sanitation as being a key challenge in the rural areas, especially as far as its impact on the quality of water supply is concerned.

One of the key strategies for implementation of the SIP-15 is the Sector-Wide Approach to Planning (SWAP). The SWAP approach implies that all significant public funding for the sub-sector follows a common approach, and is within the framework of a single sector expenditure plan (SIP-15) and relies on government procedures for disbursement, accounting, monitoring and reporting on progress. The SWAP strategy for the Rural Water and Sanitation Sub-sector was adopted in 2002 and its implementation has been quite successful to-date.

According to the assessment conducted during the RWSS Reform study, the investment needs for the sub-sector for the next 10 years are estimated to total US$ 950 Million. With this level of investment, it is envisaged that the government would be in position to achieve 100% water and sanitation coverage in the rural areas by 2015. The biggest challenge is how to secure all the required funds.

4.6.2 Guiding Principles

The key guiding principles for implementation of the SIP 15 include:

(a) ***A Demand Responsive Approach***- Where all support is determined in response to demand by the community. The community, after receiving appropriate information/advice, decide on what type of facilities they want, pay their share of the construction costs, and manage the operation and maintenance of the facilities. The local governments (districts and Sub-counties) will be responsible for influencing and regulating demand and supporting the poor communities.

(b) ***Decentralized Implementation*** - Where funds channeled directly to districts as conditional grants for implementation, and central government responsible for policy formulation, overall sector coordination and regulation, building local government capacity for service delivery, setting standards, preparing guidelines, monitoring, and sector-relevant research and development. The Fiscal Decentralization Strategy (FDS) is to be introduced in all districts with effect from 2004/05Fy. The FDS strategy implies an even greater degree of devolution of responsibility to local governments.

(c) ***Integrated Approach*** - Integration of water resources management aspects, liquid and solid wastes, safe-guarding of health and protection of the environment. A "Package" approach for rural water supply includes construction, installation and also all software aspects associated with the water supply provision namely mobilization, community-based planning and monitoring, hygiene education (including maintaining a safe water chain and promotion of household sanitation), gender awareness/creation, capacity building at user level required for continued use and sustainable operation. In order to ensure integration of all above aspects, the Ministry of Water Lands and Environment (MWLE), the Ministry of Health (MoH) and the Ministry of Education and Sports (MoES) signed a Memorandum of Understanding (MoU) on Ministerial Responsibilities for Sanitation/Hygiene Promotion Activities in December 2001, whereby lead central-level responsibilities in specific sanitation and hygiene promotion are specified as follows:

- MWLE for planning investments in sewerage services and public facilities in towns and rural growth centres
- MoH for household hygiene and sanitation
- MoES for school latrine construction and hygiene education

(d) ***Sustainability*** – Which is the prime objective of all rural water and sanitation interventions. Sustainability considerations guide technology and design options as well as guide implementation arrangements and capacity building strategies. The main foundation of sustainability is the Community Based Maintenance System (CBMS). The principles behind the CBMS are:

- Users are responsible for all routine operation and maintenance of facilities,
- The private sector will in principle provide all technical services for operation and maintenance – including the provision and distribution of spare parts,
- The role of central government and local authorities is mainly to monitor, regulate and facilitate the performance of the private sector and user communities in operation and maintenance.
- Government supports the cost of major rehabilitation expenses in the interim, in the long term it is expected that communities will increasingly co-finance and ultimately take over these expenses as well.

(e) ***Private sector participation*** - Where consultants and contractors carry out the design, construction and management of facilities. The contractors include those engaged in construction; supplies of hardware like pump sets and spare parts, other equipment and consumables.

4.6.3 RWSS Sub-sector Operational Plan

During 2002, a 5-year Operational Plan (OP5) for the RWSS sub-sector was prepared. The main purpose of the OP5, which covers the period 2002-2007, is to operationalise the 15-year RWSS Strategic Investment Plan (SIP-15). The OP5, which is based on the SWAP principles, will ensure that, within a decentralized service delivery system, all significant public sector funding follows a common approach and in line with government procedures for disbursement, accounting, monitoring and reporting on progress. The key elements of the OP5 include:

- ✓ Detailed investment plan for increasing sustainable and equitable coverage to meet the targets set by PEAP and the SIP15.
- ✓ Common approach for implementation of RWSS activities.
- ✓ Comprehensive Financing Plan detailing the financial requirements for the sub-sector, funds secured and outstanding funding gaps.
- ✓ Detailed capacity building plan covering local governments, central level institutions, private sector, NGOs, and CBOs.

The OP5 has also adopted a number of strategies to help promote household sanitation in rural areas. Building on the fact that provision of water offers an excellent opportunity to stimulate improved household sanitation and hygiene, the OP5 specifies the following minimum requirements as pre-requisites for communities that are to benefit from government funded rural water supply initiatives:

- ✓ All households of community leaders must have latrines that are safe, clean and used before such a community can benefit from the government funded water supply scheme;
- ✓ During the mobilization phase of any government funded rural water supply project, the beneficiary communities are required to increase household latrine coverage by at least 30% as a pre-requisite for continued government funding of the water supply project;
- ✓ The beneficiary community is also required, as part of the 8-year O&M plan for the water supply facility, to outline how they will go about increasing the latrine coverage and usage to at least 95% within the first 4 years of operation of the water facility.

4.7 Legal and Institutional Framework

The RWSS sub-sector is governed by the legal and institutional framework for the entire water sector as described in Chapter 3, sections 3.3 and 3.4.

4.8 RWSS Programs and Projects

As stated in Chapter 3 the water sector has embraced the Sector Wide Approach (SWAP) to implementation of all water supply and sanitation activities. Government has, therefore, moved away from the "Project based" implementation of activities to a program approach. As a result, all RWSS projects have been phased out and there is now one National Program for the RWSS sub-sector code-named: "Support to Rural Water Program". All RWSS donor and government funding is channeled through this program.

The ongoing RWSS program and some of the recently concluded RWSS projects are summarized in **Table 4.2** below:

Table 4.2 – National RWSS Programs and Projects

PROJECT	*DONOR*	*STATUS*	*REMARKS*
Rural Water and Sanitation, East Uganda (RUWASA)	DANIDA	Completed (1989-2002)	Covered 10 districts in Eastern Uganda. Involved drilling of boreholes and shallow wells, protection of springs and construction of pit latrines.
Water and Environmental Sanitation (WES)	UNICEF	Completed (1998-2002)	Covered 35 districts and involved construction of water supply facilities, mobilization and promotion of sanitation and hygiene, and construction of pit latrines.
Gravity Flow Schemes (GFS) Program	SNV and EU	Completed (1998-2003)	Covered 13 districts and involved construction of Gravity Flow water supply schemes.
Rural Borehole Drilling Project	Government of Uganda	Completed (????-2003)	Covered several districts and involved drilling of boreholes.
Rural Water Supply Project	JICA - JAPAN	Ongoing	Covering three districts (Mubende, Mpigi and Kiboga). Commenced in 1998 and involves drilling of boreholes and construction of other rural water supply facilities.
Support to Rural Water Program	SIDA, DANIDA, DFID, SNV, AUSTRIA	Ongoing	The program covers all districts and is aimed at supporting districts in implementation of water and sanitation activities, through Technical Support Units (TSUs).

4.9 Performance Monitoring, Evaluation and Reporting

The RWSS sub-sector has adopted the same Monitoring and Reporting framework established for the water sector as described in **Chapter 3**.

4.9.1 Performance Indicators

In assessing the performance of the RWSS sub-sector, specific indicators, both quantitative and qualitative, are used to measure progress made towards achievement of the set targets.

The specific performance indicators for the RWSS sub-sector are given in the **Box 4.2.**

	BOX 4.2: Key RWSS Monitoring Indicators
	Golden Indicators
1	Percentage of the rural population within 1.5 km of an improved water source.
2	Percentage of improved water sources that are functional at time of spot check.
4	Percentage of people with access to improved sanitation (households and schools).
5	Percentage of people with access to hand-washing facilities.
6	Average daily per capita total water consumption.

Table 4.3 below shows the past, current and projected performance of the RWSS as rated by each monitoring indicator.

GOAL: "To achieve sustainable safe water supply and sanitation facilities, based on management responsibility and ownership by the users, within easy reach of 100% of the rural population with effective use and functionality of the facilities."					
INDICATOR	1990	2000	2005	2010	2015
Percentage of the rural population within 1.5 km of an improved water source.	18%	56%	65%		
Percentage of improved water sources that are functional at time of spot check.					
Percentage of people with access to improved sanitation (households and schools).					
Percentage of people with access to hand-washing facilities.					
Average daily per capita total water consumption.					

Table 4.3 – Performance of the Rural Water Supply and Sanitation Sub-sector

The indicator-based performance monitoring is still a new concept in the water sector and has not yet taken root, thus the empty table above. However, following recognition of the importance and effectiveness of the indicator-based performance monitoring, this methodology has now been fully adopted by the water sector and will form the basis of all future monitoring activities. The indicator-based monitoring will be conducted through annual service delivery surveys and periodic participatory assessments.

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CHAPTER FIVE

URBAN WATER AND SANITATION

5.1 Introduction

5.1.1 The Urban Setting

According to the water sector, urban areas are defined as human settings with population exceeding 5,000 persons or that are gazetted as District headquarters. Small towns have populations from 5,000 to 15,000 persons, and large ones above 15,000 persons. Based on these criteria, there are 106 small towns and 43 large towns in Uganda, as of June 2004. Based on this definition the current urban population is estimated at 3.7 million out of the current (2004) total population of 25 million. **Figure 5.1** shows the major towns in Uganda.

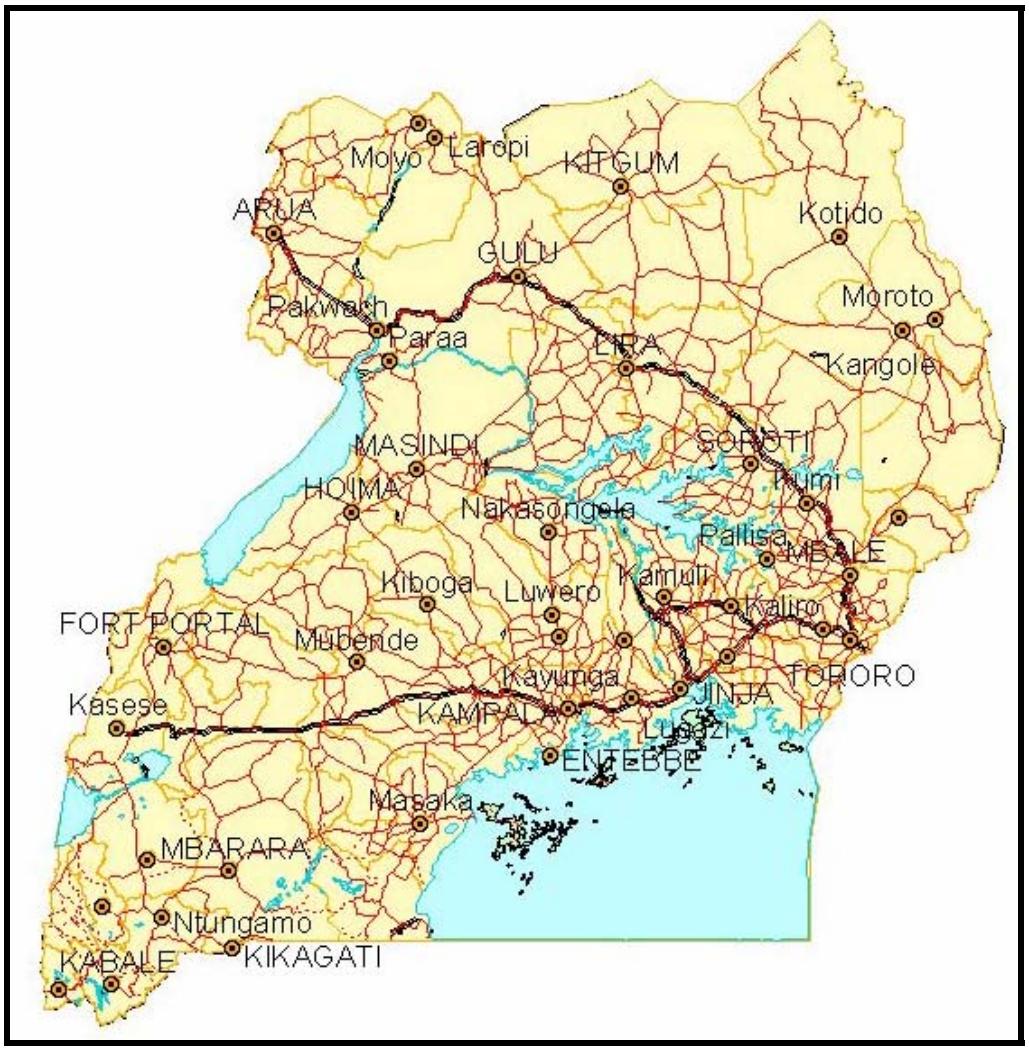

Figure 5.1 – Major Towns in Uganda

5.1.2 Rural-Urban Migration

Urbanization in Uganda has increased with small trading centres becoming towns and the older towns expanding in area and population. The population in urban areas has been growing much faster than that in rural areas – the overall population growth rate is 3.4% while that in urban areas is 4.1%. **Figure 5.2** shows Uganda's urban and rural population trends since 1950.

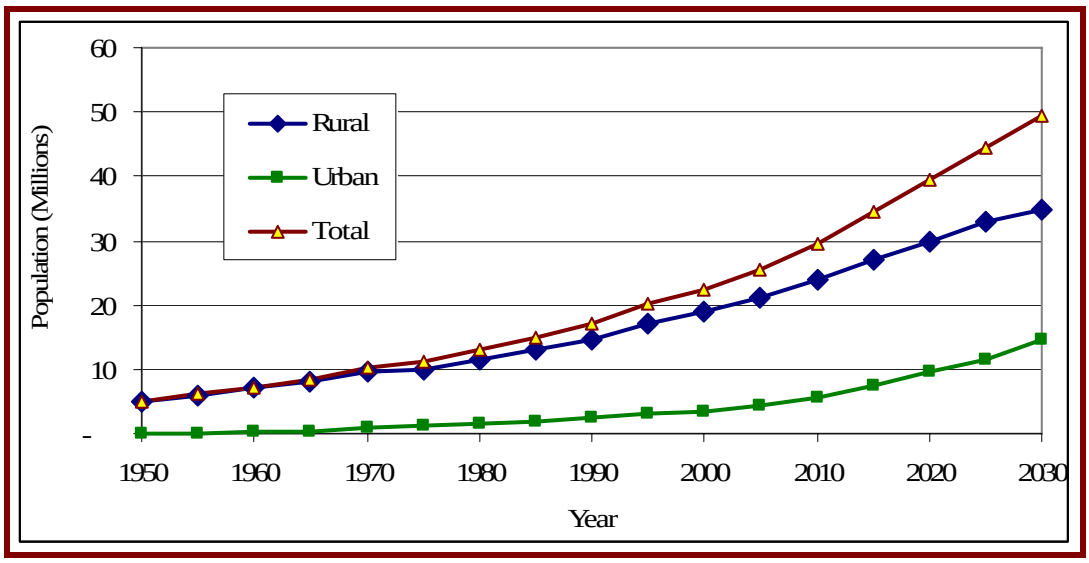

Figure 5.2: Uganda's Population Trends, 1950 – 2030

Source: NEMA (2002)

The percentage of the population residing in urban areas increased from 12% in 1993 to 14% in 2003 (UBOS, 2003). The number of urban households doubled over the last ten years from about 400,000 in 1993 to 800,000 in 2003.

5.1.3 Urban Water Supply – Historical Perspective

Development of conventional piped water supply systems started during the colonial period in the 1940s. The majority of the older systems were constructed from 1950 to 1965, mainly in the regional and district headquarters to serve the workers and the small commercial communities. No new schemes were constructed between 1965 and 1990. Only maintenance of the existing schemes was done, but even this was poor. The National Water and Sewerage Corporation (NWSC) was established as a government parastatal with a mandate to operate and provide water and sewerage services in areas entrusted to it on a sound commercial and viable basis. The rest of the water supplies were operated by DWD (and its predecessors). By 1990 virtually the whole urban water infrastructure was run down and serving less than 10% of the population in the large towns. By 1990, there were only 37 urban water systems including those under the NWSC.

In 1990, the Government, with assistance from the World Bank and the Government of Japan, started the Rural Towns Water and Sanitation Program (RTWSP). 250 small towns and rural growth centers were identified under the program, of which 60 were selected for

urgent attention. As part of the program, policies and guidelines were developed in 1992 elaborating the main implementation principles for small town water and sanitation projects. These policies and guidelines were continuously upgraded as projects were implemented and experiences gained. To date implementation in 50 towns has been completed and 12 schemes have been rehabilitated. A number of lessons have been learned from the implementation of these projects as highlighted in the **Box 5.1** below.

Box 5.1: Key lessons learned from the implementation of Urban Water Supply and Sanitation (UWSS)Projects	
1	Community participation and the "Demand Responsive Approach" are useful elements in building confidence, transparency and support from stakeholders towards the undertakings.
2	Mobilization and capacity building are continuous activities throughout project implementation.
3	Water Resources investigations and development of water sources should be carried out very early in the project. In any case, they should be done before intensive mobilization and system design.
4	Capital Cost Community Contributions have been problematic hence giving extra burden to implementation and serving no useful purpose.
5	The client or his representative should have sufficient knowledge of the project and relevant expertise to oversee the work of the consultants and contractors if "value-for-money" is to be realized. The client should never be left at the mercy of the Consultant and Contractor!
6	Private Sector Participation in Operation and Maintenance of the installed facilities is by far more effective as a management model compared to community management through User Associations.

Source: DWD (2002)

5.2 National Goal and Targets for UWSS

5.2.1 National Goal

The national goal for Urban Water Supply and Sanitation (UWSS) is:

"***To achieve sustainable safe water supply and sanitation facilities, based on management responsibility and ownership by the users, within easy reach of 100% of the urban population with effective use and functionality of the facilities."***

5.2.2 National Targets

The national target for rural water supply and sanitation coverage is to achieve 100% safe water coverage and 100% sanitation coverage in urban areas by 2015, with an 80%-90% effective use and functionality of facilities.

5.3 Urban Water Supply Situation Analysis

5.3.1 The Challenge of Urban Water Supply

Urban areas require reliable water supplies that can provide adequate quantities of water all year round, as well as infrastructure for abstraction, treatment, pumping, transmission, storage, and distribution. This makes it relatively expensive to provide – the Urban Water

Supply Investment Plan provides for a per capita investment of USD 75, but recent trends show actual per capita investments of over USD 80.

The high rate of urbanization seriously erodes the efforts at service delivery. This is particularly so with slums located in the urban fringe areas, where population growth has outpaced the supply of water. In addition the population in these areas is generally poorer, and find it more difficult to pay for water services.

Piped water is mainly provided in the wealthier and well planned core areas of towns, unlike the urban fringe areas, which usually comprise of informal settlements occupied by poorer people, many in make shift accommodation. These informal settlements, commonly referred to as 'Slums', mostly access water from improved point water sources (protected springs or boreholes/shallow wells with hand pumps). Where piped water reaches the slums most people access it from stand taps (kiosks) or yard connections. These approaches provide for a lower level of service than the house connections.

5.3.2 Urban Water Coverage

The national urban water coverage is estimated at about 65%, up from 54% in 2000. A total of 56 towns[1] (15 large and 41 small) with a population of 2.8 million people (77% of urban population) have piped water supplies. The remaining 11 large and 69 small towns (population 932,000) do not have piped water supplies.

By March 2004 there were a total of 97,537 connections in the NWSC towns, of which 79,489 (81%) are active. On the average, each active connection serves approximately 19 people, but their distribution between towns and within towns needs a better understanding before concrete conclusions can be made.

The present (2004) population in the 55 towns served with piped water (outside the NWSC area) is 735,321 people, while in the un-served towns is 832,496. There are only 10,600 connections in all small towns representing 1 connection for every 148 people but for those with services, the ratio is 1 connection for every 70 people (DWD, 2003).

Figure 5.3 shows the distribution of urban water supply for the different competing needs. The figure indicates that the main use of water in urban areas is for domestic and institutional (schools, offices, hospitals, etc) purposes. The total commercial and industrial water demand in the larger urban areas is about 33% (NWSC, 2003).

[1] Including Kampala city.

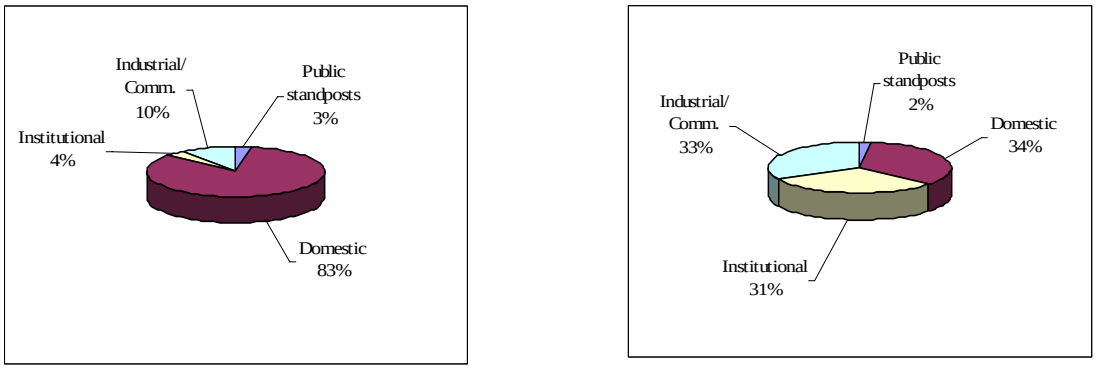

Figure 5.3: Urban Water Supply Distribution (a) Connections and (b) Revenue *(Source: NWSC, 2003)*

PER CAPITA WATER CONSUMPTION

The design criteria (DWD, 2000) and actual estimated levels of per capita consumption of water for different service levels in selected towns (MWLE, 2003a; NWSC, 2003a) are shown in **Table 5.1** below.

Table 5.1: Estimated and actual water consumption levels

Service Level	*Estimate (Litres/person/day)*	*Actual Average (Litres/person/day)*
Household connection	50 – 200	70
Yard tap	40	19
Stand tap/kiosk	20	8
Rural Water Supply	20	13
Commercial	50 – 200	1,988 litres/day
Hotels	50 – 100	
Industrial (litres/hectare/day)	10,000	

5.3.3 Sources of Urban Water Supply

The main source of water for the larger towns is surface water drawn from lakes or rivers, and in a few cases swamps, which together account for about 50% of urban water supplies. In most of the small towns, with lower water requirements, the source of water is groundwater drawn from high yielding boreholes. The main advantage of the groundwater sources is their relatively good quality that in most cases requires no or minimal treatment. A few towns use highland springs or streams under gravity flow for their water supply.

WATER QUALITY

Raw Water
Generally, the quality of surface water in Uganda has been declining over the last two decades (NEMA, 2003). Data from DWD's national water quality monitoring program indicate that raw water quality is generally better in the lake sources than rivers. The data also shows a significant decline in the quality of water from Lake Victoria over the last few years. This is an issue of major concern to NWSC since Lake Victoria is the source of water supply to the three major towns (Kampala, Jinja and Entebbe).

The quality of raw water influences the extent and cost of treatment required, and thus the tariff paid by the consumers.

Water Treatment
All urban water supplies are supposed to be treated to meet the National Drinking Water Standards (DWD, 1994). All large town water supplies under NWSC are equipped with laboratories that carry out water quality monitoring. The more complex water quality tests (e.g. heavy metals, pesticides) are carried out at the National Water Quality Laboratory operated by DWD, which also doubles as the National Reference Laboratory. However at present most water supplies under Water Authorities do not carry out routine water quality monitoring. DWD is planning to provide basic water quality equipment to the Water Authorities for routine monitoring of some basic water quality parameters. DWD also intends to set up fully equipped regional water quality laboratories to support NWSC and the Water Authorities in carrying out the full range of water quality testing and monitoring for both the urban and rural water supplies.

5.3.4 Unaccounted for Water

The level of unaccounted for water (UfW) for piped water supplies in the different towns varies between 0% - 48%, with an average of about 20%. The water losses occur during storage, transmission and distribution as a result of leakages in the systems. There are also seasonal variations in the performance of the different town water supplies due to other technical faults like major pipe bursts. The challenge of unaccounted for water is more critical in the older supply systems where the transmission mains are more susceptible to bursts. One of the priorities of NWSC is to increase the performance of its water supply systems and reduce the UfW to a modest level. This initiative has already started yielding positive results and has led to a reduction in UfW from 51% in 1998 to 38% in 2004 in the Kampala service area.

5.3.5 Tariff Levels and Pricing Policy

The current tariff structure is based on affordability and uniformity across the country while ensuring cost recovery. The current tariffs are not adequate for system expansion, but are in most cases able to cover operation and maintenance costs. Major investments in system improvement and extension are currently financed separately from sources outside the tariffs (grants from government and donors), and this is likely to continue for some time until the towns become more viable. Full cost recovery (operation and maintenance, depreciation, and

investment) would require a significant increase in tariffs. The current (2004) water tariffs are shown in **Table 5.2**.

Table 5.2: Water Tariffs by category of user

Category	*NWSC, 2003/4 UShs./M³*	*Urban Water Authorities, 2004 UShs./M³*
Public standpipes (bulk)	449	1,000
Public standpipes (jerrycan)	25 – 50	25 – 50
Domestic	693	1,000
Government and Institutional	854	1,000
Commercial and Industrial	1,187 – 1,324	1,000
Weighted average – Uganda		1,037

Source: NWSC (2003b) and MWLE (2003c)

The NWSC uses a rising block tariff structure for commercial consumers, to discourage waste of water. The NWSC approach to management allows for cross-subsidies among towns.

The NWSC applies an additional 75 – 100% of the applicable tariff in case of a sewerage connection. The tariff is higher for the commercial consumers and lower for the domestic consumers, the lowest being for bulk sale at stand taps. However the poorer users of stand taps generally end up paying more for the water collected in *Jerrycans*[2] due to the costs of operating a stand tap.

5.3.6 Revenue Collection

NWSC annual turnover for the period 2001 – 2003 is shown in **Table 5.3** below. Following adoption of a more business oriented Management Strategy, NWSC's revenue collections have been significantly increased over the past 5 years. For the first time in a long time, NWSC was able to collect enough revenue to cover all its total costs including depreciation, and post a surplus of about Shs. 778 million in 2003.

Table 5.3: NWSC Revenue Trends (Ushs. Million)

Parameter	*2001*	*2002*	*2003*
Turnover	29,297	34,054	37,140
Percentage Growth	13%	16%	9%
Operating Profit before depreciation.	4,369	7,021	8,072
Operating Profit after depreciation (excluding exceptional items)	-2,620	36	778

The total revenue collection by Water Authorities in 2003 was UShs. 987.7 million compared to the bills of UShs. 1.24 billion, giving an average collection efficiency of 79%. However the

[2] Portable plastic containers used for collection of water

collection efficiency varied from 34% in Kotido (disturbed area) and 36% in Mubende to 128% in Rukungiri town.

5.4 Urban Sanitation Situation Analysis

5.4.1 The Challenge of Sanitation in Urban Areas

Currently, only 6% of the urban population in the large towns has access to sewerage services. A significant portion of the wastewater treatment capacities in the NWSC towns are presently under utilized and are likely to remain so for quite sometime. This is partly due to the small number of household connections to the sewerage system and the limited investment opportunity that has constrained the widening of catchments. Poor urban planning has also aggravated the urban sanitation problem due to the several poorly planned housing estates which are scattered all over urban centers, thus making extension of sewerage services to such areas very difficult and expensive.

In order to address the urban sanitation challenges in the country, government is in the process of preparing Urban Sanitation Master Plans for different towns in the country. The Sanitation Master Plan for Kampala is due to be completed by the end of 2004. The Master Plans will, among other things, provide the framework for improvement and increase in coverage of sanitation services to the urban population.

5.4.2 Urban Sanitation Coverage

The sanitation coverage in urban areas is about 65%, which is still quite low. Most users of waterborne toilets are connected to individual cesspools or septic tanks. These are periodically emptied by cesspool emptiers that dump the sewage at treatment plants (where they exist) or in many cases directly into the environment. Kampala city has dozens of cesspool emptiers currently in operation. However some of the smaller towns have problems accessing them due to the low demand.

It is difficult to provide sewers in urban areas including Kampala because of their land requirements, particularly in the poorly planned areas, and high costs of construction and maintenance. The maintenance costs would make the resultant tariffs unrealistically high and not easily affordable. The main approach promoted by the NWSC is to regularly empty the sewage and treat it properly before discharge.

Many people depend on on-site sanitation, predominantly pit latrines, which has contributed to ground water contamination in many parts of the country, especially in Kampala. In order to address this problem, DWD, the Ministry of Health and Kampala City Council are promoting ecological sanitation by emphasizing the use of dry toilets in urban areas that have no access to the conventional sewerage system.

5.4.3 Urban Drainage

Kampala city and other urban areas in Uganda are currently facing increasing drainage problems because of the destruction of the flood buffer zones. With the rapidly increasing development in urban areas, most of the land reserves that used to serve as flood buffer zones are being encroached on and destroyed.

A study conducted in 2004 (Byandala, 2004), attributed the increasing urban drainage problems to the following main factors:

(i) The destruction of the upstream buffer zones in the urban areas that has reduced the runoff concentration time hence increasing the risk of flooding downstream; and

(ii) The existing drains regularly get clogged with debris and garbage reducing their carrying capacity.

In the lower areas of Kampala flooding has become a common phenomenon occurring frequently, even after a one-hour downpour.

Flooding is responsible for significant property damage in homes and industries, and has caused deaths and down time in industries. The situation in the other smaller towns is not as bad, but could easily deteriorate if construction is not well planned.

KCC has embarked on a drainage improvement program by clearing and widening the drainage channels.

In response to the rampant drainage of wetlands and encroachment on flood buffer zones, government put in place a National Wetlands Policy (1995) aimed at promoting the conservation of Uganda's wetlands in order to sustain their ecological, social and economic functions for the present and future generations. In addition, regulations for the protection of river banks and lake shores and for development of flood plains have also been issued. Government has also established a Wetlands Inspection Division under the Ministry of Water, Lands and Environment to enforce the above policy and regulations and to over see the sustainable management of wetlands in the country.

5.4.4 Impact of Poor Urban Sanitation

(1) Environmental Pollution

There are many potential sources of pollution in urban areas resulting from poor sanitation and poorly treated industrial effluent. According to a study conducted in 2001 (Mott MacDonald *et.al.*, 2001), of all the estimated total pollution loads being discharged into Lake Victoria, urban municipal loads account for 77%, fishing villages for 15% and industries for 8%.

Results from studies conducted by NEMA in the recent past attributed the rising levels of urban pollution to the following factors:

(a) *Poor Sewerage Infrastructure* - Leakages in old sewers and poorly constructed and managed septic tanks and sewage treatment works greatly contribute to environmental pollution, especially contamination of ground and surface water. **Figure 5.4** shows effluent characteristics from 17 sewage treatment plants for the major towns in Uganda. The figure shows that effluent from many sewage treatment plants does not meet the National Discharge Standards. The situation is even worse in smaller towns without or with non-functional treatment plants, where the sewage is disposed directly into the environment, without pre-treatment.

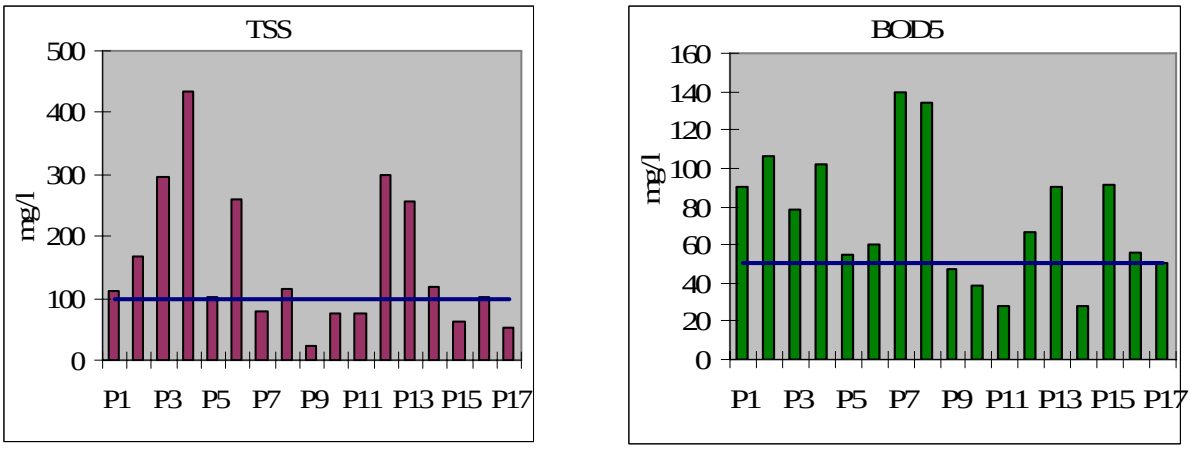

Figure 5.4: Effluent characteristics of 17 Sewage Treatment Plants *(Note: Horizontal lines show National Discharge Standards)*

(b) ***Poor on-site Sanitation*** – Poor on-site sanitation in urban areas has also greatly contributed to pollution of surface water and groundwater in high water table areas. Due to land shortage in the urban areas, some people are known to empty their filled-up latrines directly into nearby water bodies and drainage channels.

(c) ***Untreated Industrial Effluent*** – There are a number of reported cases of discharge of untreated industrial effluent into waterways or leakage/spillage of chemicals during storage and transportation. Most industries in Uganda do not have effluent treatment plants, and where they exist they are poorly designed and managed. Results from a study conducted in 2001 (Mott MacDonald *et.al.*, 2001) on the pollution to Lake Victoria indicated that industries around Lake Victoria discharge 1,045 kg/day of BOD, 96 kg/day of nitrogen and 105 kg/day of phosphorus into the lake. According to a survey carried under the same study, of the 25 industries sampled, only 1 had a treatment plant meeting required effluent standards; 15 had no treatment plants; 3 did preliminary treatment; 4 did primary treatment; and 3 had secondary treatment.

The survey also revealed that Uganda Breweries, located at Port Bell on Lake Victoria, alone accounts for 80% of the BOD load and 85% of the COD load, 93% of the SS load, 60% of the total nitrogen load and 82% of the phosphorus load discharged by industries, on the Ugandan side, into Lake Victoria. In order to address this problem, Uganda Breweries, with support from LVEMP, has constructed a wetland to treat the industrial effluent using papyrus (Cyperus papyrus). The constructed wetland treats 20m3 of effluent per day, and is also used as a demonstration site for other industrialists.

(2) Health Hazards

Cholera and other water-borne diseases are now a common occurrence in Kampala and other towns, especially during the rainy season. The most affected areas are the heavily populated slum dwellings on the outskirts of towns. The Ministry of Health has made major efforts to contain these diseases mainly through health education, promotion of latrine construction and improved medical services. Implementation of programs is coordinated with other stakeholders, particularly the Ministry of Education and Sports through schools.

Bacillary dysentery has been on the increase across the country in the recent past, registering a four-fold increase in the number of cases registered between 1999 (2,300) and January 2002 (8,300).

The number of patients suffering from persistent diarrhoea registered at Mulago hospital alone has shot up from 9% to 32% in the last three years. A study indicated that most of them come from Banda, Makerere Kivulu, Kamwokya and other slums of Kampala city (NEMA, 2003).

(3) Impact on Ecology and Biodiversity

Most towns in Uganda are situated near water bodies and wetlands, partly because of the need for provision of water to them. There is, therefore, the challenge of balancing urban development and protection of the environment. One of the biggest problems associated with urban development in Uganda is drainage of wetlands and deforestation, which have had a negative impact on Biodiversity conservation efforts. Urban streams carry increasing flow volumes having high contaminant loads, which affect the aquatic life and other properties along such streams and pose health risks to human beings and animals downstream. Toxic materials from some of the factories and industries have also contributed a lot to the destruction of the biodiversity in water bodies and wetlands neighboring urban areas. **Figure 5.5** (a) and (b) depict some typical ugly scenes in the environment surrounding urban areas in Uganda.

In some towns, wetland areas are also used for solid waste disposal, thus draining them and directly contaminating them. Wetlands are also affected by other human activities like brick-making, farming (vegetable and rice growing). This, coupled with the uncontrolled harvesting of wetland plants poses a very big threat to the sustainability of urban wetlands and biodiversity.

Despite the existence of stringent environmental laws, the environment continues being abused with impunity in urban areas. NEMA has apprehended a number of developers who disregarded the law and continued to destroy the environment. The Wetlands Monitoring Unit in the MWLE is working with other authorities to have key wetlands in urban areas gazetted as protected areas. This would enable the wetlands re-establish themselves to play their purifying properties and other ecological roles.

Figure 5.5: Drainage from (a) a residential area (with sewage fungus) and (b) an abattoir flowing into an urban stream.

5.5 Funding for the UWSS

Funding for the UWSS sub-sector has been increasing steadily over the past 10 years. The key development partners in the UWSS sub-sector include DANIDA, World Bank, EU, France (AFD), Germany (GTZ/KFW), AUSTRIA, Sida, UNICEF, DfID, the Netherlands, and Japan (JICA).

According to the assessment conducted during the UWSS Reform study, the investment needs for the UWSS for the next 10 years are estimated to total US$ 700 Million. With this level of investment, it is envisaged that the government would be in position to achieve 100% water and sanitation coverage in the urban areas by 2015. The biggest challenge is how to secure all the required funds.

5.5.1 Funding for Large Towns

The development budget for the large towns under NWSC is channeled as a government grant or loan to NWSC. Government also regularly gives additional funds to NWSC as conditional or equalization grants to implement and deliver social mission services, e.g. water

supply for the urban poor. However, in the medium to long-term, funds for investment planning and development for large towns would be channeled directly through the proposed Asset Handling Authority (AHA).

Commercialization and use of the private sector in the operation of some NWSC towns has been initiated. The experience so far shows that the private operators in some of these towns are breaking even and have started generating their own operational funds from the tariff. One of the proposals of the Urban water reform, is the establishment of a "Water Fund" where a portion of the funds generated from the water sales are banked and used for operation, expansion and construction of new WSS systems, even in the small towns as away of cross-subsidy.

NWSC receives some subsidies in form of investment funds mainly from the donors. The Government also provides start up investment funds and bridge up O&M funds for the towns recently taken on by NWSC, and for provision of services to the urban poor (DWD, 2002a). NWSC cross-subsidizes the operations in the different towns, with the more profitable towns supporting operations in the less profitable ones.

5.5.2 Funding for Small Towns

Following the adoption of the SWAP framework, Government has established a consolidated Small Towns Development Funding mechanism (Basket Funding), where both government and donor funds are pooled for the development of the small towns' WSS. Government is now in the process of phasing out the project based funding as more donors, who are currently funding specific projects, embrace the Basket Funding concept. It is envisaged that the Basket Fund will evolve into an independent National Water Development Fund (NWDF) for the UWSS sub-sector.

In the past, Government was providing conditional grants to the Local Governments for O&M of small towns' water systems. The grants were introduced to supplement the local revenues, which were not sufficient to cover O&M costs for the old WSS systems, which in most cases were poorly managed. However, with the rehabilitation of the systems and introduction of private operators to manage the systems, Government has abolished these conditional grants/subsidies.

Figure 5.6 shows the UWSS sub-sector investments for the period 2001–2005.The current sub-sector funding per capita is about US$ 12 for small towns and US$ 8 for large towns[3].

[3] 1 US$ = Ushs. 1800 as of June 2004

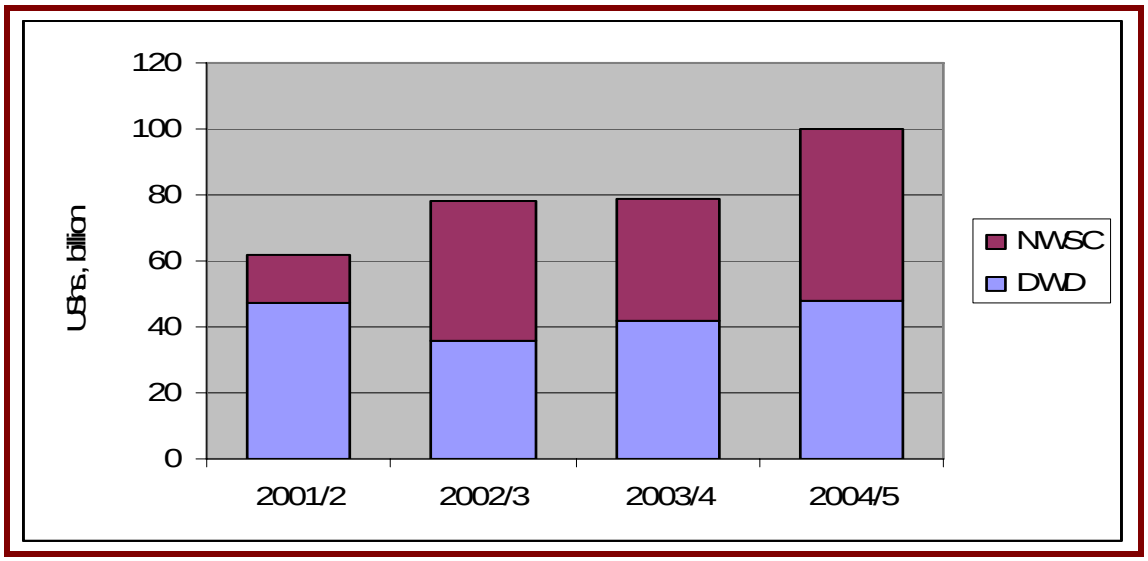

Figure 5.6: UWSS Sub-sector Funding *(Note: 1US$ = Ushs 1,800)*

Source: DWD

5.6 Management of UWSS Systems

5.6.1 National Water and Sewerage Corporation

Currently the NWSC manages piped water supplies (and some sewerage systems) in 15 large towns with a total population of 2.1 million people (57% of total urban population). NWSC has over the last 8 years adopted a number of strategies to ensure compliance with its targets, which has resulted in a significant improvement in its performance as reflected in the increase in service coverage from 50% in 1998 to 65 % in 2004.

In line with the ongoing reforms, NWSC is in the process of transforming the existing Area Management Contracts into Internally Delegated Area Management Contracts (IDAMCs). The first such contracts were signed in December 2003, and focus on the overall sector reform objective of separating operations from asset management (NWSC, 2003).

5.6.2 Water Authorities

Piped water supplies in towns that do not fall under the jurisdiction of NWSC were until 1995 managed directly by DWD. However since then DWD has handed over 56 such town water supplies to be managed by Local Authorities as part of the decentralization process stipulated in the Local Government Act, 1997. Actual operation of these water supply systems has been contracted out to Private Operators (PO) under the supervision of the Local Authorities. Already POs have been engaged for 44 towns, while the remaining ones are still operated by the town councils pending completion of the procurement process for POs.

Since 2000, DWD has established 48 Water Authorities and 48 Water Boards to manage small town water supplies. A total of 37[4] towns/rural growth centers appointed by Water

Authorities are under management by small local operators. There are positive results being experienced with Private Operators. The operations are relatively stable with water being made available on 24-hour basis. However, close monitoring of their performance, combined with support to the Local Councils and Water Authorities for management of the contracts and appropriate training are necessary to ensure that the concept can continue to be successful.

A Water Authorities Unit at DWD provides back-up support to the Local Authorities and POs. Management under the Local Authorities has resulted in some improvement in service delivery. However several schemes have still failed to break even, and maintenance of assets has in some cases deteriorated.

With the introduction of POs, it is envisaged that service delivery in these small town will improve significantly and that the POs will generate enough revenue to finance future extensions of the systems. Despite the improved performance, the POs and Water Authorities still require support, training and close performance monitoring to be able to accomplish their roles effectively.

5.6.3 Future Management Framework for the Large Towns WSS

Following completion of the UWSS sub-sector reform study, Government is in the process of implementing a number of changes in the UWSS management framework.

The 33 large towns are to be managed by a single Private Operator under a lease contract for a 5 – 10 year period. The lease will start off with the 15 NWSC towns and then expand to cover the remaining towns. The Government will finance all major investments through the Asset Holding Authority whilst the lease operator finances its working capital and bears the commercial risks thereof. The lease operator will bid for, and will be remunerated through, a share of the tariff, which is set by the Asset Holding Authority, with the approval of an Independent Regulator.

All assets are to remain in public ownership, but will be managed by an Asset Holding Authority (AHA), which will be responsible for planning and implementing investments related to water supply and sewerage infrastructure for the large towns group and will outsource most of the work to the private sector. It will also be responsible for sourcing funding and performance monitoring of the lease contract.

As part of implementation of the above reforms, NWSC is to be restructured into separate asset holding and operations units. Government will also establish an appropriate regulatory framework, which will guide the operation of the new management framework.

5.6.4 Public-Private Partnerships

The current government policy is to privatize the management of urban water supplies. Local authorities with support from DWD have in the last 4 years contracted private operators to manage 50 small towns spread across the country under management contracts. NWSC in February 2002 contracted management of water and sewerage services in Kampala (which accounts for 70% of the Corporation's activities) to ONDEO Services Ltd, a French multinational Company, for a 2-year period. The overall target is to privatize NWSC

operations and establish a strong regulatory framework. The contract expired in February 2004, and management of the Kampala Area has in the interim reverted back to the NWSC under the framework of Internally Delegated Management Contracts (IDAMCs). The IDAMCs are akin to internationally accepted management contracts. The target is to involve the private sector in the down stream activities of operations and managing service delivery.

The private operators have been well received by the public given the significant improvement and reliability of water supply services in the "privatized" water service areas. It should also be noted that despite all these improvements in service delivery, the water tariffs have remained affordable partly because of the government subsidies. Currently the tariffs are regulated by government and topped up with subsidies to enable the private operators to break-even. It remains to be seen if the current good "operator-public" relationship will continue after the government stops all subsidies and the operators are forced to make significant increases in the tariffs. Given the small size of towns and urban centers in most parts of the country, the water supply business is still not very profitable to attract many potential private operators unless several small towns are "bundled" into a single management contract. But as these towns continue to grow, the situation is likely to change and in the long-term we could see bigger private operators joining the sector.

5.7 Challenges and Opportunities

5.7.1 Challenges

The major challenges affecting the performance of the UWSS sub-sector include:

a) Inadequate financial resources: The investment requirement for urban water supply and sanitation, to meet the 2015 target, is about US$ 481 million. The challenge is how to secure all the required financial resources to meet the investment needs.
b) Poor management of the small town water supply systems under Local Governments. This has resulted in low revenue collections and heavy dependence on government subsidies.
c) Weak pricing (tariff) policy – The current tariffs are so low that they can only meet the operation and maintenance costs of the water supply systems resulting on dependence on grants, loans and subsidies for investments and system expansion.
d) Water supply to the urban poor – Currently, most urban water supply systems are limited to the well-planned and developed urban settlements. This has tended to leave out the slum areas, inhabited by the poorer communities, devoid of piped water supplies and sewerage services, resulting in high incidences of water-borne diseases in these areas. The government is addressing this issue by adopting an integrated approach towards urban water supply, which will include provision of subsidies to the sub-sector to extend water supply and sanitation services to the poorer communities in slum areas surrounding the urban centers.
e) Low sanitation coverage – The urban sanitation coverage is still very low, with most people relying on on-site sanitation (pit latrines), which has resulted in widespread contamination of surface and groundwater in urban areas. Government is trying to address this issue through the development and implementation of comprehensive sanitation master plans for all the urban areas in the country.

5.7.2 Opportunities

In order to cope with the above challenges, government has taken steps to revamp the urban water sub-sector through comprehensive policy, legal and institutional reforms aimed at increasing the performance of the sub-sector in terms of outputs but also the efficiency in service delivery.

The opportunities available to ensure this transformation of the sub-sector include:

a) ***SWAP Framework*** – Since the adoption of the SWAP framework, government and most development partners have agreed to finance the water sector through general budget support, which gives government a high degree of flexibility in allocating both local and donor financial resources according to the national priorities and development objectives.
b) ***Private Sector Participation*** – Private sector participation in the development and management of urban water and sanitation services has brought in excellent technical, financial and managerial expertise that has greatly improved on the performance of the sub-sector and made it more economically viable. The introduction of private operators in the management of small town water supplies has not only attracted the necessary technical expertise, which was lacking, but has also significantly reduced the government burden in subsidizing these towns.
c) ***UWSS Sub-sector Reform Study*** – Following a detailed analysis of the sub-sector performance, the UWSS sub-sector reform study has recommended a number of wide ranging actions that once implemented will increase the efficiency, effectiveness, and performance of the sub-sector.
d) ***Increased Political Will*** – The water sector in general is enjoying strong commitment from government and development partners through increased and continued financial support for water supply and sanitation activities.

5.8 Legal and Institutional Framework

The UWSS sub-sector is governed by the legal and institutional framework for the entire water sector as described in Chapter 3, sections 3.3 and 3.4.

5.9 Urban Water Supply Projects

Table 5.4 shows the recently completed and ongoing UWSS projects.

Table 5.4 –Urban Water Supply and Sanitation Projects

PROJECT	*DONOR*	*NO. OF TOWNS*[5]			*FUNDING (US$, Mill)*	*REMARKS*
		LT	*ST*	*SR*		
Small Towns Water and Sanitation Project	African Development Bank	3	4	0	26	All at design and documentation stage.
Support to Small Towns Water and Sanitation Project	Joint Partnership Fund	1	16	4	10.5	4 towns completed, 10 ongoing and 7 at feasibility stage.
Mid Western Towns Water and Sanitation Project	European Union	0	7	3	19	Construction ongoing in one town and 2 tendered.
Mid Southern Towns Water and Sanitation Project	French Development Agency	0	10	0	12	9 towns completed. Funds for 1 town yet to be secured.
South Western Towns Water and Sanitation Project	Austrian Development Cooperation	0	53	1		25 towns completed. 29 to be completed by 2007.
North Eastern Towns Water and Sanitation	BADEA		10	1		
Small Towns Water and Sanitation Project	IDA		11		18	Completed, 2002
Eastern Centres Water and Sanitation Project	DANIDA		11		15	Completed, 2002
South Western Towns Water and Sanitation Project	Austria		19		11	Completed, 2002
NURP – Water and Sanitation Component	IDA			6	6	Completed, 2000
Small Towns Water and Sanitation Project				5	0.7	Completed, 2002

(Note: LT=Large Towns, ST=Small Towns; SR=Scheme Rehabilitation/Expansion)

[5] This shows large towns, small towns and scheme rehabilitation/expansion.

5.10 Performance Monitoring, Evaluation and Reporting

The UWSS sub-sector has adopted the same Monitoring and Reporting framework established for the water sector as described in Chapter 3, section 3.7.

5.10.1 Performance Indicators

In assessing the performance of the UWSS sub-sector, specific indicators, both quantitative and qualitative, are used to measure progress made towards achievement of the set targets.

The specific performance indicators for the UWSS sub-sector are given in the **Box 5.2**.

	BOX 5.2: Key UWSS Monitoring Indicators
	Golden Indicators
1	***Percentage of the urban population within 0.2 km of an improved water source.***
2	***Percentage of improved water sources that are functional at time of spot check.***
3	***Percentage of unaccounted for water.***
4	***Staff productivity (staff per 1,000 connections).***
5	***Collection/billing ratio.***
6	***Number of water and sewage connections.***
7	***Percentage of the urban population with on site sanitation facilities (septic tanks, Ecosan, pit latrines, etc).***
8	***Percentage of effective response to customer complaints within 24 hours.***
9	***Average % of household expenditure paid for water and sanitation services***

Source: MWLE (2004)

Table 5.5 shows the performance of the UWSS as rated by each monitoring indicator.

GOAL: "To achieve sustainable safe water supply and sanitation facilities, based on management responsibility and ownership by the users, within easy reach of 100% of the urban population with effective use and functionality of the facilities."					
INDICATOR	1990	2000	2005	2010	2015
Percentage of the urban population within 0.2 km of an improved water source.					
Percentage of improved water sources that are functional at time of spot check.					
Percentage of unaccounted for water.					
Staff productivity (staff per 1,000 connections).					
Collection/billing ratio.					
Number of water and sewage connections.					
Percentage of the urban population with on site sanitation facilities (septic tanks, Ecosan, pit latrines, etc).					
Percentage of effective response to customer complaints within 24 hours.					
Average % of household expenditure paid for water and sanitation services					

Table 5.5 – Performance of the UWSS Sub-sector

The indicator-based performance monitoring is still a new concept in the water sector and has not yet taken root, thus the empty table above. However, following recognition of the importance and effectiveness of the indicator-based performance monitoring, this methodology has now been fully adopted by the water sector and will form the basis of all future monitoring activities. The indicator-based monitoring will be conducted through annual service delivery surveys and periodic participatory assessments.

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CHAPTER SIX

WATER AND THE ENVIRONMENT

6.1 Introduction

Water of adequate quantity and quality is a key requisite in maintaining a healthy environment. Despite Uganda's being well endowed with significant freshwater resources, the challenges of rapid population growth, increased urbanization and industrialization, uncontrolled environmental degradation and pollution are leading to accelerated depletion and degradation of the available water resources.

Besides the traditional consumptive uses of water, water is also an important habitat for fisheries, wildlife and other aquatic biodiversity whose value is enormous.

Ugandan waters are home to a very rich biodiversity that constitute part of Uganda's natural resources. However, over the past years, there has been an observed decline in aquatic biodiversity in most of Uganda's water bodies. This has been mainly attributed to destructive fishing habits, increasing eutrophication as a result of pollution; degradation of riparian watersheds and deforestation, and more frequent algal blooms, decreasing oxygen concentrations, and spread of the water hyacinth (*Eichhornia crassipes)*.

The following strategies have been adopted by Government (NEMA, 2001b) to address the threats and constraints affecting aquatic biodiversity conservation in Uganda:

(i) Gazetting open water protected areas;
(ii) Periodic review of the fisheries policy;
(iii) Strengthening of the management framework for open water resources;
(iv) Establishment of a strong regulatory framework for management and exploitation of aquatic resources;
(v) Strengthening research on aquatic biodiversity use and conservation;
(vi) Development of appropriate mitigation measures against habitat degradation;
(vii) Sensitization of the public on policies and legislation related to open water biodiversity;
(viii) Promotion of formal education on aquatic biodiversity in educational institutions.

6.2 Policy and Legal Framework for Environmental Management

6.2.1 The National Environment Management Policy

The National Environment Management Policy (NEMP) was developed in 1994 as a follow up to the recommendations of the National Environment Management Action Plan, 1994. The NEMP sets out the overall policy goals, objectives and principles for environmental management in Uganda. The overall policy goal is:

"Sustainable social and economic development, which maintains or enhances environmental quality and resource productivity on a long-term basis that meets

the needs of the present generation without compromising the ability of future generations to meet their own needs."

The NEMP recommended, among other actions, revision and modernization of sectoral policies, laws and regulations and establishment of an effective monitoring and evaluation system to assess the impact of policies and actions on the environment, the population and economy.

The Policy also allowed for the formulation of sectoral or lower level policies concerning environment and natural resources management. Some of the policies that have been formulated in conformity with the NEMP include: the National Water Policy (1999), the National Wetlands Management Policy (1996), the Wildlife Policy (1996), the Fisheries Policy (2000), the Forestry Policy (2001), the draft National Soils Policy, and several District Environment Management Policies.

KEY POLICY OBJECTIVES

Specifically, the policy seeks to meet the following objectives:

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

6.2.2 The National Environmental Act, Cap.153

The National Environmental Act, 1995, is the principal law governing environment management and conservation in Uganda. The objective of the Act is to promote sustainable development by:

(i) Integrating environmental requirements into all planning and production processes; and
(ii) Ensuring that renewable resources are optimally used through reduced waste, use of appropriate technology and finding of alternatives to present use of resources.

The Act also establishes the National Environment Management Authority (NEMA) as the overall body, charged with the overall responsibility of the management of environmental issues in Uganda. NEMA, in consultation with the lead agencies, is empowered under the Act, to issue guidelines and prescribe measures and standards for the management and conservation of natural resources and the environment in general.

KEY MANAGEMENT PRINCIPLES

The Act provides for the following principles of environmental management:

(i) To use and conserve the environment and natural resources of Uganda for the benefit of both present and future generations, taking into account the rate of population growth and the productivity of the available resources;
(ii) To respect the principle of optimum sustainable yield in the use of natural resources;
(iii) To reclaim degraded ecosystems where possible and reverse their further degradation;
(iv) To establish adequate environmental protection standards and to monitor changes in environmental quality;
(v) To publish relevant data on environmental quality and resource use;
(vi) To ensure that polluters pay and bear the cost for the pollution caused by their activities;
(vii) To ensure that environmental awareness is treated as an integral part of educational all levels; and
(viii) To promote international co-operation between Uganda and other states in the field of environmental management.

KEY MANAGEMENT MEASURES

The Act empowers the Authority in collaboration with Lead agencies to issue guidelines and management measures relating to the following, among others: (i) management of lakes and rivers; (ii) management of lakeshores and riverbanks; (iii) management of wetlands; (iv) management of hilltops, hill-sides and mountainous areas; (v) conservation of biological resources; (vi) management of forests; (vii) waste management; (viii) management of toxic and hazardous chemicals; (ix) land use planning; and (x) protection of natural heritage sites.

All these measures have direct implications to water resources management in terms of protection of water quality, hydrology, catchment protection, and biodiversity conservation.

6.2.3 Key Environmental related Regulations

In order to operationalize the provisions of the National Environmental Act, a number of specific regulations and standards have been developed together with the accompanying guidelines for managing the environment. Those directly applicable to water resources management include:

(i) Waste Discharge Regulations, 1999;
(ii) Regulations on Environment Impact Assessment 1998,
(iii) Regulations on Waste Management 1999,
(iv) Regulations on the management of river banks, lake shores and wetlands 2000,
(v) Regulations on the management of hilly and mountainous areas 2000,
(vi) National Environment Instrument (delegation of waste discharge functions) 1999,
(vii) Standards for discharge of effluent onto land and water 1999,
(viii) National Environment Notice (designation of Environment Inspectors 2000),
(ix) Minimum standards for the management of soil quality 2001.

6.2.4 International Conventions and Treaties

Uganda has international environmental obligations imposed by operation of customary international environmental law, treaties and general principles of law accepted by all nations. International standards have been used as key reference benchmarks in setting national environmental standards.

Uganda's legal framework for environmental management takes into account the challenges associated with trans-boundary resources such as shared lakes and rivers, aquatic biodiversity and the issues of migratory species of wild animals. Uganda is also a signatory to a number of treaties that protect her sovereign territory from the illegal dumping of wastes or toxic substances as well as the illegal trade in genetic material, wild life and trophies.

6.3 Institutional Framework for Environmental Management

The National Environmental Act provides for an elaborate institutional framework for effective management of the environment in Uganda as follows:

6.3.1 The Policy Committee on the Environment

This is the highest policy-making organ on Environmental issues in Uganda. The Policy Committee is composed of eleven ministers of Government. The main functions of the Committee are:

(i) Formulation of environmental policies and programs and ensure that they are implemented.
(ii) Liaison with Cabinet on all issues affecting the environment.

6.3.2 Board of Directors

The Board of Directors consists of eight members appointed by the Minister with the approval of the Policy Committee on the Environment. The Board:

(i) Oversees implementation of the environmental policy;
(ii) Oversees the operations of NEMA and approves the annual budget and plans of NEMA; and
(iii) Establishes and approves rules and procedures relating to the staff management and administration of NEMA.

6.3.3 National Environment Management Authority (NEMA)

NEMA is the principal Government agency responsible for the overall management of the environment in Uganda. NEMA is a semi-autonomous agency that co-ordinates, monitors and supervises all activities concerning the environment in Uganda. The functions of NEMA include:

(i) Co-ordinate the implementation of the Environment Policy and the decisions of the Policy Committee;

(ii) Ensure the integration of environmental concerns in overall national planning through coordination with relevant ministries, departments and agencies of Government;
(iii) Propose the development and review of environmental policies and strategies to the Policy Committee;
(iv) Initiate legislative proposals, standards and guidelines on the environment;
(v) Review and approve Environmental Impact Assessments and Statements;
(vi) Promote public awareness through formal, non formal and informal education about environmental issues;
(vii) Ensure observance of proper safeguards in the planning and execution of all development projects, including those already in existence, that have or are likely to have a significant impact on the environment;
(viii) Undertake research, and gather and disseminate information about the environment;
(ix) Mobilize, expedite and monitor resources for environmental management; and
(x) Gather, analyze and manage environmental information.

6.3.4 Lead Agencies

Implementation of the different environmental issues is done through the relevant government institutions (Lead Agencies) within whose mandate the respective issues lie. The role of NEMA is to coordinate the input by all the different Lead Agencies and ensure compliance with the National Environmental Policy and Law.

NEMA has a direct implementing role only in specific areas e.g., in activities related to the protection of the ozone layer.

In the exercise by NEMA of its coordinating, monitoring and supervisory function, a lead agency shall not be released from performing its duties as prescribed by law.

6.3.5 Technical Committees

The National Environment Act provides for the establishment of different Technical Committees to support NEMA in the coordination of specific technical environmental management issues. Technical Committees are appointed by the Board of Directors on the advice of the Executive Director.

Currently, there are four Technical Committees i.e.
(i) Technical Committee on Soil Conservation;
(ii) Technical Committee on the Licensing of Pollution;
(iii) Technical Committee on Biodiversity Conservation; and
(iv) Technical Committee on Environmental Impact Assessment.

6.3.6 District Environment Committees

NEMA, in consultation with the District Council is required to provide guidelines for the establishment of a District Environment Committee in each district. The functions of the District Environment Committees include:
(i) Act as a forum for community members to discuss and recommend environmental policies and bye laws to the District Council;

(ii) Advise the District Technical Planning Committee, the District Council and NEMA on environmental management issues in the district.
(iii) Mobilize members of the public to initiate and participate in environmental activities;
(iv) Develop, in consultation with the District Technical Planning Committee, District Environment Action Plans;
(v) Receive draft District Development Plans from the District Technical Planning Committee for review and endorsement;
(vi) Co-ordinate the activities of the District Council relating to the management of the environment and natural resources;
(vii) Ensure that environmental concerns are integrated into all district plans and projects; and
(viii) Coordinate with NEMA on all issues relating to environment management.

6.3.7 Local Environment Committees

Local Environment Committees are appointed by the Local Government System on the advice of the District Environment Committee. The functions of Local Environment Committees include:
(i) Prepare Local Environment Work Plans;
(ii) Mobilize people, through self-help projects to conserve the environment, restore the degraded environment and improve the natural environment, and
(iii) Monitor and report on any event or activity, which has or is likely to have a significant impact on the environment.

6.4 National Wetland Resources

According to the Ramsar Convention, wetlands are areas of marsh, fen, peatland 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 that do not exceed 6 m at low tide. **Figure 6.1** shows a typical papyrus wetland, one of the commonest types of wetlands in Uganda.

Figure 6.1 - Typical Papyrus Wetland

6.4.1 Size and Distribution

Uganda's wetlands cover about, 29,000 sq. km., or 13% of the total area of the country. They comprise swamp (8,832 sq. km), swamp forest (365 sq. km) and sites with impeded drainage 20,392 sq. km (NEMA, 1999). They include areas of seasonally flooded grassland, swamp forest, permanently flooded papyrus, grass swamp and upland bog. As a result of the vast surface area and the narrow river-like shape of many of the wetlands, there is a very extensive wetland edge (MWLE, 2001a).

There are basically two broad distributions of wetland ecosystems in Uganda: (a) the natural lakes and lacustrine swamps which include Lake Victoria region, Kyoga swamp complex, L. George area, L. Kyoga area, L. Edward wetlands, L. Albert area, Bunyonyi swamp, Kijanebarola swamp, Bisinia and Opeta lakes area, L. Wamala area and wetlands associated with minor lakes; (b) the riverine and flood plain wetlands which are associated with the major river systems in Uganda. Examples are: R. Nile, R. Kafu and R. Aswa. Except for Sango Bay, the bulk of Uganda's wetlands lie outside protected areas. The different types of wetlands are presented in **Table A.5** in **Annex A. Figure 6.2** shows the spatial distribution of wetlands in Uganda.

6.4.2 Wetland Values and Benefits

Uganda's wetlands support a rich diversity of plants and animals. Wetlands also have intrinsic attributes, perform functions and services and produce goods of local, regional, national or international importance. Together, they represent considerable ecological, social and economic values. **Table 6.1** shows wetlands the common wetland values and benefits – derived from attributes, functions, goods and services – classified into four categories.

Table 6.1 – Wetland Values and Benefits

Direct Values	*Indirect Values*	*Option Values*	*Non-use values*
Production and consumption goods and services such as: ✓ Fish ✓ Fuel wood ✓ Building poles ✓ Sand, gravel and clay ✓ Thatch ✓ Water ✓ Wild foods ✓ Medicines ✓ Agriculture/ cultivation ✓ Pasture/grazing ✓ Transport ✓ Recreation	Ecosystems functions and services such as: ✓ Water quality ✓ Water flow ✓ Water storage ✓ Water purification ✓ Water recharge ✓ Flood control ✓ Storm protection ✓ Nutrient retention ✓ Micro-climate regulation ✓ Shore stabilization	Premium placed on possible future uses and applications: ✓ Pharmaceutical ✓ Agricultural ✓ Industrial ✓ Leisure ✓ Water use	In terms of: ✓ Cultural values ✓ Aesthetic values ✓ Heritage values ✓ Bequest value ✓ Existence value

Source: Economic Tools for Valuing Wetlands, IUCN, 1999

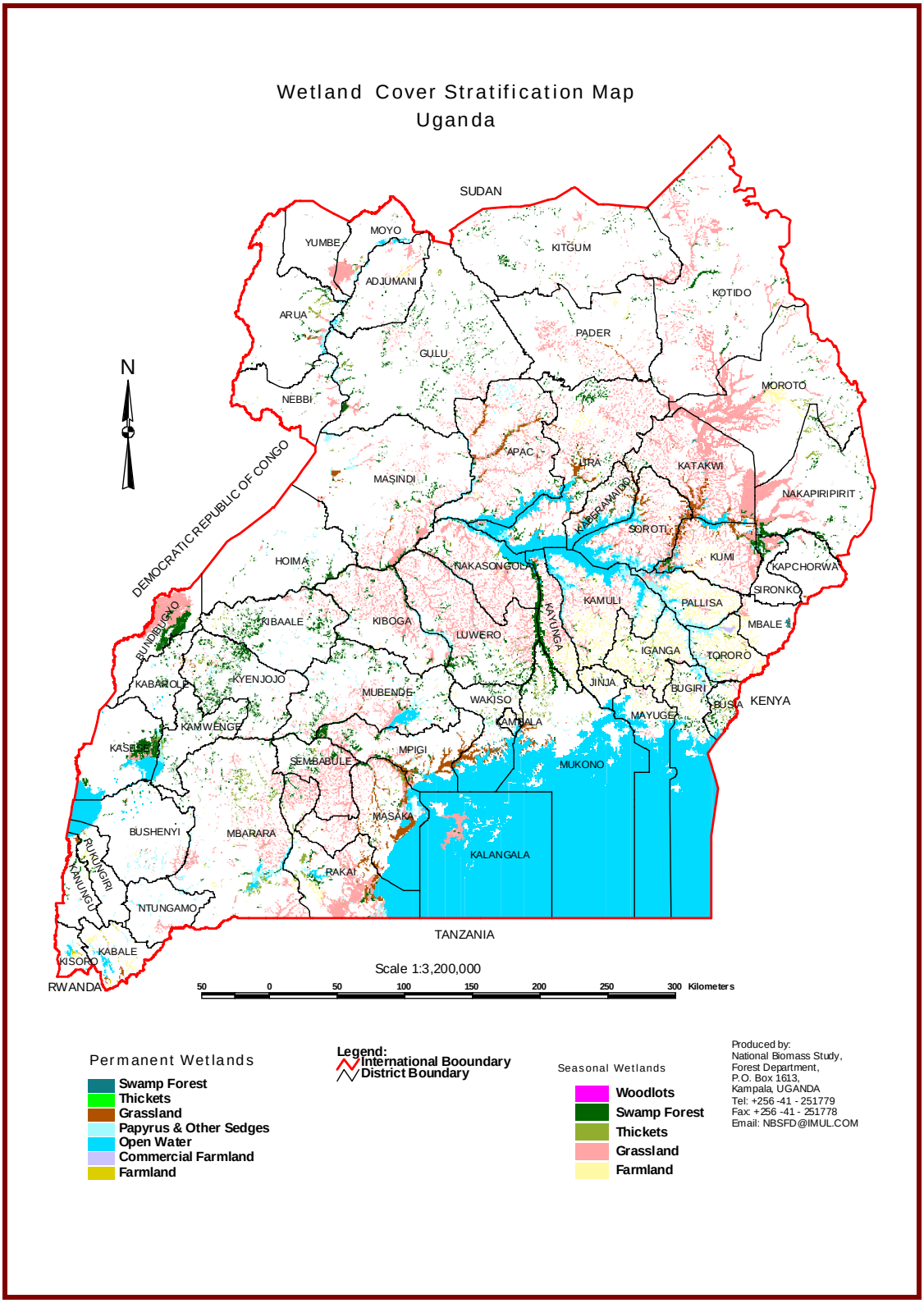

Figure 6.2 – Spatial distribution of wetlands in Uganda. **(***Source: Forestry Dep't, 2002)*

Wetlands are vital natural resources just as forests and agriculture are. In the rural areas millions of households are engaged in wetland farming, papyrus harvesting, pottery, brick-making and sand mining. About five million people, many of them cattle keepers, depend directly on wetlands for their livestock water needs. In urban areas wetlands purify industrial, commercial and domestic effluents such as sewerage and the dirt washed down with rainstorms through urban centre drainage systems.

The total value of wetlands in economic terms and their contribution to the national economy may be difficult to calculate – but it is definitely high. Wetlands provide social and economic values, through their interaction with human society. The monetary value of wetlands is difficult to determine because some of the values are free public goods such as environmental services. Others are indirect values. For example: Nakivubo Wetland in Kampala alone is estimated to contribute US$1.7 million to the economy annually as a tertiary wastewater treatment plant. About US$100,000 is estimated to accrue from wetland resources through crop cultivation, papyrus harvesting, brick making and fish farming. Rural households in Pallisa are estimated to derive about US$200/hectare/year from papyrus harvesting (MWLE, 2001a).

6.5 Wetland Management

6.5.1 Wetland Ownership and Management

Wetlands being a political and public priority, considerable progress has been made towards developing and applying the tools needed for sustainable wetland management. Opportunities to conserve wetlands exist through the following measures:

- ✓ Prioritisation of environment in Uganda's political agenda (one of the top 15 priority areas in President Museveni's Manifesto);
- ✓ Enabling policy, legal and institutional frameworks for wetlands management in Uganda;
- ✓ Increased awareness about the values and importance of wetlands.

To achieve sound wetland management in Uganda, close collaboration is needed at all levels: national, district and local. At the national level, the lead agency is the Wetlands Inspectorate Division of the Ministry of Water, Lands and Environment. The lead agency is charged with the responsibility of discharging the functions allotted to central line ministries by the Constitution and the Local Governments Act, namely: formulation of policy, setting of standards and guidelines, supervision and monitoring, technical support, and resource mobilisation.

Uganda is one of the most advanced countries in Africa and the world in terms of wetland management. This is so because wetlands represent one of the country's most vital resources. It has within its borders over 8% of Africa's wetland resources. Wetlands are "held in trust" by the Government and Local Governments for the good of all citizens of Uganda in accordance with the Constitution 1995.

The National Policy for the Conservation and Management of Wetlands Resources (1995) provides for an Environmental Impact Assessment before any modification or restoration on wetlands is carried out. The result of such an environmental assessment is to determine whether such restoration or modification should proceed and if so to what extent. Research into wetland values and functions to determine their capacity to perform their

various functions is being carried out. Uganda has zoned some of its wetlands for industrial development and some have been proposed to be gazetted as "Nature Reserves" for conservation purposes.

6.5.2 Wetlands Management Policy and Legal Framework

There are several relevant policies and laws that provide for the management and conservation of wetlands in Uganda. These include: the Constitution (1995), National Environment Statute (1995), Wetlands Policy (1995), Water Statute (1995), the Land Act (1998), the National Environment Regulations (2000). A specific Wetlands Management Law is under preparation.

Uganda is also a signatory to the several international conventions and agreements relevant to wetlands conservation. These include: Convention on Biodiversity, CITES, World Heritage Convention, Bonn Convention, Agreement on the Conservation of African-Eurasian Migratory Water Birds. Uganda has ratified all the above conventions and agreements.

Wetlands resources have trans-boundary significance, serving as habitats for migratory waterfowl and other fauna. Government participates in the Convention on Wetlands of International Importance especially as Waterfowl Habitats (Ramsar 1971). Uganda ratified the Ramsar Convention in 1988 and designated L. George (15,000 hectares) as a Ramsar Site because it supports a wide variety of biological resources and is located within the Queen Elizabeth National Park, which is a Man and Biosphere Reserve of UNESCO. Four more wetlands have been proposed as Ramsar Sites and these are: Lakes Bisina, Lutembe, Mabemba and Opeta.

THE NATIONAL WETLANDS POLICY (1995)

The National Wetlands Policy (1995) aims at promoting the conservation of Uganda's wetlands in order to sustain their ecological, social and economic functions for the present and future generations. The major principles enshrined in the Policy include:

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

WETLANDS REGULATIONS

Wetlands regulations were drafted by NEMA and came into force in January 2000. A number of other resource use guidelines have been prepared by NWP, (Guidelines for Smallholder Paddy Rice Cultivation, General Guidelines for Wetlands Management, Fish Farming in Seasonal Wetlands, Sand and Clay Mining in Wetlands, and Rehabilitation of Sand and Clay Mining Areas).

The Wetlands Regulations for the management of river-banks and lake shores are in place. These regulations stipulate that the Government or local governments shall hold in trust for the people and protect riverbanks and lakeshores for the common good of the citizens of Uganda and shall not lease out or otherwise alienate any bank and lakeshore. It further states that environmental impact assessment is mandatory for all major activities on riverbanks and lakeshores, and special measures are essential for protection of such areas against soil erosion, siltation and water pollution.

6.5.3 Wetlands Management Institutional Framework

The overall responsibility for wetlands management in Uganda is vested in the Wetlands Inspection Division (WID) under the Ministry of Water, Lands and Environment. WID basically carries out a supportive role to the different players like Forestry, Fisheries and Water resources sectors.

WID is implementing the Uganda National Wetlands Conservation and Management Programme (NWCMP) whose aim is to assist the government in developing the policy and guidelines for conserving and managing sustainably the nation's wetlands and to acquire the technical capacity to do so. NWCMP works in collaboration with many other agencies or institutions, namely: NEMA, Department of Fisheries, Forest Department, Department of Agriculture, Department of Animal Industry, Fisheries Research Institute, Makerere University Institute of Environment and Natural Resources, National Water and Sewerage Corporation, Uganda Electricity Board, and the Uganda Wildlife Authority.

A partnership of such complexity with diverse partners operating in a coalition requires coordination. A National Wetlands Inter-Agency Coordination Committee was established to carry out this function at the national level. The District Environment Committees and Local Environment Committees play a similar role at their respective levels. Co-ordination across the levels requires effective links between these bodies.

WID has further adopted a sustainable management strategy that allows for a variety of management options. WID has adopted strategies with respect to the use of wetlands to eradicate poverty and these include: education and dissemination of information to increase peoples' knowledge for increased wetlands use (e.g. distribution of posters, calendars, wetlands policies, newsletters and other publications, radio messages, television programmes, exhibitions); restoration of hydrological and ecological functions in vital wetlands to improve availability, productivity, value and diversity of wetland products for use by local communities; development and implementation of management plans for key wetland areas to enable resource users to optimise and fairly distribute wetlands benefits; institutional capacity building at the districts and local levels for improved decentralisation of wetland management. Funding to the WID is still well below targets and the Division could do more if availed additional financial support.

6.5.4 Wetlands Sector Strategic Plan 2001-2010

In 2001, the Government of Uganda brought all wetland activities under one planning framework, i.e. the Wetland Sector Strategic Plan (WSSP). This was done in recognition that wetlands are playing a key role in achieving Uganda's overall policy goal of poverty eradication. The WSSP operates as an integral planning and financing tool, according to the sector wide approach for development planning, and the basket-funding concept.

The WSSP aims to provide a clear sense of purpose and direction and a supporting action framework for all those who will be involved in wetland management and conservation for the next ten years. The Plan identifies the appropriate players in the implementation of the plan. The document is expected to attract sufficient internal and external funds for the continuation of wetland management activities in Uganda.

Underlying the WSSP is Uganda's vision for its wetlands. The vision emphasises that wetland management should serve the interests of the environment and people of Uganda. It denies any approach to environment management that promotes environmental protection for the sake of the environment alone. It recognises that wetland management, which includes protection, is done for the benefit of all Ugandans and it emphasises that sound wetland management runs parallel to poverty eradication and achievement of economic prosperity.

6.5.5 Wetlands Monitoring

NEMA has the overall responsibility for coordinating, monitoring and supervising environmental management matters in Uganda. This extends to providing technical support and supervision to kick-start the management of wetlands (NEMA 1999).

NWP has developed Guidelines for Compliance Monitoring of Wetlands (MWLE, 2002). These guidelines deal with how to monitor the adherence to laws related to wetlands and accompanying regulations and the implications and penalties involved. The main target audience is the district officials who are charged with the responsibility to uphold the wetland laws and regulations. Capacity building of districts is one of the priority activities within the District Wetlands Action Plan (DWAP). Capacity building efforts began with the training of trainers (District Environment Officers) and provision of training tools and publicity materials.

To ensure that Guidelines for Compliance Monitoring of Wetlands are implemented, and that abuses of wetlands are effectively curbed in order to contribute to the overall goal of sustainable management of Uganda's wetland resources, the Government has embarked on a comprehensive sensitisation and awareness creation campaign on the sustainable use and management of wetlands.

The monitoring of wetlands is routinely carried out by WID. This is done during field trips, community meetings, or by receiving and recording information from local leaders on the status of their wetlands. The data generated by general monitoring is used to develop wetland action plans, and as an input in the District State of Environment Reports, whose annual preparation is a legal requirement.

Wetland monitoring activities can serve a particular purpose such as ecological monitoring, which is normally an extended program of regular inspections to ascertain whether

prevailing ecological conditions match the previously defined norm or lie within certain limits. Ecological monitoring is carried out in wetlands where detailed management plans have been developed. In the process of developing a national ecological monitoring programme, the WID will determine the overall status and ecological trends of wetlands in Uganda (MWLE, 2002).

6.5.6 Wetlands Biodiversity

Uganda's wetlands are known to support some 43 species of dragon flies (of which 8 species are known to occur in Uganda only), 8 species of molluscs; 52 species of fish (which represents 18% of fish species in Uganda); 48 species of amphibians; 243 species of birds, 14 species of mammals; 19 species of reptiles; and 271 species of macrophytes. All these species are of conservation importance, including those endemic to Uganda. The country's wetlands remain highly susceptible to loss. Nationally, about 7% have been converted to other land uses. Wetland species are highly specialised, and if their habitat are disturbed the impact is great, leading to decline and even extinction of some species. Ten sites have been identified as hot spots for biodiversity requiring immediate and special attention. They include Muchoya, L. Nabugabo, Lutembe Bay, Lake Bisina, Albert Nile. Doho Rice Scheme, Kyojja Swamp, Masulu, R. Ssezibwa system and L. Mutanda (MWLE, 2001).

6.6 Environmental Management Issues and Challenges

6.6.1 Pollution

Growing population pressure around most water bodies has led to an increase in pollution. Most water pollution in Lake Victoria for example is domestic in origin, but the recent increased economic growth which has resulted into increased industrialization and setting up of a number of industries including sugar, textiles, oil, and distilleries located mainly in the towns of Kampala and Jinja that are located close to Lake Victoria and the River Nile has led to increased industrial pollution sources. Most of these industries have no waste water pre- treatment facilities thus they discharge directly into the water bodies.

In order to address the issue of pollution, the following actions are being undertaken by NEMA:

(i) Increasing capacity for pollution monitoring through gazetting and training of Environmental Inspectors. A total of 164 Environmental Inspectors have been gazetted by NEMA. NEMA has also set up a small analytical laboratory where samples for waste water discharges are analysed. In addition, NEMA has also acquired two mobile laboratories which are used for on-site analysis and monitoring of pollution levels in various parts of the country

(ii) Issuance of Waste Discharge Permits, where those who generate hazardous wastes are required to obtain a permit for storage, transportation and disposal of any such wastes. This process requires the permit applicants to produce evidence of their capacity to safety handle and dispose such wastes without causing harm to ecosystems such as water bodies. As part of the Permit enforcement system, Standards for discharge of effluent into water bodies and land were gazetted in

1999. The standards prescribe minimum levels of particular elements and compounds for treated effluent before discharge into water or land.

(iii) Enforcement of the "Polluter Pays" principle for those industries discharging beyond set limits. The funds raised will be used to abate the effects of pollution. A pollution Licensing Committee provided for under the National Environment Act has been established and is to operationalise the requirements for the Polluter Pays Principle provided for in the law for control of pollution.

(iv) Establishment of a National Cleaner Production Centre in 2003, where research into cleaner production methods is being undertaken with the aim of reducing pollutant emissions by industries. Cleaner production technologies have already been adopted by several industries including: Fish processing plants, sugar industries, and Breweries, which discharge effluent directly into Lake Victoria. These technologies involve recycling resources including waste water, process control, conserving resources, efficient management of production inputs, re-use of secondary materials and minimisation of pollution sources and wastes

(v) Regular inspections to monitor compliance with environmental standards are being undertaken, involving carrying out an inventory of all existing industries, and collecting data on the quality and quantity of effluent discharged and points of discharge and receiving waters.

(vi) Environmental audits for compliance so far carried out have led to signing of compliance agreements to be implemented by operators of facilities with measures that include those for control of pollution of water bodies. In addition, industries are required to carry out self-monitoring and submit quarterly reports of monitored parameters to NEMA.

(vii) Monitoring stations have been set up around major water bodies for monitoring pollution due to industrial effluents and wastes.

(viii) Before any development that is likely to have an adverse effect on the environment is implemented, Environmental Impact Assessment (EIA) must be carried out. To-date, over one thousand projects have been subjected to EIA

The above pollution monitoring and control efforts by NEMA are in addition to the activities of DWD which is the lead agency on maters of management of water resources, including control of pollution into water bodies.

6.6.2 Wetlands Degradation

Many wetlands have been degraded or modified hence interfering with the vital ecological functions they perform. Wetlands perform vital ecological functions such as regulation of water flows and discharge into rivers and lakes. Wetlands are being converted or modified at a very fast rate for developmental purposes and this is considered as a rightful and development-oriented activity, even by policy makes at all levels of government. **Figure 6.3** below shows a typical cultivated wetland.

In many parts of the country, almost all the seasonal wetland valley bottoms have been converted into rice cultivation and in other parts large areas of wetlands have been

converted to pasture for grazing. Nevertheless, the damage to permanent wetlands in rural areas is probably still relatively limited.

Drainage or reclamation of wetlands has caused a disruption in the water supply, reduction in water quality and change in microclimate of some valleys and decreased the water table in some areas. Examples are the valley wetlands around Bushenyi and Kabale. The major reasons for drainage of wetlands is for cultivation and dairy farming in the rural areas, while in urban centres filling in for construction of settlements, roads and other purposes is the major threat to wetlands.

Figure 6.3 – Typical cultivated wetland

6.6.3 Water Weeds

There are several weeds that have infested major Ugandan water bodies in the recent past, the most significant being the Water Hyacinth. In the 1980s and 1990s the main negative impacts of water hyacinth were felt in the fisheries, water supplies, marine transport, hydroelectricity power generation, environment and health sectors. The control of the water hyacinth is being spearheaded by the Department of Fisheries Resources with an overall objective of bringing about sustainable control of water hyacinth in Lake Victoria and other water bodies in the catchments to levels that do not exert negative socio-economic or environmental impacts.

Through the riparian countries and LVEMP various control methods have been deployed to control the water hyacinth, which include manual, mechanical and biological interventions. Manual methods use manual equipment like forked hoes, spades, wheel burrows, pangas and rakes. The use of shore-based and mobile cranes supported by other machines is involved in the mechanical method, while the biological method puts to use its natural enemies, two weevil species namely*, Neochetina eichhorniae* and *Neochetina bruch*i. A reduction of nearly 80% has been achieved, though re-growth is evident, therefore, sustained methods are needed. Control of water hyacinth has been a remarkable achievement, requiring considerable organisation at all levels and achieved with minimal negative environmental impacts.

6.6.4 Nutrient Enrichment and Eutrophication of Water Bodies

Enrichment of major water bodies with nutrients especially Phosphorus and Nitrogen is facilitated by a number of factors including atmospheric deposition (the main source for Lake Victoria), poor farming and forestry practices, as well as untreated and partially treated municipal sewage and industrial effluents. Excessive eutrophication has been observed to result in oxygen deficits in bottom waters of major lakes and has contributed to the accumulation of toxic gases such as hydrogen sulphide in the lower water column. The cumulative negative impacts of these effects of eutrophication to biodiversity; to ecosystem ecology and trophic dynamics; and to overall productivity in the affected zones of the water bodies, especially Lake Victoria are serious, though the actual magnitude is not sufficiently understood mainly because of lack of adequate scientific information on the spatial magnitude, dynamics, and impacts of eutrophication in the lake.

Control of nutrient enrichment from land use (through prudent agriculture, forestry, animal husbandry, and wise use of wetland buffers); and from municipal and industrial effluents, calls for close collaboration and co-ordination with many sectors including crop agriculture, animal husbandry, fisheries, forestry, industry, local government and National Water and Sewage Corporation. Atmospheric loads of nutrients, the principal source of phosphorus and nitrogen into Lake Victoria, may be of national, regional and international origin. They are, therefore, even more challenging to control.

The impacts of eutrophication on the environment and resources of Lake Victoria are complex and many of their modalities, dynamics and extent are not fully understood. They require focused joint and coordinated, regional research.

6.6.5 Destructive Fishing Practices

Excessive and destructive fishing pressure exerted by the use of under sized meshes, beach seines, poison, dynamite; excessive number of fishermen is often enhanced by greed for money, lack of sense of ownership of the fishery exacerbated by the 'open access policy' syndrome, insufficient research information on fish stocks, insufficient sensitization and uncertainty about the next meal (poverty). Excessive and destructive fishing pressure steadily assaults and degrades the environmental and the biological resource base of the fishery including spawning, nursery and feeding grounds/habitats, as well as the reproductive and recruitment potential. Eventually fish stocks decline and the fishery collapses. Ingredients of this scenario have been observed in a number of lakes in Uganda, especially Lake Victoria.

Apart from control of the environmental impacts given above, management of fish stocks would call for successful control of fishing effort and cessation of the use of destructive fishing gears and methods. Control of these negative impacts is, however, complicated by several factors including community perception of the open access policy, lack of viable alternatives to fishing and insufficient research information on fish stocks and their dynamics. Regulation and policing of fishing behaviours and norms have not succeeded in curbing destructive fishing practices and the breaching of other fishery management regulations at local and national level.

6.7 Capacity Building for Sustainable Environmental Management

In order to ensure sustainable environmental management, Government has invested a lot of resources in developing the capacity of central government agencies, local governments, the private sector, and the general public to empower them to monitor, regulate and manage the segment of the environment they are responsible for. Some of the key capacity building achievements include the following:

(i) Environmental Education has been integrated in the Primary Education Curriculum. In addition, three Government Universities and several private Universities have started offering Environmental Education programmes in the tertiary education system.

(ii) NEMA is also assisting Central Government Agencies to develop EIA Sectoral Guidelines that will be useful in integrating environment concerns in sectoral development planning. EIA guidelines for the Water, Roads, Energy and Mining Sectors have already been developed.

(iii) NEMA is implementing a comprehensive sensitisation and awareness raising campaign on sustainable environmental management at both national and local levels. This has involved Television and Radio environmental programs, Newspaper supplements, Public lectures, Music and Drama Environmental shows, Newsletters, etc. This campaign has been very successful in enhancing the level of understanding of environmental issues by the general public and the local communities.

(iv) NEMA has also supported the recruitment of qualified Environment Officers in all the districts in Uganda. NEMA has also organized formal and informal training for the District Environment Officers, District Environmental Committees and Local Environmental Committees in environmental planning, management, and bye-law formulation and enforcement.

(v) A number of educational, training, information and publicity print materials have been produced and disseminated regularly to the public. Training in formal environmental education has been conducted in most of the districts, and schools have initiated school environmental education programmes.

(vi) NEMA continues to conduct regular training for politicians, decision makers and natural resources managers, at both local and national level, in Environment Management and Environment Impact Assessment.

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CHAPTER SEVEN

WATER FOR FOOD SECURITY

7.1 Introduction

Despite Uganda's remarkable economic growth registered in the recent years, one key set back remains the persistent food shortages and critical nutritional deficiencies often experienced in many parts of the country. Under-nourishment, especially in childhood years, is unacceptably high and periodic famine has become a common phenomenon in many parts of the country. This situation is partly attributed to occasional poor harvests attributed to erratic rain seasons, which have a very significant impact on the largely rain-fed subsistence farming being practised by over 80% of the population.

An example of the adverse impact of the above situation on the most vulnerable section of the population, children, is given **Box 7.1** below:

BOX 7.1 – Impact of Malnutrition on Children in Uganda
✓ 40% of overall death among children in Uganda is due to malnutrition!
✓ 38% of children below 5 years of age experience stunted growth due to malnutrition!
✓ 23% of all children in Uganda are under weight due to malnutrition!
✓ 4% of all children in Uganda are wasted due to malnutrition!

Source: *National Food and Nutrition Policy, 2000, MAAIF and MoH*

In order to address the above challenges, government has initiated several national programmes aimed at addressing, among other issues, constraints to food production, processing, storage and marketing of agricultural products, and improvement of general national food security.

Over the years, agriculture has remained a dominant sector in the Ugandan economy, and contributed 33% to the total GDP in fiscal year 2002/03. The relative contribution of the major agricultural products to the national GDP is highlighted in **Figure 7.1**.

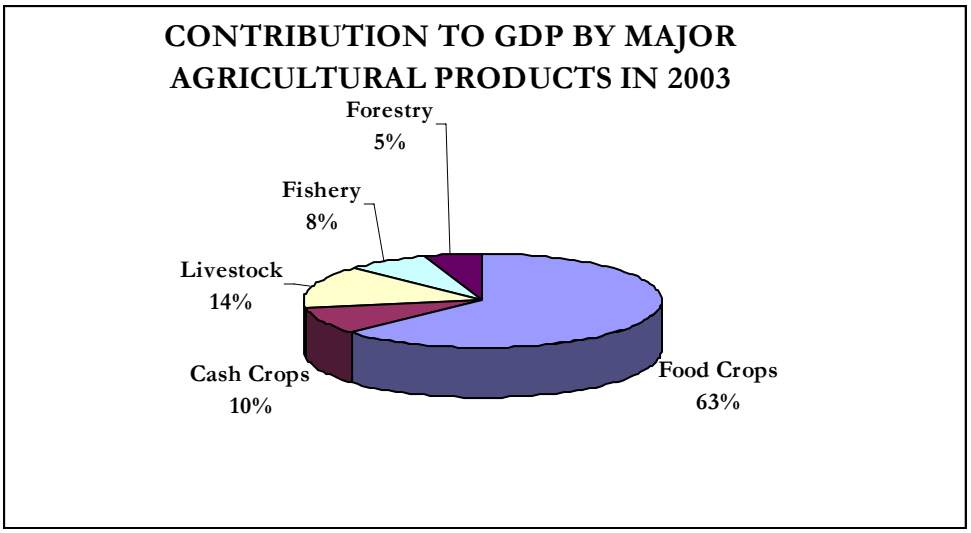


Figure 7.1 – Relative contribution to GDP by major agricultural products
(*Source: UBOS, 2003*)

The frequent droughts experienced in the recent years have aggravated the food shortages in many parts of the country resulting in increased government spending on food imports in aid of the affected communities. The role of water towards enhanced food security in Uganda cannot be over emphasized. To this effect, Government is promoting the sustainable use of water for enhanced agricultural production through several initiatives including:

- ✓ Promotion of small to large scale irrigation,
- ✓ Water harvesting for supplementary irrigation,
- ✓ Soil and water conservation, and
- ✓ Swamp development and utilisation.

7.1.1 National Goal and Targets

Due to its strategic role in the national economy, agriculture represents a key factor in the general improvement of economic performance, increased incomes and rising living standards of rural households as well as in ensuring food security and poverty eradication.

One of the key national development goals is:

"To ensure food security for all Ugandans and to increase household incomes through increased exports of high value agricultural products."

To achieve this goal, government has put in place comprehensive policies and national development programs. These include among others; the Poverty Eradication Action Plan and the Plan for Modernisation of Agriculture.

7.2 Water for Irrigation Development

According to the 2002 Uganda Population and Housing Census, the country's annual population growth rate was 3.4% while the annual growth rate of food production was about 1.5%. These statistics clearly indicate that the current food production levels cannot match the population growth and that the country is likely to experience acute food shortage in the near future. The government has, therefore, recognised an urgent need to develop and implement programs aimed at increasing agricultural productivity to ensure food security for the country.

Demonstrations carried out using small-scale irrigation technologies and simple water harvesting techniques have shown very positive results with increases in crop yields of 100-400%. Following these encouraging results, the government strategy, over the next 30 years, is to increase cereal production by 70% through intensified irrigated farming.

7.2.1 Irrigation Potential

The total potential irrigable area in Uganda is estimated at 202,000 ha (FAO, 1995). A study conducted by JICA in 2004 revealed that less than 14,418ha of the potential irrigable area are under formal irrigation and 67,000ha under informal irrigation, particularly for rice production. Water use for small-scale irrigation schemes is estimated at 10,000m3/ha/year while Government large-scale irrigation and commercial irrigation schemes are estimated at 12,000m3/ha/year. Details of the current water requirement and irrigated area are indicated in the **Table 7.1 below.**

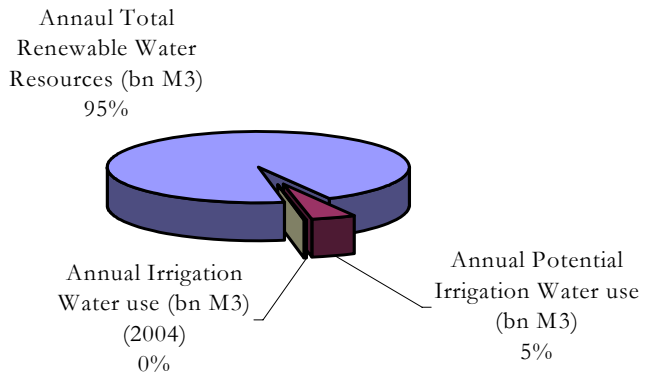
Table 7.1 – Irrigation Development in Uganda

Type of Irrigation	*Area (ha)*	*Relative Water Use (M^3/ha/year)*	*Total Water Use (10^6 M^3/year)*
Small-scale irrigation technologies	300	10,000	3.00
Government Irrigation Schemes	2,036	12,000	24.43
Commercial	5,282	12,000	63.38
Commercial, supplemental irrigation (Kakira Sugar Plantation)	6,800	5,000	34.00
Total	14,418		124.01

Source: DWD - Water for Production Study, 2003.

Figure 7.2 shows the current and potential irrigation water use as a percentage of the annual total renewable water (ATRW) resources, estimated at 66Km^3.

Figure 7.2 - Irrigation Water Use in Uganda



The table and figure above reveal that the country's current and potential irrigation water use, estimated at 124 Million m^3/year and 2,000 Million m^3/year respectively, is quite small compared to the ATRW.

7.2.2 Water Harvesting for Supplementary Irrigation

With annual total renewable water resources of 66 Km^3/year, Uganda has a very high potential of harnessing its water resources to boost its agricultural production. Though most of Uganda's agriculture is currently rain-fed, the increasing incidences of droughts and the general increase in food demand as a result of the high population growth has prompted farmers to adopt innovative measures of water harvesting to boost their farm production. These measures include among others:

- ✓ Collection of runoff from rooftops into storage structures;
- ✓ Impoundment of surface runoff into reservoirs;
- ✓ Deep tillage to prevent runoff; and
- ✓ Percolation furrows in horticultural crops to enhance in-situ replenishment of soil moisture.

LARGE SCALE WATER HARVESTING

Large scale water harvesting in Uganda is limited to the few large scale irrigation schemes which divert water from major rivers and lakes for irrigation during the dry season. These include the sugarcane and tea plantations, and commercial rice schemes whose total irrigation requirement is estimated at 120 million m^3 per year.

In addition to these large scale diversions, there are also a number of Valley dams/tanks that have been constructed in several districts in Uganda, mostly the cattle corridor, predominantly for livestock water supply and to a small extent, human consumption. The storage of these valley dams/tanks ranges from 6,000 m^3 to 400,000m^3.

As part of the irrigation development strategy, Government is promoting the construction of multi-purpose reservoirs (Valley dams and tanks) whose water will be used for both livestock water supply and small scale irrigation purposes. As part of this initiative, Government is promoting the use of the most efficient irrigation systems in order to sustain water abstraction in the reservoirs throughout the dry period. These include among others: localized, sprinkler and drag hose irrigation systems, which have been demonstrated and found viable in drought prone areas.

SMALL SCALE WATER HARVESTING

Small scale water harvesting (from roof-tops, small springs and diversion of small streams) has been successfully conducted in various parts of the country predominantly for domestic supplementary irrigation for vegetable production, horticulture and small scale irrigation of high value cash crops like clonal coffee and Vanilla.

WETLAND RECLAMATION

Wetland reclamation for paddy rice production is very popular in many parts of Uganda, especially eastern Uganda. Over 53,000 ha of wetlands have been reclaimed for both small scale and large-scale paddy rice production in Uganda. Given the interest shown by many farmers to take up paddy rice production, the Government, with funding from Japan, has initiated a small-scale irrigation project to support and build capacity of the rice farmers to enhance rice production in the country and also ensure sustainable use of the wetland resources. So far 13 districts from eastern Uganda are already benefiting from the project, namely; Kamuli, Iganga, Mayuge, Bugiri, Busia, Tororo, Mbale, Pallisa, Sironko, Kumi, Soroti, Katakwi and Kaberamaido.

7.3 Water for Livestock Production

The livestock sub-sector contributes 7.5% of the GDP and 17% of the agricultural GDP. In 2000, the livestock population was estimated at 5.8 million cattle, 1 million sheep, 6.2 million goats, 1.5 million pigs and about 24 million units of poultry. Annual production is estimated at 97,000 tonnes of beef, 510,000 tonnes (510 million litres) of cow milk, 41,000 tonnes of chicken meat, 16,000 tonnes of goat meat, 9,700 tonnes of mutton and lamb and limited amounts from various other animals.

Most of the livestock population is concentrated in the 29 Districts in the cattle corridor running southwest to northeast across Uganda. These Districts make up 44% of Uganda's surface area and contain 40% of the population, 55% and 42% of the indigenous and exotic cattle, respectively, 42% of sheep and goats, 36% of the pigs and 38% of the poultry flock.

LIVESTOCK WATER SUPPLY

Estimates indicate that about 60% of pastoral households lack water for domestic and livestock use. As a result, livestock have to cover long distances in search of water with all the associated health and productivity risks. Scarcity of water in the cattle corridor reduces

agricultural productivity, promotes nomadism, breeds socio-political conflicts and exacerbates the spread of livestock diseases.

In order to address the plight of pastrolists living in the cattle corridor, Government has for many years implemented livestock water supply programs to try to contain the rampant nomadism. However, these interventions are still inadequate due to the high livestock population and also due to poor maintenance of the facilities. According to an assessment carried out in 1999 (UDC/MFPED, 1999) there are a total of 316 valley dams and 765 valley tanks in the country, out of which only 111 valley dams and 268 valley tanks are operational.

As a long-term strategy, Government has recently prepared a comprehensive Water for Production investment plan which envisions, among other measures, the construction of one valley tank/dam in each sub-county in the cattle corridor districts, with capacities ranging between 6,000 – 10,000 m^3. This plan, once implemented, will result in the construction of a total of 1,465 valley tanks/dams by 2015. The districts to benefit from the programme include: Luwero, Mbarara, Masindi, Nakasongola, Rakai and Sembabule.

Table 7.2 shows the current (2003) and projected (2015) livestock water requirements.

Table 7.2 – Current and Projected Livestock Water Requirements

	2003	*2015*
Total Tropical Livestock Units, (TLU) (growth rate 3.5%)	6,112,226	9,559,252
Annual Total Water Requirements (in m^3)[1]	111,548,125	174,456,350
Water Requirements, 3 months without Recharge (Storage requirements) (in m^3)	27,505,017	43,016,600

7.4 Water for Fisheries Production

The overall fisheries sector goal is ***"to ensure increased and sustainable fish production and utilisation by properly managing capture fisheries, promoting aquaculture and reducing post harvest losses."***

The fisheries sector in Uganda provides a vital source of food, employment, recreation, trade and socio-economic well being for the people of this county and for the global community. Per capita fish consumption stands at about 10 Kg per person per annum. Areas of highest rates of fish consumption in the country coincide with areas of highest population densities, which are in the vicinity of the lakes. The liberalised economy has stimulated investment in the capture and aquaculture fisheries resulting in increased foreign exchange remittances as well as household earnings. Therefore, the contribution of fisheries to food security in Uganda cannot be over emphasised. Fisheries are crucial particularly to the populations living along rivers, lakes, islands and the disadvantaged rural poor.

In the past, Uganda's fisheries industry used to boast of over 300 endemic fish species, several of which are targeted for commercial and subsistence exploitation. However, over time, the composition of the fish species in the different lakes has changed due to human exploitation and introduction of exotic species which have led to the extinction of several native species. There are now only 23 commercial species of fish in Uganda's water bodies.

The current fish consumption is estimated to be 240,000 tonnes based on the present per capita fish consumption estimated at 10 kg per year. The projected fish consumption by the year 2015 is 320,000 tonnes. Uganda's current recommended maximum fish export quota is 60,000 tonnes per year.

Besides the traditional fish capture, Government is also promoting aquaculture to boost fisheries production to cope with the increasing fish demand (both domestic consumption and export). This initiative is also coupled with improvements in the conservation and management of capture fisheries through stock rebuilding, targeting of under exploited fish stocks, more rational harvesting practices and wider application of fish food technology to reduce post harvest losses.

The main challenges facing the fisheries sector are:

- ✓ Decline of fish catches due to unsustainable fishing methods such as use of undersized fishing nets and beach seines which crop a lot of immature fish;
- ✓ Decline in species diversity in Lake Victoria and Lake Kyoga following introduction of Nile Perch;
- ✓ Decline in fish size and weight due to increased fishing pressure;
- ✓ Deterioration of water quality due to pollution from industrial wastes, soil erosion due to poor agricultural practices in the catchment areas.

Lake Victoria contributes over 50% of the total annual production in Uganda and is therefore of critical importance to mange the lake resources sustainable. Continued yields from the lake will depend on water quality and proper harvesting regimes. Following introduction of Nile Perch and Nile Tilapia into the lake, ecological changes resulted in a fishery dominated by the two introduced species.

The numerous smaller lakes, extensive wetlands and network of rivers and streams are sources of fish for the communities around them. Production from these areas is estimated at up to 2% of the total estimated production from the country's fisheries. However, since most fish from the smaller systems is directly used by the local residents, the current figure may be an under-estimate especially with reference to seasonal riverine- stream-swamp fisheries in the east and the north of the country.

AQUACULTURE

Uganda is well endowed with areas suitable for aquaculture production in addition to suitable tropical climate. Aquaculture was introduced in Uganda in 1953 through a fish-farming project started by the Fisheries Department with a Fisheries Research Station at Kajjansi. The purpose of fish farming introduction was to reduce malnutrition by improving

the supply of animal protein, especially among the rural population. Ugandans from all regions and socio-economic backgrounds have taken up aquaculture. The great majority of fish farmers are ordinarily farmers who manage their fishponds as part of their mixed farming enterprise.

There are currently about 20,000 ponds producing 5,000 tonnes per annum. Average pond size is 250m^2 and number of farmers is estimated at 9,000. However, commercial farmers with average pond sizes of 1000m^2 are coming up.

Water Requirements for Aquaculture

Water requirements for aquaculture are currently minimal, as water for aquaculture at current production takes place in wetlands and with no significant water consumption compared to the natural status of wetlands. However, with the projected investments in private, large-scale aquaculture water for aquaculture will become largely consumptive due to increased evaporation from reservoirs.

From a water point of view, there is need for clear guidelines and instruments regarding:

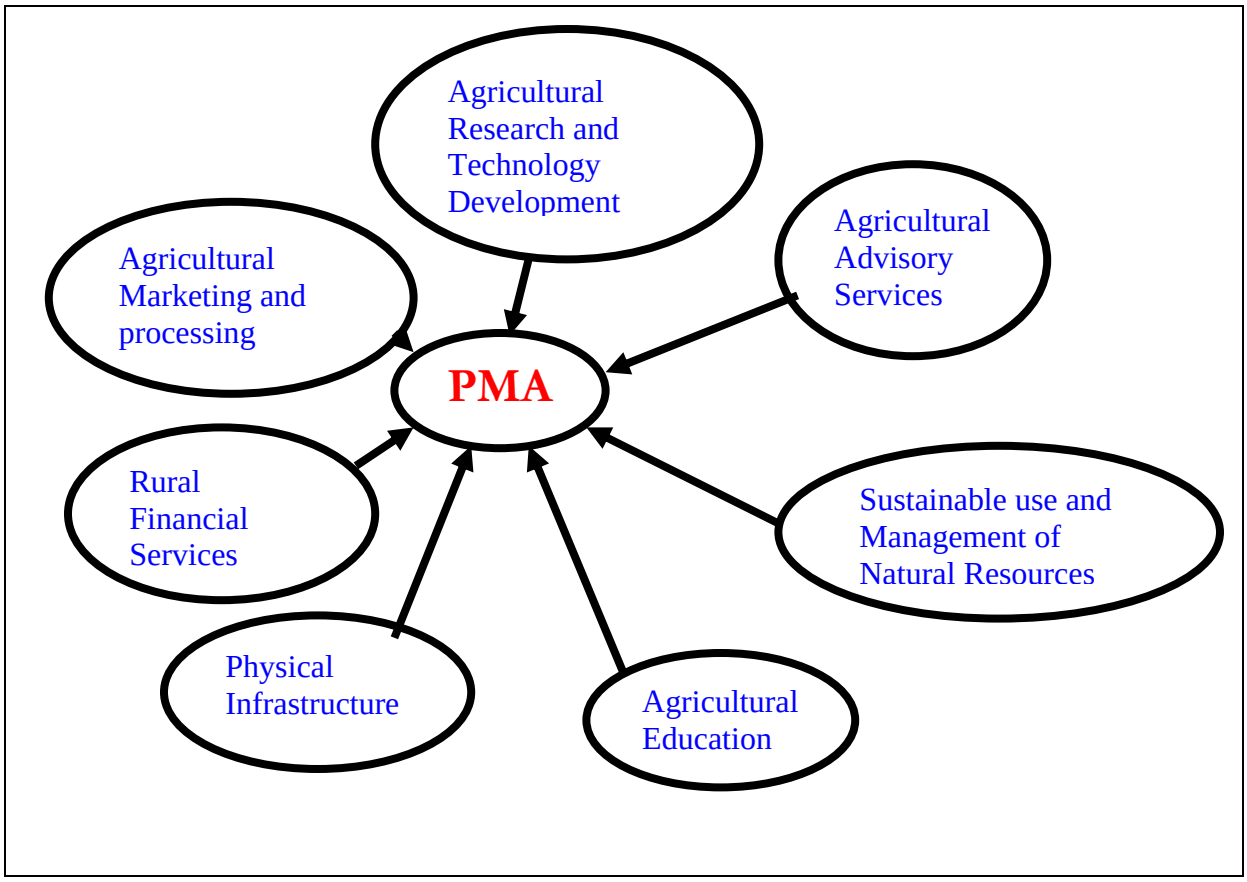
i) The utilisation of wetlands/swamps for large-scale aquaculture;
ii) The use of streams (i.e. diversion canals) for aquaculture production;
iii) Cage culture farming in water bodies (location, size, pollution control, etc.);
iv) The use of genetically modified fish including the use of chemicals (hormones) by private farmers;

7.5 National Plans and Strategies

7.5.1 Plan for Modernisation of Agriculture

The Plan for Modernisation of Agriculture (PMA) is a strategic framework for eradicating poverty through multi-sectoral interventions enabling the people to improve their livelihoods in a sustainable manner by raising farm productivity, increasing the share of marketed agricultural production, and creating on-farm and off-farm employment.. It is an outcome-focussed set of principles upon which sectoral and inter-sectoral policies and investment plans can be developed at both central and local government levels.

The PMA aims at making adjustments in institutions and policies so as to improve service delivery for purposes of enabling the rural poor to attain a better living. The main focus areas for the PMA are shown in the schematic below.



PMA OBJECTIVES

- Increase incomes and improve the quality of life of poor subsistence farmers.
- Improve household food security through the market.
- Provide gainful employment; and
- Promote proper use and management of natural resources.

PMA STRATEGIES

- Making poverty eradication the over-riding objective of agricultural development,
- Extending decentralization to lower levels of government for efficient service delivery,
- Removing direct government involvement in the commercial aspects of agriculture and promoting the role of the private sector,
- Supporting the dissemination and adoption of productivity enhancing technologies,
- Guaranteeing food security through the market and improved incomes,
- Ensuring that all intervention programs are gender focused,
- Involving and empowering local governments in the planning and budgeting process to enable them influence public policy ; and
- Ensuring coordination of the multi-sectoral intervention to remove any constraints to agricultural modernisation.

7.5.2 Irrigation Sector Development Plan

Though more than 80% of Uganda's population is involved in agriculture, most of it is rain-fed small-scale subsistence farming, which is vulnerable to climatic variability and erratic rain seasons. Other than a few large-scale sugar cane and tea plantations, irrigation is not wide spread in Uganda. In addition, there are a few scattered medium scale rice schemes and horticultural farms, which practice irrigation, though on a small scale.

Reasons for the little developed irrigation farming in Uganda include among others:

(i) The small-scale nature of our agricultural activities with very small economic returns that cannot pay for the high investment and operational costs of modern irrigation technology.

(ii) The favourable climatic conditions in the past have sustained rain-fed crop production in many parts of Uganda thus making the need for investment in expensive modern irrigation systems not a priority.

(iii) The land tenure system in Uganda has not favoured large scale farming in Uganda because of the small fragmented pieces of land belonging to different house holds which are not economically viable for commercial farming.

However, due to the high population growth, the traditional subsistence farming methods cannot produce sufficient food to meet the current and projected food requirements. This, coupled with the erratic rain seasons being experienced in many parts of the country, has prompted government to seriously consider irrigated agriculture as a viable option for ensuring food security and for raising household incomes through farming in high value crops for export. This new thinking is reflected in the Irrigation Sector Development Plan (ISDP) developed as part of the Plan for Modernisation of Agriculture (PMA).

IRRIGATION STRATEGY

As part of the ISDP, an Irrigation Strategy has been prepared as a blue print for the transformation of the average Ugandan farmer from a purely small-scale subsistence farmer to a more commercial oriented farmer.

The strategy addresses the following key issues, which are important for improved agricultural productivity:

- Sustainable use of water resources for enhanced crop production through irrigation;
- Small scale water harvesting for supplementary irrigation;
- Irrigation economics; including the identification of suitable and high value crops;
- Land ownership and accessibility to water resources,
- Rural financing systems and financial services and agricultural marketing systems for small farmers and small industries;
- Management of government schemes, including farmers participation, contributions/payment for infrastructure/input services and operation and maintenance arrangements;
- Access to quality seeds, fertilizer and other inputs;
- Technical and managerial capacity in water supply development and water use management at national, district, extension and farmer level;

- Promotion and regulation of private sector participation;
- Post-harvest management and marketing;
- Promotion of household small-scale appropriate technologies, irrigation expertise, efficient soil water management practices, livestock water supply management; and
- Research and demonstration, extension services and farmer education.

7.5.3 Water for Production Strategy

In order to address the water for production challenges, government undertook a Water for Production (WfP) sub-sector reform study, as part of the overall reforms taking place in the water sector. The study, which was completed in November 2003, was aimed at developing a comprehensive Strategy for the WfP sub-sector focusing mainly on improving rural household incomes through use of water for increased agricultural productivity and food security.

The strategic interventions proposed by the WfP sub-sector reform study are given in the **Box 7.2** below:

	BOX 7.2: Key Strategic Interventions proposed under the WFP Reform Study
1	Improved access to water for livestock, especially in the cattle corridor.
2	Promotion of water harvesting for small-scale supplementary irrigation.
3	Promotion of small-scale aquaculture and culture-based fisheries in existing reservoirs.
4	Creation of an enabling environment for private sector investment in the sub-sector.

The study also highlighted the following facts regarding the WfP sub-sector:

- ✓ The country has adequate water resources which could be harnessed to increase agricultural production;
- ✓ The existing policy and legal frameworks are conducive for promotion of Water for Production; in particular through appropriate policies described in the National Water Policy (1999) and the Plan for Modernisation of Agriculture (2000);
- ✓ There is inadequate technical capacity at national, district and local levels to effectively undertake the water for production intervention measures and activities. This lack of capacity, especially at local level, is reflected in the poor management of existing water supply facilities and poor exploitation of existing potential;
- ✓ There is lack of effective coordination mechanisms regarding water for production activities due to institutional fragmentation at national and district levels;
- ✓ The absence of viable financing systems and financial services for small farmers and small industries is a major constraint for development of WfP;
- ✓ Agriculture marketing infrastructure is key to realisation of the WfP potentials. At the moment, agricultural marketing is not effectively addressed.
- ✓ Poor management of Government irrigation schemes has portrayed a negative image of the irrigation sector and served as a disincentive for the would-be actors in the sector.
- ✓ There is a general lack of appropriate mechanisms for assisting farmers/farmer's groups in irrigation system development.

- ✓ There is insufficient coverage of livestock watering facilities in the country resulting in unhealthy competition for the few existing facilities.
- ✓ Poor planning, design, construction and management of livestock watering facilities has greatly contributed to the poor state of many of the existing facilities.
- ✓ There are increasing cases of encroachment on wildlife protected areas by livestock keepers in search of water and pasture, especially during the dry season.

7.6 Future Outlook

Water plays a vital role in agricultural production and food security in Uganda. It is clear that with the high population growth and increased occurrence of droughts, irrigated agriculture is going to play a central role in ensuring food security in Uganda.

Efforts made by government in addressing food security issues are commendable, so far. The Plan for Modernization of Agriculture (PMA) offers an excellent opportunity for revamping Uganda's agriculture sector towards sustainable food security. Although the PMA has put in place the enabling environment in terms of appropriate policies, strategies and institutional framework, the government is still faced with the challenge of fully operationalizing the PMA principles to have these translated into tangible benefits to the millions of poor farmers in the country.

Government will continue to promote both large-scale and small-scale irrigation for increased food production. A lot of emphasis is also to be put on improved delivery of livestock water supply as a strategy to achieve increased livestock production. In addition, Government will also continue with its campaign for wide spread aquaculture as a strategy for increased fish production to meet both the domestic and export markets.

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CHAPTER EIGHT

WATER AND ENERGY

8.1 Introduction

Uganda is endowed with abundant renewable energy resources. These include plentiful biomass supplies, extensive hydrological resources, favorable solar conditions and large quantities of biomass residues from agricultural production, among others. With the exception of biomass, Uganda utilizes only a small fraction of its renewable energy resource potential.

Biomass, principally fuel wood and charcoal, is in quantity terms the most important energy source in Uganda. Wood fuel (firewood and charcoal) on both non-commercial and commercial basis constitutes about 93% of energy consumed in the country. Sources of these dry materials are mainly trees and bushes, which occur in all types of land cover use e.g. forests, woodlands, bushlands, agricultural farms etc.

Uganda's Modern Fuel supply and consumption is composed of Petroleum products about 6% and electricity about 1%.

8.1.1 Current Hydropower Planning Status

Almost all of Uganda's current Hydropower (300MW) is generated at Kiira and Nalubaale stations located at the outlet of Lake Victoria, which is part of the Nile system. There are also a few existing small-scale Hydropower schemes contributing a total of 20 MW.

Currently domestic power demand exceeds the available supply by as much as 80 MW during peak periods, and is growing at the rate of 8% per year. Load shedding is common and the shortfall in generation capacity is limiting growth in many sectors of the Ugandan economy.

The Government formulated a Hydropower Development Master Plan (Kennedy and Donkin, 1997), to guide the hydropower planning and development process in Uganda. The Master Plan includes a comprehensive study of all the potential large-scale and small-scale hydropower schemes that are possible both on the White Nile and on all non-Nile rivers in the country. It also outlines a well-documented energy development strategy based on power demand forecasts, historical Lake Victoria hydrology, project generation potential, environmental effects, and cost criteria.

8.2 Hydropower Development

Hydropower is the major source of electrical power in Uganda. It is the most abundant and cheapest electrical power source in the country.
Uganda has a comparative advantage in hydropower resources in the region. Most of Uganda's hydropower potential is concentrated along the White Nile with a total estimated potential of 2,000 MW. In addition, there are also several small rivers in different parts of the country, with a potential for mini and micro hydropower development.

8.2.1 Large Scale Hydropower Development

To-date, only a small fraction of Uganda's hydro resources are exploited. Almost all of Uganda's current Hydropower (300MW) is generated at Kiira and Nalubaale stations located at the outlet of Lake Victoria.

The process for the development of Bujagali Hydropower scheme is already underway and that for Karuma Hydropower scheme will commence shortly. Completion of these two schemes will add another 400 MW to Uganda's power supply, which will go a long way in reducing the power deficit. **Table 8.1** shows the major potential hydropower schemes.

Table 8.1- Major existing and potential hydropower schemes in Uganda

Site	*Current Installed Capacity (MW)*	*Max. Potential (MW)*	*Proposed Installed Capacity (MW)*	*Status*	*Comm Date*
Owen Falls	180	-	-	In Operation	1954
Owen Falls Extension	-	-	200	Partly Commissioned. (120MW from 3 units). The other 2 units are to be commissioned by June 2005.	2000
Bujagali	-	320	250	Negotiations in progress	2005
Kalagala	-	450	350	Feasibility study completed	N/A
Karuma	-	180	150	Feasibility studies completed, negotiations in progress	N/A
Ayago South	-	234	N/A	Preliminary studies available	N/A
Ayago North	-	304	N/A	Preliminary studies available	N/A
Murchison	-	642	N/A	Preliminary studies available (has adverse environmental effects)	N/A

N/A= Not Applicable

All the above potential hydropower projects are solely for hydropower generation purposes. To-date none of the projects has been conceived as a multi-purpose project. In line with the current policy on private sector driven service delivery, the government strategy is to encourage and attract the private sector to invest in most of these hydropower projects. The response has so far been good with already two projects (Bujagali and Karuma) having attracted private sector investment. With the increased private sector involvement in the power sector, Government has hitherto established the Electricity Regulatory Agency (ERA) to regulate the sector and ensure "fair play" by all potential players in the business of power generation, transmission and distribution and to protect the consumers from exploitation by "profit hungry" private companies. Besides ERA, government has also strengthened the National Environmental Management Authority (NEMA) to enforce strict compliance of all power projects to the existing environmental management laws and regulations. This includes among other things the requirement for comprehensive environmental impact assessments (EIA) and audits for new and existing hydropower projects respectively.

8.2.2 Small Scale Hydropower Development

Besides the large-scale hydropower sites, Uganda also possesses a number of small sites with potential for mini- and micro hydropower development. The current contribution of the small-scale hydropower schemes is about 20 MW. **Table 8.2** below shows the existing and potential small-scale hydropower schemes in Uganda.

Table 8.2- Existing and potential small-scale hydropower schemes

Site	*District*	*Installed Capacity (MW)*	*Estimated Potential (MW)*	*Status*
Maziba	Kabale	1.0	-	In operation
Kuluva	Moyo	0.12	-	In operation
Kagando	Kasese	0.06	-	In operation
Kisizi	Rukungiri	0.06	-	In operation
Mobuku 1	Kasese	5.0	-	In operation
Mobuku 2	Kasese	-	11.1	Pre-feasibility Studies complete
Mobuku 3	Kasese	10.0	-	In operation
Muzizi	Kibale	-	4.0 – 10.0	Estimate
Paidha	Nebbi	-	6.0 (with dam) 3.3 (run of river)	Ready for development
Rwizi	Mbarara	-	0.5	Pre-investment studies completed
Kakaka	Kabarole	-	3.0	Estimate
Nsongezi	Mbarara	-	2.0	Estimate
Nyamabuye	Kisoro	-	2.2	Pre-investment studies completed
Siti	Kapchorwa	-	1.0	Feasibility study planned
Sipi	Kapchorwa	-	5.4	Pre-investment studies completed
Anyau	Arua	-	1.5	Feasibility study completed
Haisesero	Kabale	-	1.0	Estimate

Site	*District*	*Installed Capacity (MW)*	*Estimated Potential (MW)*	*Status*
Kitumba	Kabale	-	0.2	Estimate
Mpanga	Kabarole	-	0.4	Estimate
Nyakibale	Rukungiri	-	0.1	Estimate
Leya	Moyo	-	0.12	Estimate
Amua	Moyo	-	0.18	Estimate
Nyarwodo	Nebbi	-	0.4	Estimate
Mvepi	Arua	-	2.4	Estimate
Esia	Moyo	-	0.24	Estimate
Ala	Arua	-	1.5	Estimate
Agoi	Arua	-	0.35	Estimate
Nkussi	Kibale	-	0.9	Estimate
Mitano	Kabale	-	2.0	Estimate
Kikagati	Mbarara	-	-	Abandoned
Sezibwa	Mukono	-	0.5	Estimate
Tokwe	Bundibugyo	-	0.2	Estimate
Mgiita	Bundibugyo	-	0.15	Estimate
Miria Adua	Arua	-	0.1	Estimate
Sogahi	Kabarole	-	2.0	Estimate
Ishasha	Rukungiri	-	4.0	Feasibility study and plant design completed
Buseruka	Hoima	-	15.3	Pre-feasibility studies completed
Nengo Bridge	Rukungiri	-	7.7	Pre-feasibility studies completed

Figure 8.1 shows the location of some identified hydropower projects that are being considered for development by the energy sector.

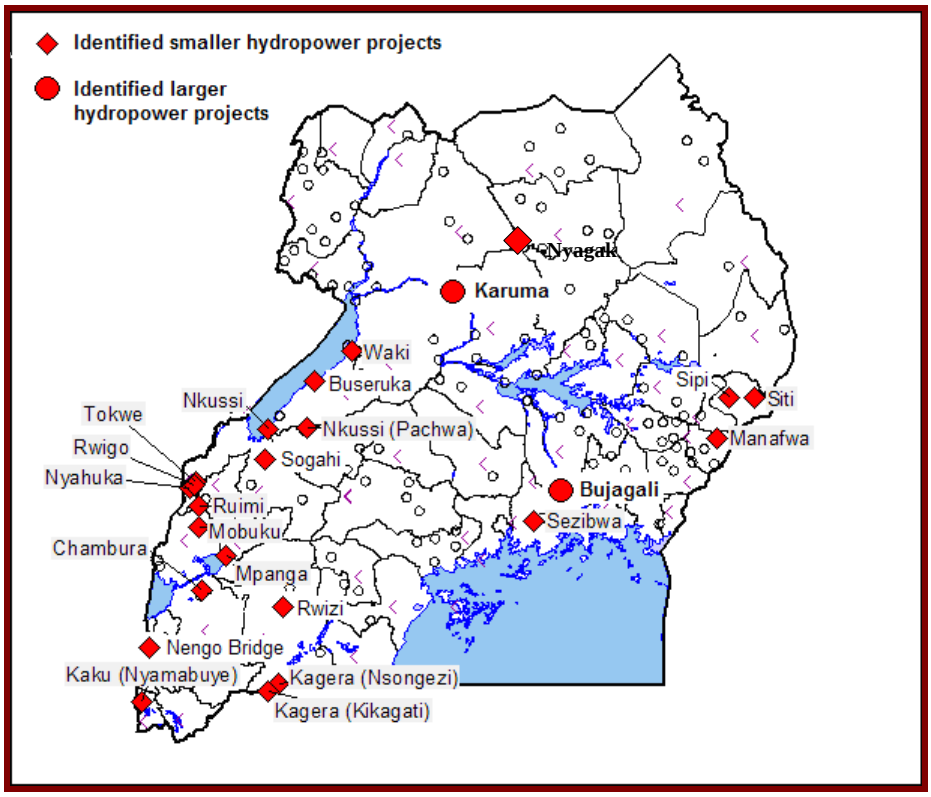


Figure 8.1 - Some Identified Hydropower Projects

8.3 Hydropower Consumption

8.3.1 Electricity Coverage

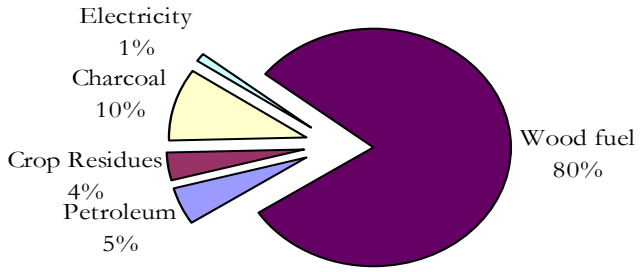
Only 9% of Uganda's population is supplied with grid electricity, and 70% of these customers reside in the three major towns of Kampala, Entebbe and Jinja. Approximately 20% of the country's urban population is connected to the national grid, while only 3% of the rural population is connected to the grid. Official records show that there are about 230,000 grid electricity users. The national average annual per capita electricity consumption is about 44 kWh, compared with an average of 170 kWh and 10 kWh for the major urban areas and rural areas respectively.

Figure 8.2 shows the existing national electricity grid and the planned future extensions.

Figure 8.2 - Existing Electricity Grid and the Planned Extensions

Uganda's per capita energy consumption of 0.3 TOE or 12.72 GJ, is among the lowest in the world. Few people have access to modern energy supplies such as electricity and petroleum products. The energy consumption is about 5 million TOE/year of which approximately 94% is biomass (wood, charcoal and agricultural residue). Wood fuel is the dominant energy source accounting for 80 per cent of the total energy consumed in the country. Wood fuel is consumed either as charcoal (largely consumed in urban areas) or firewood (mostly used in rural areas). **Figure 8.3** shows the dominant position of wood fuel in the energy sector of Uganda.

Figure 8.3: Uganda's Energy Consumption



8.3.2 Electricity Pricing

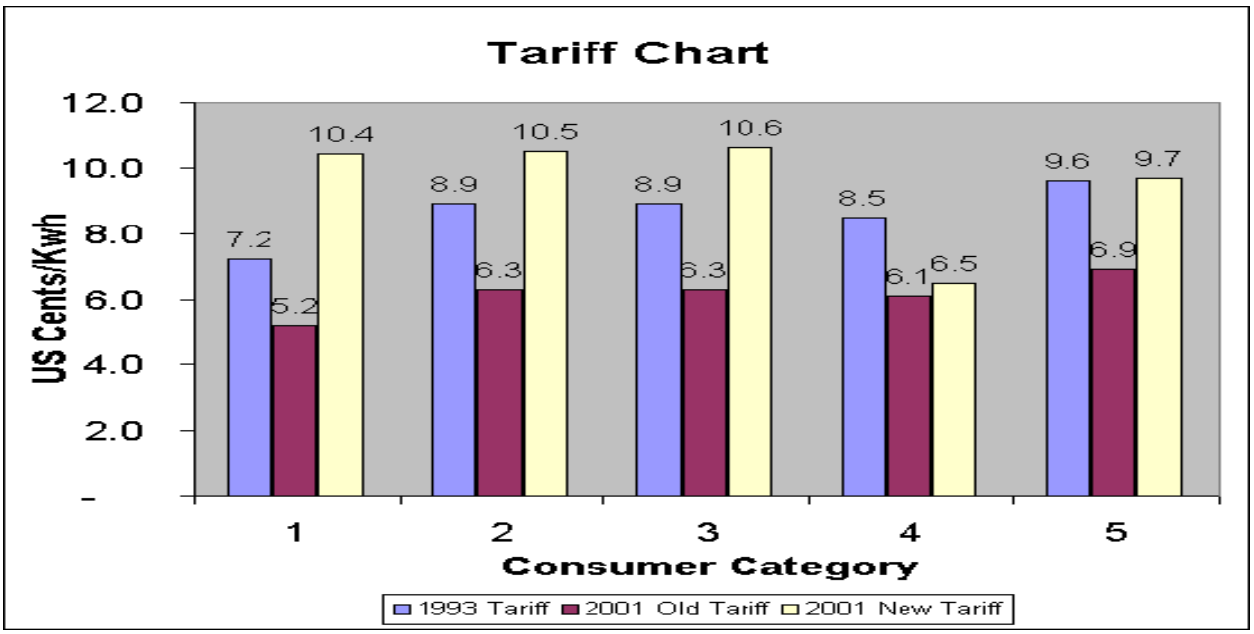
The Electricity Regulatory Authority (ERA) conducts annual electricity tariff reviews to ensure that the revenue requirements of the utility companies are met in a sustainable manner and the consumers are not overcharged. The annual tariff reviews are carried out in order to:

- ✓ Correct for inflation and currency exchange;
- ✓ Support new capital investments in the sector;
- ✓ Attract private sector investment in the sector;
- ✓ Remove cross subsidies to reflect the cost of supply for each customer category; and
- ✓ Cover operation and maintenance costs.

The current tariff structure provides for subsidies to the poor customers. However, the subsidy is within the same class of consumers and not across different classes. For example, during the 2001 tariff review, the domestic tariff for the first 30 kWh per month was set far below the long run marginal cost (LRMC) rate at Ushs. 20/= per kWh. Consumption

between 31 and 200 units per month was set near the LRMC at Ushs. 70/= per kWh; whilst consumption above 200 units was set above LRMC at Ushs. 100/= per kWh to subsidise poor customers. **Figure 8.4** shows the tariff trend for the past 10 years.

Figure 8.4 – Electricity Tariff Trend



8.4 Rural Electrification Program

Rural electrification forms an integral part of the Government's wider rural transformation and poverty eradication agenda. The Ministry of Energy and Mineral Development in consultation with the Ministry of Finance, Planning and Economic Development, the Ministry of Local Government and other stakeholders in the private and public sector prepared a Rural Electrification (RE) Strategy and Plan covering the period 2001 to 2010, which was approved by Cabinet. As part of this plan, Government in collaboration with the private sector has initiated a number of rural electrification programs, the most noticeable ones of which include the Energy for Rural Transformation (ERT) program and the Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE). These two programs are complementing the traditional approach of grid extension.

The primary objective of the RE Strategy is to reduce inequalities in access to electricity and the associated opportunities for increased social welfare, education, health and income generating opportunities.

8.4.1 Energy for Rural Transformation (ERT)

Under the ERT program, Government, in collaboration with the private sector and our development partners, is planning to undertake a massive rural electrification initiative covering all regions of Uganda.

Under the ERT program, Government aims to achieve a rural electrification rate of 10% by the year 2010 %. This implies that 480,000 rural consumers (a net increase of 400,000 over the year 2000 figure) are to be serviced. It is estimated that 15% of the increase in serviced households will come from higher connections to the existing grid outside the urban triangle, 40% from extension of the interconnected grid, 25% from isolated grids and 20% from photovoltaic solar systems.

8.4.2 Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE)

UPPPRE is one of the programs implemented by government to increase rural access to electricity as part of the Rural Electrification Strategy.

The aim of UPPPRE is to create the necessary conditions for accelerating access to electricity using solar technology by isolated and dispersed rural areas projected not to have access to grid-based electricity in the near future and which have both ability and willingness to pay the unsubsidized cost of the systems. On a macro level, the impacts of the program include:

- ✓ Prices of solar equipment have gone down by 30% due to an increase in the number of suppliers and buyers. There has been a recorded growth in sales of 20% per year.
- ✓ An increase in the number of people accessing solar systems with support of village banks and Micro-finance credit schemes. As a result more people in the rural areas are switching from Kerosene to solar lighting.

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CHAPTER NINE

COPING WITH WATER RELATED DISASTERS

9.1 Introduction

In Uganda water related disasters such as droughts, floods, landslides, windstorms and hailstorms contribute well over 70% of the natural disasters and destroy annually an average of 800,000 hectares of crops making economic losses in excess of 120 billion shillings. Economic loses resulting from transport accidents and fires and other climate related disasters are estimated at shillings 50 billion annually.

It should, however, be noted that it is difficult to establish the exact social and economic impacts of most of these disasters due to lack of a systematic approach and mechanism for collection of such data and information in the country. In most cases government and other relief agencies are only interested in offering relief aid to the affected persons during such disasters but no effort is made to comprehensively assess and document causes, extent and the social and economic impacts of the disasters. Worse still, as soon as the disaster has been contained, it is totally forgotten and no effort is made by any one to document the lessons learnt for future reference.

The vulnerability of many Ugandan communities to water related disasters is growing by the day due to many undesirable human activities such as deforestation, ecosystem degradation, environmental pollution, social unrest, transport accidents, urban and wild fires and poor land use in many parts of the country. It is well within our powers to do something about this. Better decision-making, improved planning, effective risk management, innovation in development and environmental protection activities - these are the human activities that can reduce the vulnerability of communities. To this effect, risk assessment and disaster reduction should be integral parts of all sustainable development projects and policies. Sustainable development projects and policies can significantly reduce the number and impact of disasters by building sustainable communities that have the long-term capacity to cope with and or withstand the hazards.

9.2 Major Water-related Disasters in Uganda

Past experience in Uganda shows that El Nino and Lanina episodes are the principal causes of the most severe water related disasters in Uganda. During a Lanina year chances of drought conditions, often leading to famine conditions, during the period November to April/May of the following year are increased especially over the eastern areas of the country. On the other hand during an El Nino year chances of intense flood level rains are increased during the period October to December over most parts of the country. The intense flood level rains are reflected in increased incidences of intense lightening and thunderstorms, hailstorms and windstorms/gust winds. The widespread flooding leads to destruction of life and property and increased outbreaks of waterborne diseases such as cholera and dysentery.

The strongest El Nino experienced in the recent past was the 1997/98 El Nino, which resulted in one of the worst widespread record floods witnessed by the country in more than

50 years. The floods mainly affected the eastern and central parts of the country, where several people died, transport infrastructure was damaged, crops and homes were destroyed and thousands of people were displaced from their homes. There were severe landslides experienced in the mountainous parts of eastern Uganda where many people and homes were buried and a lot of property destroyed. The moderate El Nino of 2002 also resulted in moderate floods also centred over the eastern areas of the country.

On the other hand during the 1998/99 Lanina there was severe drought experienced especially in the south-eastern part of the country. There were massive crop failures in many parts of the country, which resulted in widespread famine. It had to take the intervention of Government and other relief agencies to avert the human suffering that was unleashed by this drought. The drought mostly affected the "cattle corridor" where there was total lack of pasture and water for livestock. This resulted in a massive exodus of livestock to other less affected districts in search of pasture and water. This led to an outbreak of conflicts, cattle diseases and deaths of livestock.

Table 9.1 below shows some of the major documented water related disasters that have been experienced in Uganda in the recent past with their associated impacts.

Table 9.1 – Water Related Disasters in Uganda

Year	*Nature of Disaster*	*Impacts*
1961/62	El-Nino Rains	✓ Extensive floods experienced in many parts of the country; ✓ Destruction of Roads, Bridges, houses, crops, and property worth millions of dollars (actual loss not established); ✓ Drastic rise in the water level of Lake Victoria (by 2.5 M submerging all major infrastructure along the lake shores.
1993/94	Drought and Famine	✓ Over 1.8 million people were affected due to lack of food, water, and inadequate pasture for livestock.
1997/98	El-Nino Rains	✓ Landslides killed 53 people in total, and over 2,000 people were displaced. ✓ Roads, Bridges, houses, crops, and property worth more than US$ 20 million were destroyed.
1999	Drought and Famine	✓ Over 3.5 million people in 28 districts were affected by lack of food and a large number livestock suffered from inadequate pasture and water.

(Source: PEAP, 2004)

9.3 National Disaster Preparedness and Management Strategy

Following recognition of the severe socio-economic impacts of both natural and man-made disasters, Government decided to establish a fully-fledged Ministry in charge of disaster preparedness and management. The Ministry is under the Office of the Prime Minister. The Ministry is charged with the responsibility of coordinating all national disaster management and planning efforts. The Ministry liases with all other relevant

government institutions to ensure proper planning and coordination of all disaster related interventions in the country.

Government has also developed a Disaster Preparedness and Management Strategy whose key objective is to establish national and local capabilities to ensure that all the known natural and man-made hazards do not result into disasters and in the event that they do, the people affected can continue to meet their minimum needs for food, water, shelter, health, and security through their own efforts and minimal external appropriate assistance.

The fundamental principle underlying the Strategy is the recognition that the costs of responding to disasters once they strike far exceed the costs of disaster prevention and risk reduction activities. Indeed, worldwide, a three-fold multiplier has been found between effective disaster mitigation and emergency response. Further more the savings in relief costs due to mitigation is not a one-time saving; the value of disaster mitigation also saves response time and disaster victims/workers lives, etc. For example, during the 2002 El Nino, with a very small financial support from GTZ, the population was sensitized and prepared three months in advance and subsequently no person died when the El Nino and landslides eventually occurred.

The Strategy aims at creating an integrated and multi-sectoral approach to planning, preparedness and management of disasters in order to ensure sustained productivity and socio-economic development.

Government is also considering developing climate based Disaster Management policies and practices aimed at minimizing the population's vulnerability levels to climate based hazards and to save lives and livelihoods when such disasters occur. The desired policies are to focus on providing early warning information of approaching disasters, predicting and mitigating their impacts on the country, the population and people's livelihood, preparing for and managing the disaster. Government's intention is to come up with a comprehensive integrated National Early Warning System (EWS) for food security and overall disaster prevention, mitigation and overall management.

9.4 National Disaster Preparedness and Management Policy

The overall objective of disaster preparedness and management in Uganda is to save lives and livelihoods, and to reduce Uganda's vulnerability to likely disasters, in cooperation with local communities, NGOs, local and international donor organizations, and enhance the country's capability to contain or minimize the social and economic effects of disasters.

The National Disaster Preparedness and Management Policy sets the overall policy goal and objectives for disaster management in Uganda. The overall policy goal is:

"To promote, in relation to disasters, prevention, preparedness, mitigation, response and recovery to be implemented in a manner that integrates disaster management with development planning and programming."

The main Policy objective is to ensure that the people of Uganda can avoid serious social and economic disruptions as a result of disaster events. Underlying these broad policy objectives are certain key principles, which will guide policy development and implementation. These include:

(i) The adoption of a multisectoral approach to disaster management;
(ii) Capacity building for key national and local stakeholders to effectively participate in all disaster management initiatives;
(iii) Establishment of a comprehensive and effective early warning system for impending disasters;
(iv) Integration of gender concerns in all disaster management plans and intervention; and
(v) Adoption of an inter-agency coordination and collaborative mechanism for disaster management.

The Policy provides a broad framework for harmonization of sectoral and cross-sectoral policy objectives, principles and strategies relevant to disaster management in the country.

9.5 Challenges of Coping with Water-related Disasters

Water related disasters cause a disruption of economic activities and a consequent loss of production. This affects the preparedness, mitigation and recovery processes/stages of the disaster management cycle. Secondly, disasters usually cause enormous losses in life equipment and property worth million of shillings. These would have been very useful and instrumental in the response and recovery stages of disaster management.

Natural disasters especially drought earthquakes and landslides lead to the destruction of farmlands and livestock leading to famine and household food security undermining the mitigation and recovery stages in disaster management. The socio-economic dislocation and the destruction of the physical infrastructure inhibit the speed of recovery, rehabilitation and increase the expense of future mitigation.

The loss of shelter, the exposure to the elements, the increased economic and physical vulnerability all result in risen morbidity and mortality rates; further undermining the process of recovery and rehabilitation.

The disasters also cause an ecological breakdown/environmental erosion, pollution, and destruction of the environmental base. This erodes the base for the recovery process as well as limiting the speed of the rehabilitation.

Natural disasters often lead to political and social instability. This is because they often lead to displacement, unemployment and as a result political discontent and civil unrest. This usually undermines the processes of mitigation, rehabilitation and recovery.

9.6 Future Outlook

Based on the lessons learnt in the last five years, Government is now refocusing its efforts towards a more holistic approach to disaster management in Uganda. Government is in the process of further strengthening the enabling policy, legal and institutional framework required to address cross-sectoral disaster management issues. There are also plans to strengthen the national and local capacity for disaster preparedness and management in the country. This will go hand-in-hand with the enhancing the existing administrative and coordination mechanisms for disaster preparedness and management in the country.

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CHAPTER TEN

SHARED WATER RESOURCES

10.1 Transboundary Setting of Uganda's Water Resources

Almost all of Uganda's water resources are transboundary in nature and shared with her neighbors. This poses the challenge of Uganda making maximum use of the water resources within its territory for her socio-economic development while not compromising the legitimate right by her neighbors to the same shared resources. As a result, Uganda has been very keen on fostering close collaboration with her neighbors in the joint planning, management and development of the shared water resources.

The transboundary nature of Uganda's water resources has greatly influenced the legal and institutional framework adopted for the management of the country's water resources. This influence is also reflected in the significant number of regional water resources management and development initiatives that Uganda is involved in.

Within this transboundary context, Uganda is interested in ensuring that all its shared waters are managed optimally and equitably to derive mutual benefits for all the riparian countries. Specifically, Uganda is keen on ensuring sustainable inflows of water of adequate quantity and quality from its upstream riparians and securing an equitable share of the shared waters to support its national economic and social objectives.

The strategic framework for the development and management of water resources in Uganda recognizes two important principles. First, water is fundamental to achieving the national objective of poverty eradication through the promotion of rapid economic growth, good health, food security, and social equity. Secondly, within the regional context, cooperative development of shared water resources can serve as a catalyst for a broader range of cooperation and economic integration. Equitable use of the shared waters and utilization of the comparative advantages of the riparian countries, using water where it can most efficiently and cost-effectively produce power, grow food, and support industrialization, provides the greatest opportunities for sustainable growth and development in the region and sustainable use of the resource.

10.1.1 Uganda's major Shared Water Bodies

Uganda's major shared water bodies include the following:

(a) Lakes:
- ✓ Lake Victoria – Shared with Kenya and Tanzania;
- ✓ Lake Albert – Shared with the Democratic Republic of Congo;
- ✓ Lake Edward – Shared with the Democratic Republic of Congo

(b) Rivers:
- ✓ River Nile – Shared with Democratic Republic of Congo, Burundi, Rwanda, Tanzania, Kenya, Sudan, Egypt and Ethiopia;
- ✓ River Kagera – Shared with Burundi, Rwanda and Tanzania;
- ✓ River Semiliki - Shared with Democratic Republic of Congo;
- ✓ River Malaba – Shared with Kenya;
- ✓ River Sio – Shared with Kenya;
- ✓ River Aswa – Shared with Sudan;

10.2 River Nile Basin

River Nile is the longest river in the world with a total length of about 6700Km and a basin area of about 3 Million Km^2. The Nile basin is shared by 10 countries (Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda) with a total population of about 300 million people, 160 million of whom live within the basin and rely on the Nile Waters for their basic socio-economic needs. **Figure 10.1** shows a map of the Nile Basin.

Uganda occupies a unique position in the Nile Basin as she is a downstream country with respect to Kenya, Burundi, Rwanda, Tanzania, and Democratic Republic of Congo, and is also upstream with respect to Egypt and Sudan. This position puts Uganda in a very delicate situation, which calls for very careful articulation of her interests with respect to both upstream and downstream countries. Given her unique position in the basin, Uganda has until now opted for a more flexible approach in engaging other riparian countries on complex Nile water issues as opposed to the rigid either "downstream" or "upstream" positions. This has ensured that Uganda's national interests are safeguarded without necessarily antagonizing any of the riparian countries.

Generally, Uganda is interested in ensuring that the Nile waters are managed and developed optimally and equitably to derive mutual benefits for all riparian countries while safeguarding her national interests. Uganda is keen on ensuring the unimpeded utilization of an equitable share of the Nile waters to support her national economic and social development objectives. Of specific interest is the consumptive use of the Nile waters for irrigated agriculture and domestic and industrial purposes. Uganda is also interested in the regulation of the equatorial lakes for optimal hydropower generation and flood control.

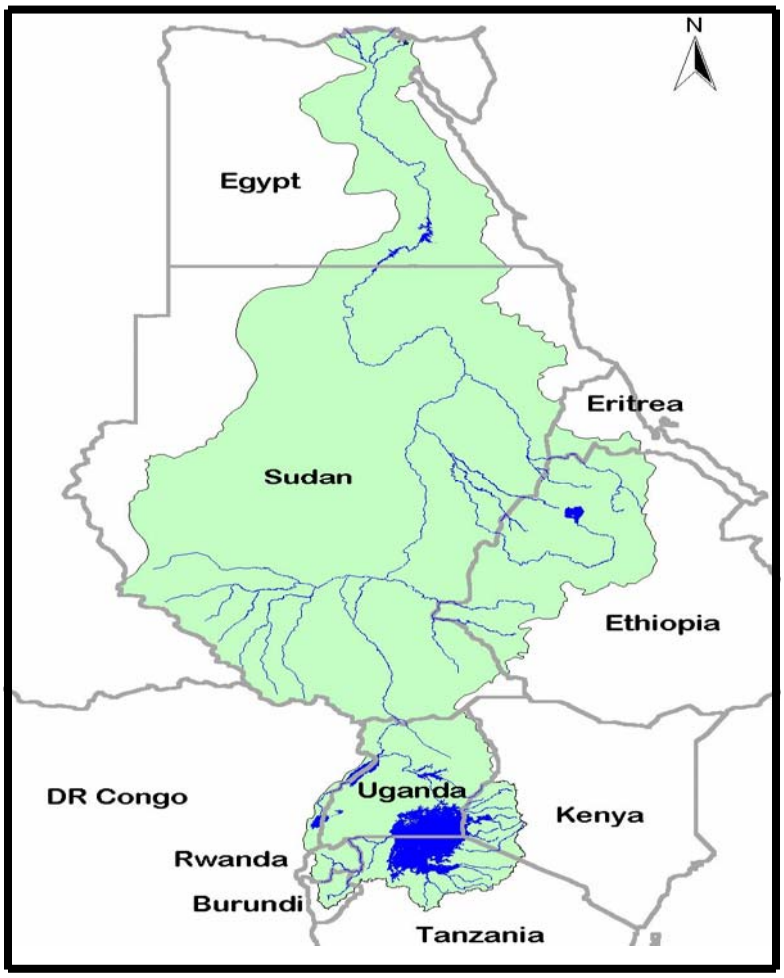

Figure 10.1: Uganda's location in the Nile Basin

Table 10.1 gives statistics related to the water resources availability and utilization for the different Nile basin countries. The table shows that, in spite of the development opportunities presented by the Nile water resources, only a few of the riparian countries use the waters on a large scale.

Table 10.1 - Water Resources availability and utilization in the Nile basin

Country	Population	GDP (Million US$)	% of Total Basin Area	Total Renewable Water (TRW) Resources (Km^3/Year)	Internal Renewable Water Resources (KM^3/Year)	% of Irrigated Land	Irrigation Water Withdrawal as % of TRW
Burundi	6,356,000	977	0.43	3.6	3.6	7.0	5.0
DR Congo	50,948,000	4,187	0.71	1,283.0	935.0	0.1	0.01
Egypt	67,884,000	81,003	9.06	58.3	1.7	100	93.0
Eritrea	3,659,000	672	0.12	6.3	2.8	4.0	5.0
Ethiopia	62,908,000	7,966	11.74	110.0	110.0	2.0	2.0
Kenya	30,669,000	9,971	1.68	30.2	20.2	1.0	3.0
Rwanda	7,609,000	2,183	0.68	6.3	6.3	0.4	0.4
Sudan	31,095,000	10,215	63.75	88.5	35.0	12.0	56.0
Tanzania	35,119,000	6,812	3.96	89.0	80.0	3.0	2.0
Uganda	23,300,000	8,110	7.87	66.0	39.2	0.1	0.2

Source: The United Nations World Water Development Report, 2003.

Despite the tremendous natural resources in the Nile Basin, most of the riparian countries are among the poorest in the world (four of which are among the 10 poorest countries in the world). Seven of the 10 countries have a GDP of less than US$ 300. This situation has been compounded by a number of factors including political instability, rapid population growth, extensive environmental degradation, and increasing water scarcity in several parts of the basin.

10.2.1 The Nile Flows

The flows of the Nile are highly variable from year to year. Figure 10.2 shows the long-term variations in flows of the Nile at Jinja, Kyoga Nile at Masindi Port and Albert Nile at Panyango.

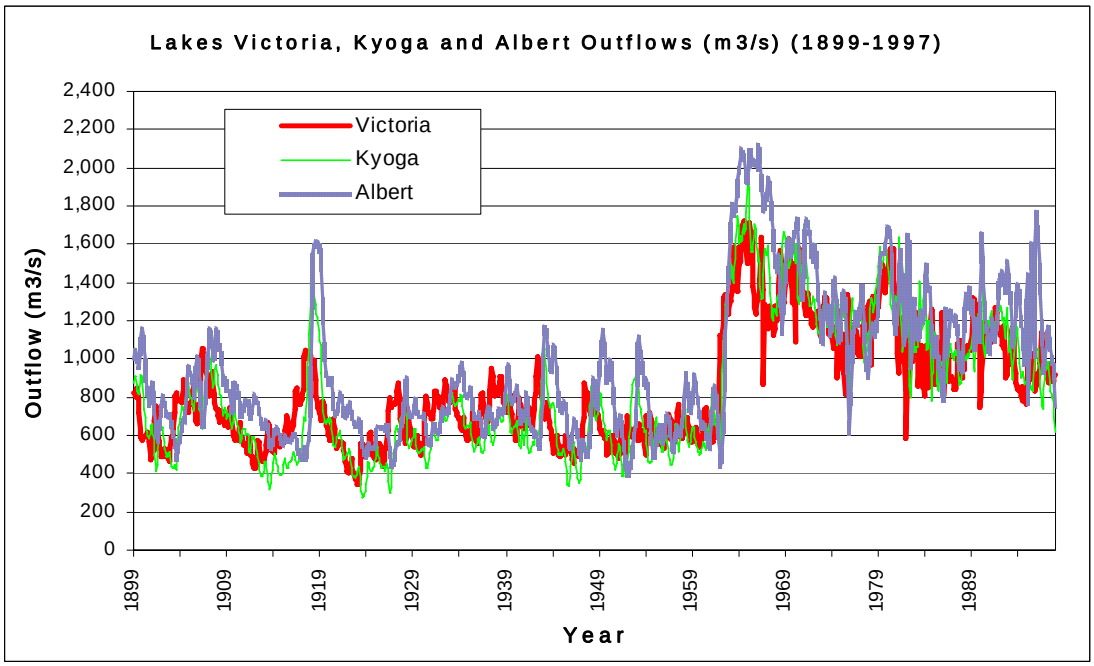

Figure 10.2 – Long-term variations in outflows of Lakes Victoria, Kyoga and Albert

The long-term average outflow from Lake Victoria has been 840 m^3/s, and the range of outflows is between a minimum of 345 m^3/s and a maximum of 1720 m^3/s. At the 95% monthly reliability level, the flow of the Victoria Nile is of the order of 495 m^3/s.

10.3 Lake Victoria Basin

Lake Victoria is the second largest freshwater body in the world with a surface area of 68,800 km^2 and an irregular shoreline of about 3,440 km. The lake is shared by three riparian states (Kenya 6%, Tanzania 49%, and Uganda 45%, by area), with a total catchment area of about 193,000 km^2 extending over five countries (Kenya, Tanzania, Uganda, Burundi, and Rwanda). The lake is generally shallow (max. depth 84 m; mean depth 40m), and is drained by a number of large rivers. River Nile, which begins its long journey to the Mediterranean sea from Jinja, is the single outlet from the lake. **Table 10.2** shows the main rivers draining into Lake Victoria.

Table 10.2 - Major rivers draining into Lake Victoria

Country	*River*	*Average Discharge (m^3/s)*	*Percentage Contribution (%)*
Kenya	Sio	11.4	1.5
	Nzoia	115.3	14.8
	Yala	37.6	4.8
	Nyando	18.0	2.3
	North Awach	3.7	0.5
	South Awach	5.9	0.8
	Sondu	42.2	5.4
	Gucha-Migori	58.0	7.5
Tanzania	Mara	37.5	4.8
	Grumeti	11.5	1.5
	Mbalageti	4.3	0.5
	East Shore Streams	18.6	2.4
	Simyu	39.0	5.0
	Magogo Maome	8.3	1.1
	Nyashishi	1.6	0.2
	Isanga	30.6	3.9
	South Shore Streams	25.6	3.3
	Biharamulo	17.8	2.3
	West Shore Streams	20.7	2.7
	Kagera	260.9	33.5
Uganda	Bukora	3.2	0.4
	Katonga	5.1	0.7
	North Shore Streams	1.5	0.2
	Total	778.3	100.0

Source: COWI 2002

10.3.1 Water Balance of Lake Victoria

Table 10.3 shows the water balance of Lake Victoria. The table shows that direct rainfall over the lake surface is the biggest input into the lake, contributing 82% of the total inflow, while evaporation from the lake is the biggest output from the lake accounting for 76% of the total outflow. The contribution of runoff from the terrestrial catchments is, therefore, about 18 % only.

Table 10.3 - Average inflows to and outflows from Lake Victoria

Average 1950 - 2000	*Flows (m^3/s)*	*Percentage (%)*
Rain over lake	3631	82
Basin discharge	778	18
Evaporation from lake	-3330	76
Victoria Nile	-1046	24

Source: COWI 2002

10.3.2 Lake Level Variations

The long-term variations in levels of Lakes Victoria, Kyoga and Albert is Shown in **Figure 10.3**. According to available historical records, Lake Victoria levels have varied between a minimum of 10.22 m and a maximum of 13.33 m on the Jinja gauge. Between October 1961 and May 1964, the water level in Lake Victoria rose rapidly by 2.5 m as a consequence of extraordinary high rainfall. Since that time the levels have remained high, but appear to be on a declining trend. The variations in levels of Lakes Kyoga and Albert follow the same pattern as Lake Victoria, the main source of inflow into the Lakes.

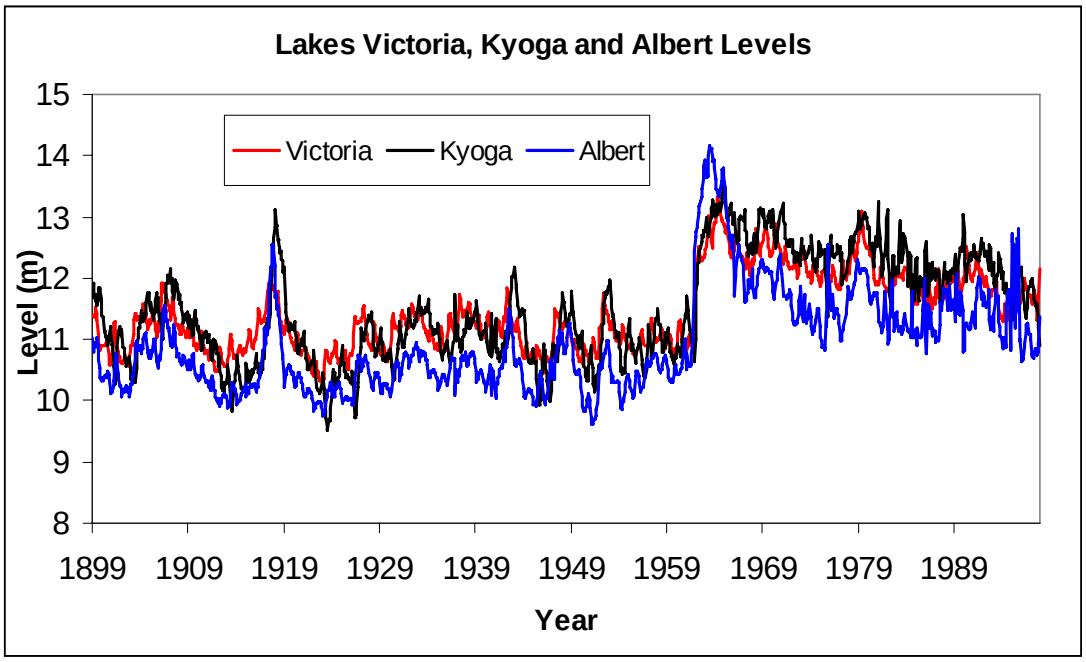

Figure 10.3 – Long-term variation in levels of Lakes Victoria, Kyoga and Albert

10.3.3 Socio-economic Potential

The total population of countries within the Lake Victoria basin is nearly 100 million, of which nearly 33 million are living in the Lake Victoria Basin. Lake Victoria is a vital natural resource with enormous potential to spur social and economic development of the riparian countries. The potential has been identified in the areas of fishery, agriculture, tourism, water supply, transport, hydropower generation, industry, and in Trade and investment. However,

this potential has not been fully harnessed resulting in high levels of poverty among the majority of the inhabitants of the basin.

10.4 River Kagera

The Kagera basin is spread over Burundi, Rwanda, Tanzania and Uganda with a total area of 59,800 Km^2, contributed as shown in the **Table 10.4** below. **Figure 10.4** shows the extent of the R.Kagera basin.

Table 10.4 – River Kagera Basin

Country	*Catchment Area (Km^2)*	*% of total Catchment Area*
Burundi	13,060	22
Rwanda	20,550	34
Tanzania	20,210	34
Uganda	5,980	10
Basin	59,800	100

The Kagera is the largest of the 23 rivers that drain into Lake Victoria, and it carries 34 % of the annual inflow to the lake, over twice as much as the next largest river, the Nzoia in Kenya. This proportion drops to 24 % when the input of rain less evaporation on the lake surface is taken into account.

An estimated 14 million people, almost 40 % of the 35 million within the Lake Victoria basin, live in the Kagera basin. The population density within the basin averages 227 persons/Km^2, 30 % higher than the 174 persons/ Km^2 in the rest of the Lake Victoria basin.

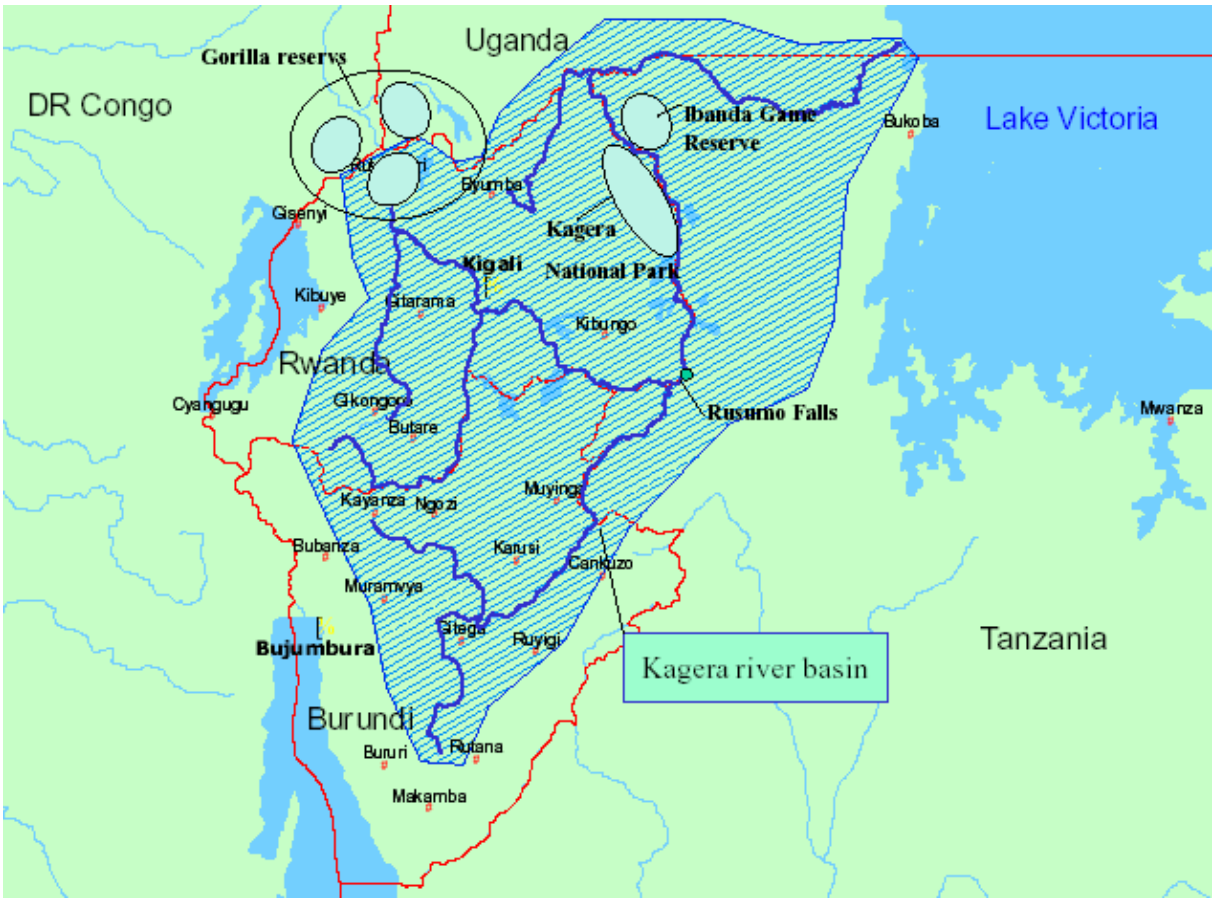

Figure 10.4 – River Kagera Basin

10.5 Vision and Goals

Management of shared water resources is a very complex process, more so in an environment characterised by high poverty levels, high population pressures, rampant environmental degradation, and lack of trust among the riparian states. Success of such a complex process requires high levels of cooperation and commitment by all the riparians through consensus on a common set of shared values and vision.
The shared water resources management initiatives that Uganda is currently involved in are all based on a common vision agreed on by all the riparians. These visions are all focussing on the promotion of socio-economic development of the riparian countries through eradication of poverty, enhanced food security, and strong regional cooperation and integration.

10.5.1 Nile Basin Shared Vision

In order to use the shared water resources to stimulate socio-economic development in the basin, the Nile basin countries negotiated and agreed on a "Shared Vision":

'To achieve sustainable socio-economic development through the equitable utilization of, and benefits from, the Common Nile Basin Water Resources".

The Shared Vision demonstrates a high level of commitment by the riparian countries towards the Nile basin cooperation and is based on a legacy of mutual trust and confidence between the Nile basin countries. The shared vision provides the broad integrating framework with in which the countries can jointly undertake 'win-win' water resources management and development projects and programs in order to meet their development goals. The shared vision also gives firm political commitment and legitimacy to the cooperation process and ensures ownership of the process by all the concerned parties.

A Strategic Action Program has been launched to translate the NBI's shared vision into action. This consists of two complementary sub-programs, i.e:

- ✓ ***A Shared Vision Program (SVP)*** – Which is comprises of seven basin-wide projects intended to create an enabling environment for cooperative development, and;

- ✓ ***Subsidiary Action Programs (SAPs)*** – Which are implemented by smaller groups of Nile riparian states, comprising physical investment at sub-basin level involving two or more countries.

The linkage between the "Shared Vision" and the Strategic Action Program is shown in **Figure 10.5** below.

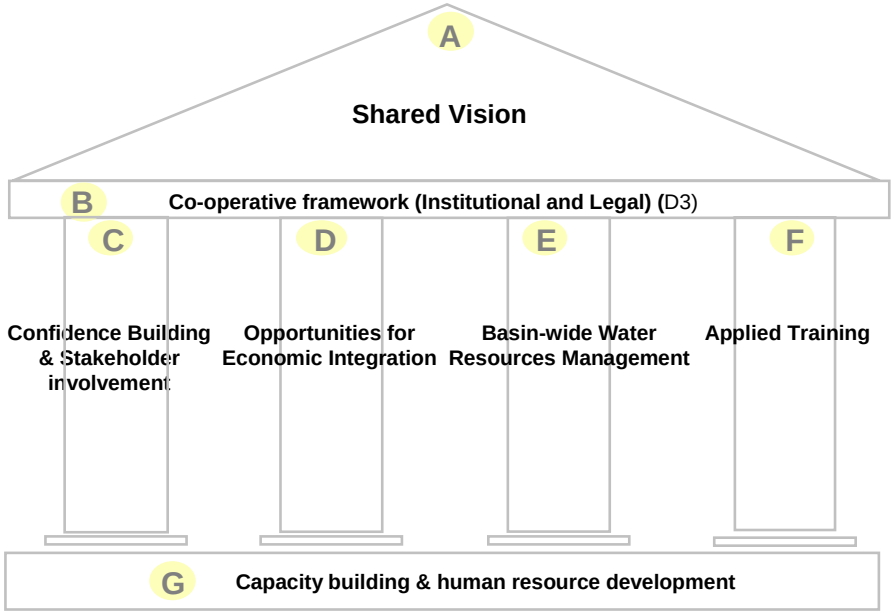

Figure 10.5 – Linkage between the Shared Vision and the Strategic Action Program

In order to ensure effective implementation of the Strategic Action Program, the Nile basin countries agreed on a set of policy guidelines, which emphasize that all intervention measures are to be planned at the lowest appropriate level. The appropriate planning level needs to involve all those who will be affected Given the hydrological conditions of the Nile Basin, action on the ground will mainly be planned and implemented at sub-basin level.

10.5.2 Lake Victoria Basin Shared Vision

In order to promote equitable economic growth, poverty eradication and sustainable utilization of natural resources and protection of environment, the Lake Victoria basin countries agreed on a "Shared Vision":

"***To ensure a prosperous riparian population living in a healthy and Sustainably managed environment providing equitable development opportunities and benefits."***

On the basis of this mission, the basin countries jointly prepared the East African Co-operation Development Strategy (1997 – 2000) in which the Lake Victoria Basin was designated as a regional economic growth zone to be developed through a coordinated implementation process by the Partner States (EAC, 1997a). Recognizing that a healthy environment is a prerequisite for sustainable development, the EAC Partner States have also agreed to take concerted measures to foster cooperation in the joint and efficient management of and the sustainable utilization of the natural resources within the basin for their mutual benefit.

10.6 Legal Framework for Management of Shared Water Resources

The overall policy objective for the water sector in Uganda is:

"To manage and develop the water resources of Uganda in an integrated and sustainable manner, so as to secure and provide water of adequate quantity and quality for all social and economic needs of the present and future generations with the full participation of all stakeholders."

With regard to shared water resources, the policy directions draw heavily on the globally accepted principles of international water law, the key ones being:

	Principle	*Implication*
1	***Equitable and reasonable utilisation of shared water resources***	This principle recognises the sovereignty of the states where the resource is located and the right of those states to use or share the resource. At the same time the principle imparts an obligation on the part of the state using the resource not to injure the interests and rights of other states sharing the resource
2	***Obligation not to cause significant harm to co-riparians***	This principle demands that, in utilizing the shared resources, riparian states are required not to cause significant harm to the interest of other states by pollution or other conduct.
3	***Prior notification***	The principle requires that each of the riparian States should notify other riparian States of planned measures or planned activities within its territory that may have adverse effects upon those other States.
4	***Information sharing***	The principle also requires riparian states to cooperate and share information regarding the development of shared water resources. It is also the basis upon which riparian states can build a reliable and comprehensive knowledge base of the shared watercourse as a basis for planning and sharing of beneficial uses.
5	***Community of interest in an international watercourse***	This principle requires that all riparian States sharing an international watercourse system have an interest in the unitary whole of the system.
6	***Environmental impact assessment and environmental audits***	This principle requires all riparian states to carry out an environmental impact assessment of any planned activity and environmental audits existing projects and economic activities in a shared basin.
7	***Precautionary principle***	This principle requires that each riparian State takes the necessary measures to prevent environmental degradation from threats of serious or irreversible harm to the environment.
8	***"Polluter pays" principle***	This principle requires that the person/State that causes the pollution, shall as far as possible bear any costs associated with it.

The above principles have also formed the basis for the preparation of the specific cooperative legal frameworks for the management of shared water resources in the region.

10.6.1 Legal Framework for the sustainable management of the Nile waters

Treaties regarding the management of the waters of the Nile Basin date back to 1929 when Great Britain and Egypt signed an agreement under which no irrigation, power works or other measures were to be constructed or taken on the Nile and its branches or on lakes from which it flows in the Sudan or in countries under British administration except with the previous agreement of the Egyptian government. The Agreement was followed by the 1959 Agreement on the Full Utilization of the Nile Waters, which was signed between Egypt and Sudan. The 1959 Agreement apportions the waters of the Nile between the two signatory states.

Given the new political dispensation in the Nile basin, the Nile Basin countries, in 1995, embarked on the process of negotiating and developing a new Nile Basin Cooperative Framework Agreement for the sustainable management and development of the shared Nile water resources. This process is still ongoing and it is envisaged that once these negotiations are successfully concluded, the resulting agreement will supersede all the existing Nile water agreements.

10.6.2 Protocol for the Sustainable Development of the Lake Victoria Basin

This protocol was signed by the three East African States (Uganda, Kenya and Tanzania) in November 2003 and is supposed to be ratified by the three states by November 2004 for it to become effective. The protocol puts in place a comprehensive legal framework for the sustainable management and utilization of the water resources of the Lake Victoria basin.

Besides the above protocol, several other specific legal instruments have been signed between the Lake Victoria basin states for the management of the basin's natural resources. These include among others:

- ✓ The 1977 agreement setting up the Kagera Basin Organization (KBO) for the integrated development of the Kagera River basin;
- ✓ The 1994 Convention establishing the Lake Victoria Fisheries Organization (LVFO) for the sustainable management of the Lake Victoria Fisheries resources;
- ✓ The 1994 agreement for the establishment of the Lake Victoria Environment Management Program (LVEMP);

10.7 Institutional Framework for the Management of Shared Water Resources

The lead agency for management of shared water resources in Uganda is the Directorate of Water Development. The institutional framework for the management of shared water resources, therefore, follows the existing water sector institutional framework described in Chapter 3, Sections 3.4.

However, besides the national level institutions, specific regional institutions have been established by the riparian countries to manage the shared water resources. The most notable of these include:

10.7.1 The Nile Basin Initiative

The Nile Basin Initiative (NBI) is a transitional institutional arrangement set up in 1999 by the Nile basin countries to oversee the implementation of the Nile River Basin Action Plan pending establishment of a permanent legal and institutional framework for the Nile Basin. The NBI consists of a Nile Basin Council of Ministers responsible for water affairs (Nile COM), which is the top policy organ of the NBI; a Technical Advisory Committee (Nile TAC) comprising of two senior government technical officials to advise the Ministers; and a Nile Secretariat which provides administrative support to the Nile COM and Nile TAC. The NBI institutional set-up is shown in **Figure 10.6** below.

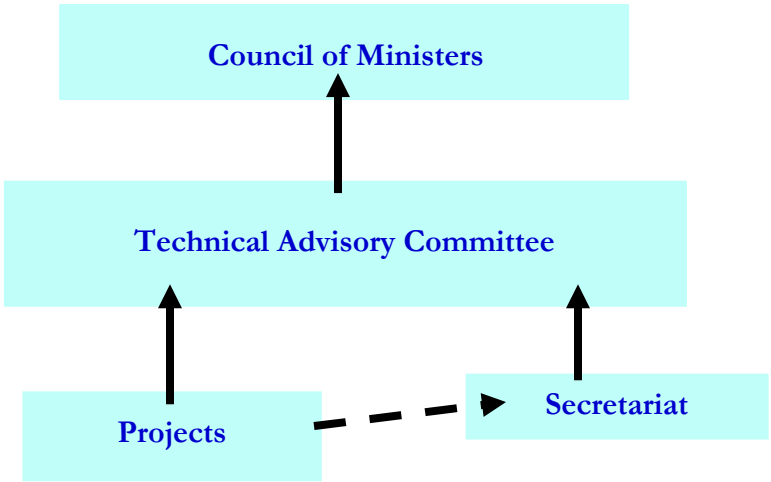

Figure 10.6 - Nile Basin Initiative Institutional set-up

10.7.2 The Lake Victoria Development Program (LVDP)

The current institutional set-up for the Lake Victoria Development Program (LVDP) is shown in **Figure 10.7** below. It is envisaged that upon ratification of the Lake Victoria

Protocol, the Lake Victoria Basin Commission will be established to replace the current institutional set-up.

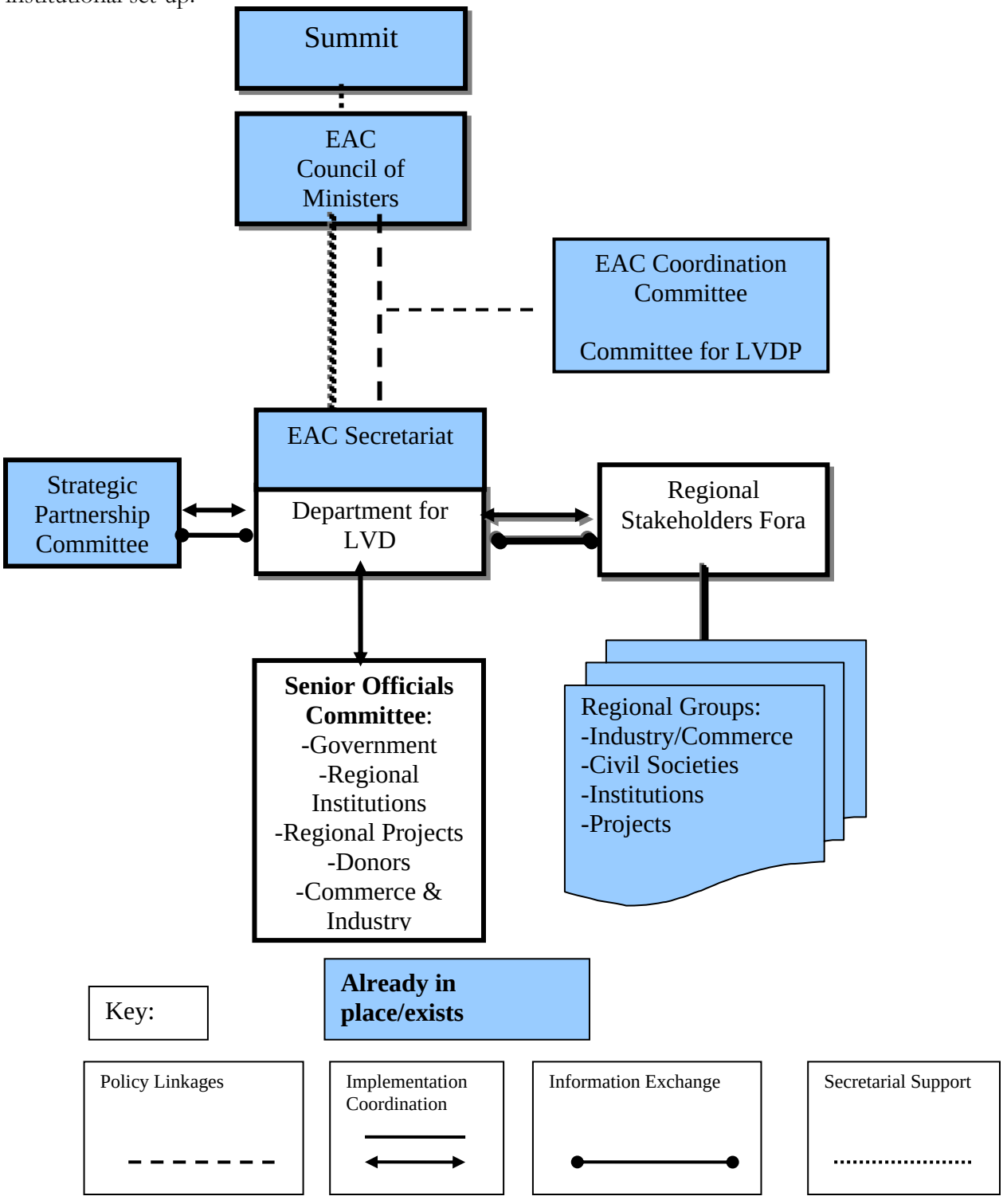

Figure 10.7 – LVDP Institutional set-up

10.8 Ongoing Programs and Projects

There are a number of ongoing shared water programs and projects in which Uganda is involved, aimed at promoting sustainable management and development of shared water resources in the region. These are summarized in **Table 10.5** below.

Table 10.5 – Shared Water Projects and Programs

Project	*Brief Description/Status*	*Funding Agency*
Nile Basin Initiative Shared Vision Program	✓ Implemented by the 9 Nile basin countries and comprises of 7 projects in the following areas: Environment, Applied Training, Agriculture, Hydropower, Water Resources Management, Socio-economics, Confidence Building. ✓ Most of the projects are to commence by December 2004.	Consortium of Donors coordinated by World Bank
Nile Equatorial Lakes Subsidiary Action Program (NELSAP)	✓ Implemented by 6 countries (DR Congo, Burundi, Rwanda, Kenya, Tanzania and Uganda) and comprises of 6 projects in the following areas: Fisheries management, River basin management, Hydropower, Agriculture.	SIDA, NORAD, African Development Bank
Lake Victoria Environmental Management Program	✓ Implemented by Uganda, Kenya, and Tanzania and comprised of 10 components i.e. Fisheries Management and Research, Water Quality and Ecosystem Management, Wetlands Management, Land Use Management and Pollution Control, Catchment Afforestation, Water Hyacinth Control, Capacity Building, Micro-projects, and Municipal and Industrial Waste Management. ✓ Phase 1 of the project commenced in 1997 and is to be completed in 2004. Phase 2 is under preparation.	World Bank, GEF, SIDA
Nile Basin Water Resources Projected	✓ Implemented by the 10 Nile basin countries, including Eritrea with technical support from FAO. ✓ Major areas included; Development of the Nile Basin Decision Support System (Nile DST), Upgrading of the Hydrometric monitoring system in the basin, strengthening of water resources databases, Capacity building in Legal, Institutional and GIS skills. ✓ Project commenced in 1996. Phase 3 of the project is scheduled to commence in December 2004.	Government of Italy.

Transboundary Agro-Ecosystem Management Project for the Lower Kagera Basin	✓ Implemented by Rwanda, Tanzania and Uganda with technical support from FAO. ✓ Its objective is to protect ecosystems in the lower Kagera basin through the productive and sustainable use of biodiversity resources and agricultural ecosystems. ✓ Project commenced in 2003.	GEF
The Nile Basin Discourse (NBD)	✓ The NBD was created to mobilize civil society in the development of the Nile basin. The NBD has facilitated the establishment of National civil society forums in all the Nile basin countries.	IUCN
The Lake Victoria Development Program	✓ Implemented by Uganda, Kenya and Tanzania, with the possibility of Rwanda and Burundi joining in the near future. ✓ Addresses all the key socio-economic development activities in the Lake Victoria basin.	Various donors including SIDA, World Bank, ADB, etc.

10.9 Shared Water Resources Management Issues and Challenges

10.9.1 Issues

The key shared water resources management issues of relevance to Uganda include:

(a) Hydropower - Overall, hydropower is relatively little developed in Uganda, but power demand is increasing rapidly and the availability of electricity is limiting development. There is substantial potential for increased development of reliable, low-cost power, for example through expansion of hydropower production and through exploring opportunities for regional power trade. There is, therefore, need to promote optimal development, management, and use of the shared water resources of the equatorial Nile for hydropower production.

(b) Irrigation - Agriculture, which is of great economic and social importance, is by far the largest potential water user in the region. Improvements in agricultural practices and water use efficiency are key factors in ensuring food security in the region and Uganda in particular. There is, therefore, need to prepare and implement a plan to develop and use water resources in Uganda for modernization of agriculture.

(c) Environmental concerns - The major environmental issues related to shared water resources include land degradation, water quality deterioration, aquatic weeds infestation, drainage of wetlands, floods and droughts. There is need for joint collaboration in the protection of the shared water resources from environmental degradation.

(d) Institutional Capacity - Strong national and regional institutions are an important element in achieving sustainable management and development of the shared waters and enhanced regional cooperation. There is need to build capacity in the national and international aspects of water resources planning, management and development.

(e) Participation and public awareness – Effective stakeholder participation and increased public awareness is a pre-requisite for sustainable management and development of shared waters. There is, therefore, need for putting in place mechanisms for effective stakeholder participation in all water resources management and development activities and comprehensive communication strategies for sustained public awareness on salient water resources issues.

10.9.2 Challenges

(a) ***Conflicting interests*** – One of the greatest challenges in shared water resources management and development is dealing with the conflicting interests from the different riparians. For example, in the Lake Victoria basin, whereas Kenya and Tanzania are interested in inter-basin water transfers to meet their domestic, industrial and irrigation water needs in the water scarce parts of their countries, Uganda on the other hand is interested in the uninterrupted flow of water into Lake Victoria to support its hydropower production at Owen Falls Dam. This, therefore, calls for joint basin-wide planning and implementation of "win-win" projects.

(b) ***Mistrust among the riparians*** – High levels of mistrust among the riparians can be a big set-back to any development efforts in a shared basin. There always exists suspicion and ill-feelings among the riparians in what the other riparians could be doing with the shared waters! This is reflected in the reluctance by the riparians to share data on the shared water resources and information on planned and existing development projects in the individual countries.

(c) ***Fragmented and incompatible national water resources management and development plans –*** In most cases, each riparian country has its own national water resources management and development plan which does not take into consideration the broader basin-wide management and development issues. This often results in implementation of conflicting development projects, duplication of activities and wastage of resources. There is therefore need for joint basin-wide planning and implementation of "win-win" projects with more emphasis being put on the "sharing of benefits".

(d) ***Environmental conservation –*** It is obvious that poor water resources management practices in the upstream countries can result in serious environmental issues for the downstream countries too. The challenge is always how downstream countries can influence the way activities are implemented in the upstream countries and how to ensure that the upstream countries contribute towards the cost of environmental restoration activities in the downstream countries.

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CHAPTER ELEVEN

WATER EDUCATION AND CAPACITY BUILDING

11.1 Situation Analysis

11.1.1 Introduction

Basic education is a fundamental right for all human beings and one of the essential elements for ensuring successful implementation and sustainability of water sector activities and for combating poverty in general.

The process of developing, maintaining and disseminating knowledge on water in such a way that all stakeholders benefit and feel part of the process remains a big challenge to the water sector. The government of Uganda has however recognized the seriousness of this challenge and has embarked on the process of implementation of appropriate intervention measures to address the issue.

Although most of the water sector personnel are highly trained and have the requisite qualifications for their respective job assignments, many of them still require specialized refresher training to keep on-form with the rapid technological and scientific advancements. However, the major problem still remains the low priority rating given to training and capacity building activities by the policy makers, which is evident in the small budgetary allocations channeled to this area. In addition the high labor turn over amongst local government personnel who have under gone training continue to affect efforts to build capacity at that level. For example, in the 13 districts of Eastern Uganda covered by RUWASA project, practically all the six graduate district water officers moved to other employment after acquiring Masters degrees. Although the government training policy recommends bonding of staff for at least three years after completion of the course, lack of enforcement makes the policy ineffective. To a greater majority of the leaders therefore investment in capacity building is considered a waste of resources. As a result, funds are not readily provided for training, both at the central and local government levels.

11.1.2 Literacy Rate

According to the Uganda National Household Survey 2002/2003, the adult literacy rate in Uganda is estimated at 69%. The same survey indicated that 17% of the population aged 15 years and above have never had any formal education and 44% have not completed primary education.

Uganda's literacy rate has continued to rise over the years but there remains a gender imbalance as shown in the **Table 11.1** below.

Table 11.1 – Literacy Rate Trend

Population Category	*1997*			*2003*		
	Average	Male	Female	Average	Male	Female
10 years and above	65%	72%	58%	70%	77%	63%
18 years and above	62%	75%	51%	69%	80%	59%

(Source: Ministry of Education and Sports, 2004)

The observed increase in literacy rate is mostly attributed to the introduction of Universal Primary Education (UPE) in 1997. Despite this intervention, the literacy rate still remains low and therefore more resources have to be injected into the sector if the MDG targets are to be met.

11.1.3 Free Basic Education

Free basic education, popularly known as Universal Primary Education (UPE), is one of Government's strategies to address the low literacy rates in Uganda. The strategy provides for free primary education for all children of school going age. This strategy was emphasizes the role of education (literacy and numeracy) in human resource development and enhancing the quality of life for the poor in Uganda.

Since the introduction of UPE in 1996, the total enrolment in primary schools has risen from about 2.5 million in 1996 to over 7.3 million in 2003. **Figure 11.1** shows the distribution of primary school enrolment in the different regions in the country.

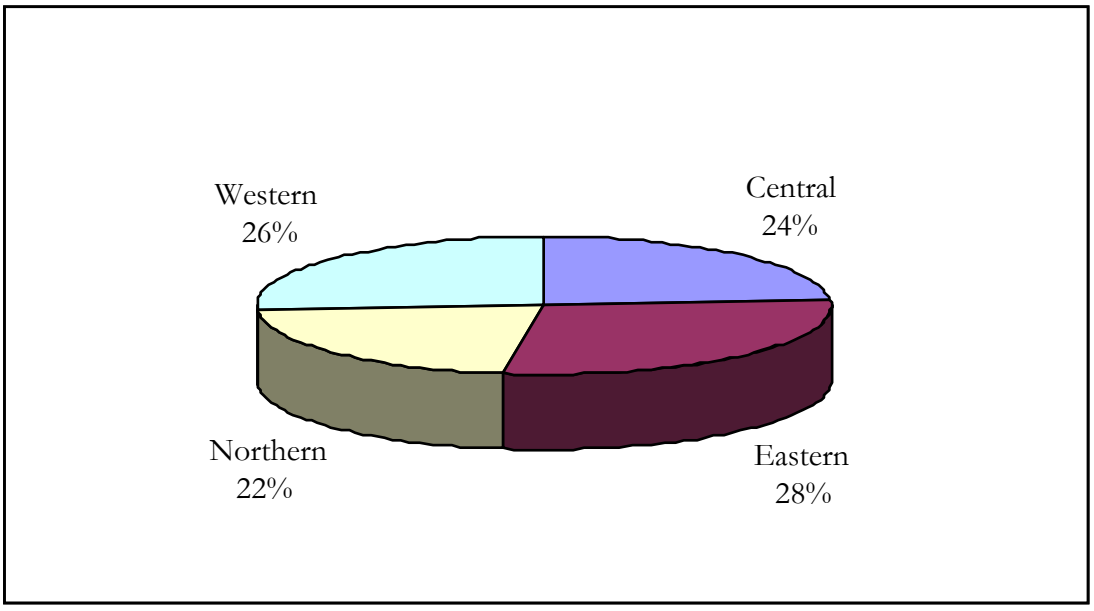

Figure 11.1 – Distribution of Primary School enrolment in Uganda

11.2 Water Education and Research

11.2.1 Water and Hygiene Education in the School Curriculum

One of the Government strategies to address the low levels of understanding of water and hygiene issues by the public is to integrate water, sanitation, hygiene and health education in the primary and secondary school curriculum as part of the basic science education at these levels. The aim of this initiative is to develop and inculcate positive knowledge and traits that will enhance healthy living and a sustainable environment not only in the schools but also at community level.

The education minimum standards and basic requirements document also spells out issues of water, sanitation and hygiene in schools and stresses the use of health clubs and societies in schools to enhance the knowledge and practice of sanitation and hygiene among learners.

11.2.2 Water and Hygiene Education and Research at University and Tertiary Levels

To ensure sustainable supply of manpower to the water sector, there are two universities in Uganda (i.e. Makerere and Kyambogo) offering degree courses in Civil Engineering, with options for students to specialize in Water Resources Engineering and other Water related Sciences. In the recent past Makerere University started offering Masters Degrees in Civil Engineering in general and Water Resources Engineering in particular. In addition to these two Universities, there are a number of Technical Institutes and Colleges offering Diplomas and Certificates, respectively, in Water Engineering related courses.

At Makerere University, the Faculty of Technology offers Bachelor of Science degrees in both Civil and Mechanical Engineering. Both these courses contain a significant water component. At Masters level, two water related options are offered i.e. Environmental Engineering and Water Resource Engineering. At PhD level, different water related research is being undertaken and to-date, there are a total of eight PhD candidates.

The Makerere Institute of Environment and Natural Resources offers Bachelors, Masters and PhD in water related subjects as well, mostly focusing on Environmental Management and Water Quality Management. Other departments offering water related courses at both Undergraduate and Graduate levels include the Departments of Geology, Geography, Botany and Zoology.

The combined annual intake of students into water related courses offered at the two Universities is about 500. The biggest challenge facing the two Universities is inadequate qualified staff. Due to the low salaries offered by the two Universities, it is difficult for them to attract and retain highly qualified staff who prefer to take on better paying jobs in the private and public sector.

Motivation to students pursuing water related courses has been greatly enhanced by the support of the Directorate of Water Development, National Water and Sewerage Corporation, Consultancy Firms and Manufacturers who are supporting a National Scheme

run by the Uganda Institution of Professional Engineers of awarding Annual Prizes to outstanding Civil Engineering students at Makerere University. It is anticipated that this scheme will be expanded to benefit students from other tertiary institutions.

Table 11.2 shows the institutions offering training in water-related areas.

Table 11.2 - Institutions offering training in water-related areas

Institution	*Courses Offered*	*Applied Research Capacity*	*Regional functions*	*International Orientation*
Uganda Polytechnic Kyambogo	Certificate Ordinary Diploma in Water Engineering Higher Diploma in Construction	Relatively well equipped labs, qualified staff available but short of technicians and Phd. holders	Caters for the Region, including Rwanda and Congo	Has linkages with a number of institutes in the UK
Makerere University Department of Agricultural Engineering.	Under graduate: Soil & water Eng.; Hydraulics & Hydrology Climatology & Modeling Irrigation Post graduate course: Soil & water Eng; Water resource systems; Agricultural waste management	Have capacity to do research in; Surface run off management Appropriate. Irrigation technologies Soil drainage studies	-	University of Pretoria, Ohio State University and the Earth University of Costa Rica
Makerere University Institute of Environment & Natural Resources	M.Sc Environmental Science Research methods & Data management; Rural water management; Biodiversity and management; Urban & peri-urban management; IWRM	Does research in Ecotechnology Has a water analysis laboratory with basic equipment	Teaching and consulting Institution for local & International clients	Universities in Europe and U.S.A
Fisheries Research Institute (FIRI)	MSc Fisheries and Aquatic Science	Human resource available (25 research scientists) Has operational capacity Laboratories	EU - base for the Lake Victoria Research Project	E.g., Universities of Waterloo, Manitoba, Florida, Ohio; Wageningen; Hull, Limnology Institute, Austria. Malaysia
Makerere University Department of Civil Engineering	Undergraduate Courses: Fluid Mechanics; Hydraulics and Hydrology; Environmental Chemistry; Water Resources Engineering; Public Health Engineering; Graduate Courses in Water Resources and Environmental Engineering	Research on: Groundwater pollution, Industrial wastewater treatment, Stabilization ponds, Appropriate (low cost) water treatment, Influence of lake Victoria on the local weather, Remote sensed data use in lake model, integrated lake basin management, etc	Some students from Kenya Tanzania, and Sudan attend degree courses here	Collaboration with several European Institutions (Norway, UK, Italy)
Uganda Management Institute	Offers tailor-made Certificate training courses in General management, Project management, Financial management and Procurement.	-	-	-

11.2.3 Water Related Research

Due to lack of adequate financial and technical resources at most of the existing Universities and Research institutions, very little applied research has been carried out by these institutions in the past.

In the recent past however, the Directorate of Water Development signed a Memorandum of Understanding (MoU) with Makerere University for collaboration in applied research in support of the water sector activities. The MoU highlights the following areas of collaboration:

(i) Technical information exchange,
(ii) Utilization of physical facilities,
(iii) Partnerships in applied research,
(iv) Specific joint technical investigations of relevance to the water sector,
(v) Tailor-made training for water sector personnel.
(vi) Specialized raining.

As part of the implementation of the MoU, the two institutions have identified research projects shown in **Table 11.3**, which are current being implemented;

Table 11.3 – Water Research Projects

Theme	*Specific Research Topic*
Water Lifting Devices	▪ Improvement of locally made Wind Pumping Systems ▪ A Foul Flush diverter for improved Rainwater Quality
Water Quality	▪ Appropriate Technologies for Fluoride Removal in Rural Water Supply ▪ Appropriate Technologies for Iron and Manganese Removal in Rural Water Supply ▪ Evaluation and Operation of Bank Infiltration Systems – A case study of Kayunga Water Treatment Plant.
Water Resources	▪ Flood Analysis for use in Design of Valley Dams and Assessing Ground Water Recharge ▪ Dedicated Procedure for Planning and Management of a Valley Dam Scheme

Other additional research topics include;

- Assessment of Desirable Water Source Characteristics for Sustainable Water Supply: With Application of GIS
- Renewal Energy Water Pumping Systems
- Gravity Flow Schemes (GFS)

In addition to the above collaborative research, the University has also initiated its own water related research projects, which are being implemented by PhD graduate students in the Civil Engineering Department. These include:

(i) Development of Water Resources Engineering and Management Decision Support Systems;
(ii) Analysis Of Impact Of Anthropogenic Pollution Loading And Mitigation Measures On Shallow Groundwaters (Case Of Informal Peri-Urban Settlements - Bwaise III In Kampala, Uganda);
(iii) Natural Organic Matter Removal And Trihalomethanes (Chlorinated Organics) Control In Water Treatment;
(iv) Development of holistic Ecological Sanitation (Ecosan) Systems in Uganda.

SIDA is also funding a research project in Makarere Faculty of Technology, which is meant to strengthen the capacity of Makerere Staff to supervise at PhD levels through joint research between Makerere University and Universities in Sweden. A second component of the funding aims at fostering regional collaboration for research and engineering education between the institutions responsible for engineering education in the Universities of Makerere (Uganda), Dar Es Salaam (Tanzania) and Eduardo Mondlane (Mozambique).

11.3 Capacity Building in the Water Sector

The water sector in Uganda recognizes the importance of capacity building in the successful and sustainable implementation of sector activities. To this effect, a Water Sector Human Resource Management unit has been established to address the capacity requirements for the sector. The role of the unit is to identify staff training needs relevant to the sector, implement relevant training for sector staff at various levels, and ensure that strategic capacity building programs are in place to address the capacity needs of the sector. The current water sector strategy demands that capacity building be considered an integral part of all water sector programs and projects to ensure their sustainability.

11.3.1 Water Sector Capacity Building Programs

For the past many years, the tradition in the water sector has been that individual water sector programs and projects include training and capacity building as one of their components to meet their specific needs. This approach has proved ineffective and has often led to duplication and wastage of resources. What has been lacking is a comprehensive sector-wide capacity building program to address all the capacity building needs for the sector in a holistic manner.

In order to address the above weaknesses, the Directorate of Water Development (DWD), in 1994, prepared a comprehensive Training and Human Resources Development Plan for the water and sanitation sector for the period 1995 – 2000. The five-year plan formed the basis for implementation of all capacity building activities in the sector during that period. Given the success of the Plan, DWD adopted this sector-wide approach to capacity building, which is the capacity building model that has been adopted by the water sector.

This sector-wide approach to capacity building mainly focuses on equipping the sector personnel with the relevant skills, knowledge and attitudes in the management of water and sanitation programs through specific tailor made training courses. In addition, staff, mainly from the center, and a few from the districts are also funded to participate in relevant short training courses, Masters and PhD programs conducted both within the Africa region and abroad.

The current Water Sector Human Resources Development Programme is being implemented under the Policy and Sector Capacity Development (PSCD) Component of the Joint Partnership Fund, funded by Danida , Sida and DFID.

11.4 Water Sector Data and Information Management

11.4.1 Data Collection and Management

The Management Information System (MIS) for the water sector was established in 1998. The unit was set up with the sole purpose of monitoring financial and physical sector activities and therefore facilitating efficient management and decision making. Since its inception, the MIS function has progressed through a series of design reports that have culminated into databases that constitute the archives for the sector today.

Over the years the MIS unit of the DWD has developed data collection procedures that are currently used in all the districts of Uganda, and these include: -

(i) Data collected on a quarterly basis from water sector programs implemented under DWD, which are later compiled into an annual document. This information is sent to the Ministries of Finance, Planning & Economic Development and the Prime Minister's Office. In this way the information sharing with other stakeholder ministries is enhanced.

(ii) Data collected on a quarterly basis by the districts on various water and sanitation related aspects such as data on rural and urban water supply, O&M, conditional grants and other NGO's in the districts. This information is initially processed in the district, and later transferred to the centre for analysis and thereafter feedback given to the districts.

(iii) The districts also collect data on new safe water sources, which are then updated bi-annually. This data is processed and shared with other water sector stakeholders.

(iv) The Water Authorities unit of the DWD also collects specific data on functioning urban water supply systems. This information is later with other stakeholders through reports, intranet and the DWD website.

The problem however is that some districts in Uganda do not have computers, while others may have the computer hardware but do not know how to use the available soft wares. As a

measure to address the above problem, the Directorate of Water Development came up with a strategy to digitize all data and information in the 56 District Water Offices. Prior to the digitization, the districts that did not have computers and photocopiers could send there data/information in hard copies to DWD and this slowed down the data processing and information sharing process.

The digitization program was however packaged to include training in the relevant computer software for the district personnel involved in the exercise. This involved training in the use of packages such as MS Word, MS Excel and MS PowerPoint. This intervention has gone a long way to bridge the big gap that existed between DWD and the districts.

WATER RESOURCES DATA COLLECTION

In addition to the above water sector data and information, DWD, through the Water Resources Management Department, also collects specialized water resources data and information used for planning and management purposes. This includes;

(i) ***Hydrological data*** – This includes routine measurements of lake levels and river levels and discharges. This is done through a network of 70 surface water monitoring stations installed on all major rivers and lakes in the country.

(ii) ***Hydrogeological data*** – This includes routine measurements of groundwater levels in different parts of the country. This is done through a network of 16 groundwater observation stations installed in different parts of the country.

(iii) ***Water Quality data*** – This includes routine measurements of different water quality parameters on both surface and groundwater in different parts of the country. This is done through a network of 119 water quality sampling sites that have been established countrywide.

(iv) ***Water use data*** – This includes information and data submitted by the different regulated water users who hold water use and waste discharge permits. This data and information is used for assessing the level of compliance of the different water users and also the level of commitment of the different water sources.

(v) ***Spatial (GIS) data*** – This includes soils data, land cover, topographic data, administrative boundaries, catchment bounries and infrastructure data used in production of maps.

ELECTRONIC DATABASES

At the moment DWD has electronic databases in all district water offices into which data is collected, analyzed and exported to the head office manually or through electronic mail.

In the future there is a plan of having local area networks in all districts and linking them up to a central database so as to facilitate collection and dissemination of data/information at a touch of a button. At the moment the National Water and Sewerage Corporation already possesses a linked database that collects data from all cities/towns under their operation to one central database at the head office operation.

In addition to the above databases, the Water Resources Management Department (WRMD) also operates four databases established for storage of surface water, groundwater, water quality and water permits data and information. The databases have been upgraded and are

now compatible with the Management Information System (MIS) design for the water sector. WRMD also has a GIS database for storage of all the spatial data acquired by the department.

INFORMATION NETWORKS

The Network for Water and Sanitation ***(NETWAS***) is a Non Government Organization involved in capacity building efforts for the water sector and collaborates with several national, regional and global networks. The major ones being ITN Africa Network, Streams of Knowledge, Water Supply and Sanitation Collaboration Council (WSSCC) & Water and Sanitation Program-Africa (WSP-AF). NETWAS is a portal linking up Uganda, Kenya and Tanzania. These networks mainly assist Uganda in capacity building in water and sanitation as done by ITN Africa & WSSCC and WSP-AF specializes in water and sanitation capacity building for the poor, through policy development, sustainable investments, and learning and dissemination. These networks work closely with governments, NGOs, private sector, and civil society in formation gathering and sharing.

11.4.2 Indigenous Knowledge in Water Management

There is no deliberate effort to document the contribution of indigenous knowledge to water management in Uganda. As a result, there is limited and scanty literature in the subject area. This probably arises from the negative attitude policy makers have on rural communities as custodians of indigenous knowledge, and therefore their contribution in this area is more often neglected. In a few cases however, hydro geologists have utilized the knowledge of local communities while investigating the potential for under ground water and the viability of spring wells. In some instances local communities have advised on the management of water sources that are considered sacred.

11.5 Water Information Dissemination

The importance of an effective IEC (Information, Education, and Communication) component for the success of Water supply and sanitation programs cannot be under estimated. The experience of the past decade clearly demonstrates that even the best designed programs failed or produced minimal results, because decision makers and intended beneficiaries were not adequately informed, educated or mobilized.

Communication or public awareness is therefore very vital in planning for safe water supply, sanitation and behavior change. The water sector uses the following strategies to disseminate information, raise awareness among the public and mobilize communities to participate in water and sanitation activities;

(i) **Newsletters, Journals, Magazines and Annual Publications –** These are periodic (Quarterly, Bi-annual, or Annual) publications by the water sector giving a comprehensive assessment of the performance of the sector during a specific reporting period and highlighting the major achievements and key events during that period.

(ii) **"Open Days" –** These are special days (say once a year) where the general public is invited to DWD premises and led through guided tours of the different sections of the directorate. During these tours, the public is exposed to the different activities in the directorate including some of the key outputs. Following the guided tours, the public is also treated to an exhibition demonstrating some of the products of the directorate and later to a series of lectures on specific topics relevant to the theme of the day.

(iii) **Workshops, Seminars and Conferences –** The Directorate of Water Development organizes regular workshops, seminars and conferences to sensitize the public on the different activities in the sector, to train stakeholders on different water and sanitation related issues, and provide information to the general public on specific water sector programs.

(iv) **Newspapers -** Supplements in the national Newspapers are regularly used to disseminate water, sanitation and hygiene information. Through the local newspapers, the sector also publishes supplements/articles on specific sector activities. This may be done on a quarterly basis or in response to specific events such as World Water day, or even to update the public on the status of progress of sector activities and thereby enforce accountability and transparency with the stakeholders.

(v) **Printed Booklets –** These are used to present specific information targeting specific groups e.g. Mary and Ben for primary school behavior change, the caretaker's and Water user committee booklets among others.

(vi) **Flyers and Posters** – These are used to convey specific messages targeted at schools, communities and the public. A number of posters and flyers on school sanitation, O & M and community hygiene and sanitation improvement have been printed by the sector and distributed to the primary schools at no cost.

(vii) **Television -** These mainly apply in the urban and semi-urban areas where the target audience can afford the costly equipment/technology and electricity.

(viii) **Electronic media -** The Directorate of Water Development maintains a website which is updated on a regular basis. Through this channel the sector provides relevant information on sector activities to the entire international community. The website address is www.dwd.co.ug.

(ix) **Radio spot messages -** These short messages of between 1 to 3 seconds or minutes are aired on regular FM stations in all the regions of the country to communicate specific messages to the target audience. E.g. "Wash your hands after latrine use to prevent disease transmission" or "Cholera kills, therefore ensure proper hygiene".

(x) **Radio talk shows:** In this strategy, specific topical areas related to water and sanitation are selected and discussed at the local FM stations. In some cases opinion leaders are hosted in the talk shows, and members of the public are given opportunity to ask questions. The language of communication will normally depend on the target audience, but in most cases the local language spoken in a particular region is used for communication.

(xi) **Radio drama /Serial drama and traditional media/drama -** This strategy has proved very effective amongst rural communities with limited formal education. In

this strategy, information depicting day to day hygiene and sanitation practices in the rural community, including operation and maintenance of water facilities are relayed to the communities through drama, which is either aired on the local FM stations or village drama performances, with the local community as the target audience. In most cases local cultural performing groups are contracted from the particular communities to develop and perform the plays.

(xii) **Annual Calendars –** Besides the calendar itself, these also contain specific information and pictures depicting specific aspects of different water sector activities and programs.

(xiii) **Home and environment improvement campaigns** - This strategy is used to inform, motivate, persuade and educate local communities to improve their sanitation and hygiene in their homesteads. It uses an integrated approach and different strategies such as hygiene and sanitation competitions, media, home visits and drama.

(xiv) **Video Shows** - The sector also uses video facilities especially during formal training of district water office staff and DWD staff and the film van services for the communities. These services were usually hired from Ministry of Health and used to sensitize and mobilize target communities to respond to certain weak situations. E.g. payment of community contributions, O & M of water source and sanitation & hygiene improvement

11.6 Challenges and Constraints

11.6.1 Challenges

One of the major challenges for water education and research arises from competition for the limited resources between hardware and soft ware activities. Because of the high demand for water installations, there is a tendency for policy makers to channel more resources into construction activities at the expense of software activities like capacity building, community mobilization and research.

The other challenge is the long time it takes to realize tangible benefits from investments in water education and research. Sensitization of the community may not immediately translate into behavioral change and change in people's attitude. Learning is a very slow process that needs a lot of patience and dedication, which facts policy makers are not willing to accept since they are under pressure to deliver tangible results in a very short time.

11.6.2 Constraints

The efforts of government in addressing the problem of literacy and capacity building for the population continue to be hampered by the following constraints;

(i) Inadequate financial resources;

(ii) High poverty levels amongst the rural population;
(iii) Low literacy levels making communication both difficult and expensive;
(iv) Poor educational facilities, especially in the rural areas; e.g. School buildings, training materials, quality of teachers etc.
(v) Lack of adequate social infrastructure such as roads, electricity, telephones etc to enable the rural community benefit from advancements in modern technology.

11.7 Future Outlook

Despite the current low literacy rates in the country, the future looks more promising, especially if the current Government interventions are successfully implemented. Universal Primary Education presents one good opportunity to ensure that all Ugandan children have a chance to learn how to read and write.

It is envisaged that, with the big success of UPE, the Government will consider introducing Universal Secondary Education to complete the basic education cycle. With all these developments at macro level, the water sector is positioning itself strategically to ensure that water related issues are incorporated into the entire school curricula from primary to university level.

Building adequate and sustainable capacity for the water sector and raising the level of awareness of the public on water issues is a slow and continuous process, which requires substantial financial input as well as commitment by all the stakeholders.

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CHAPTER TWELVE

VALUING WATER

12.1 Situation Analysis

Uganda's water resources are a key strategic resource, vital for sustaining life, promoting development and maintaining the environment. Access to clean and safe water and improved sanitation facilities and practices are pre-requisites to a health population and therefore have a direct impact on the quality of life and productivity of the population. Besides domestic water supply, water is also vital for: Livestock Water Supply, Industrial Water Supply, Hydropower generation, Agriculture, Marine Transport, Fisheries, Waste Discharge, Tourism, and Environmental Conservation. Water, therefore, significantly contributes to the national socio-economic development and thus poverty eradication.

Agriculture has continued to be a source of livelihood for the majority of the people in Uganda. Similarly, the generation of electricity, which also relies heavily on the availability of water, provides 25% of the energy supply for Uganda. The electricity sub-sector contributes about 1% to formal sector employment in the country. The industrial sector, another major consumer of bulk water contributes about 25% to formal sector employment. Water is a major means of inland transport in Uganda.

Water has traditionally been considered as a public and social good, which is available in unlimited quantities and therefore should be available to everyone free of charge! This has led to misuse and pollution of water resources making it increasingly scarce.

Government budgetary allocations to the water sector have over the past years been inadequate (0.3% of GDP). The current investment in the sector has been made possible by the significant external financing from Uganda's cooperating partners. Donor financing as a percentage of the total capital expenditure during the period 1991-1995 was in the range 75% - 91%.

Furthermore, there has been very limited private sector involvement in the management and development of water resources in Uganda. The public good nature of the water resource discourages a private entity to invest in the preservation or improvement of the resource since it is difficult to recover costs from users.

In order to address the above issues, the Government prepared a National Water Action Plan (WAP) which embraced most of the Rio (UNCED, 1992) principles, the most important one of which being the recognition of water as an economic good with an economic value and that should be taken into account while allocating it among competing uses. The WAP principles were later embedded in the Water Statute, 1995, and the National Water Policy, 1999. These developments, coupled with the extensive sensitization of the public on the value of water, have started yielding results as the general public has started recognizing water as a precious resource, which ought to be managed and used responsibly.

12.2 Economic Value of Water

The National Water Policy 1999 provides that water is a socio-economic good and its allocation should be based on the social and economic values. Recognition of the different values of water helps in conserving the water resource; reducing wastage and loss; shifting consumption to high value uses and balancing scarce water resources with increasing demands. Uganda has developed allocation strategies for water among competing uses based on a comprehensive assessment of the economic, social and environmental impact of each intended use.

Sound economic principles require that sectors or individual water users be charged for water at a rate equal to the full economic cost of supplying the water. The full economic cost of water is a summation of the full supply cost, opportunity cost, and economic and environmental externalities.

Full supply costs refers to operation and maintenance costs and capital costs. The operations and maintenance costs include purchased raw water, electricity for pumping, labor, repair materials, input costs for managing and operating storage, distribution and treatment plants. Capital charges refer to capital consumption i.e. depreciation charges and interest costs associated with reservoirs, treatment plants, conveyance and distribution systems.

In Uganda, water is provided to users at a price lower than the marginal or even average supply cost, and hence there is no incentive for conservation and waste reduction. This leads to a paradoxical situation where the water resource is already under stress and yet the subsidy encourages users to waste it.

Water pricing policies are important instruments to achieve national and regional goals. Users should pay a fair price for water in order to reflect its value to society as a scarce resource. With tariffs moving towards full cost recovery (average cost pricing), high-value users ought to be able to obtain the water they need at an economical price.

12.2.1 Tariff Levels and Pricing Policy

The current tariff structure is based on affordability and uniformity across the country while ensuring cost recovery. The current tariffs are not adequate for system expansion, but are in most cases able to cover operation and maintenance costs. Major investments in system improvement and extension are currently financed separately from sources outside the tariffs (grants from government and donors), and this is likely to continue for some time until the towns become more viable. Full cost recovery (operation and maintenance, depreciation, and investment) would require a significant increase in tariffs. The current (2004) water tariffs are shown in **Table 12.1**.

Table 12.1: Water Tariffs by Category of User

Category	NWSC, 2003/4 UShs./M³	Urban Water Authorities, 2004 UShs./M³
Public standpipes (bulk)	449	1,000
Public standpipes (jerrycan)	25 – 50	25 – 50
Domestic	693	1,000
Government and Institutional	854	1,000
Commercial and Industrial	1,187 – 1,324	1,000
Weighted average – Uganda		1,037

Source: NWSC (2003b) and MWLE (2003c)

The NWSC uses a rising block tariff structure for commercial consumers, to discourage waste of water. The NWSC approach to management allows for cross-subsidies among towns.

The NWSC applies an additional 75 – 100% of the applicable tariff in case of a sewerage connection. The tariff is higher for the commercial consumers and lower for the domestic consumers, the lowest being for bulk sale at stand taps. However the poorer users of stand taps generally end up paying more for the water collected in *Jerrycans*[1] due to the costs of operating a stand tap.

12.3 Social Value of Water

The Constitution of the Republic of Uganda 1995 provides that every Ugandan is entitled to clean and safe water. The National Water Policy and Water Statute also re-iterate that in allocating water for different uses, first priority should be given to the provision of water of adequate quantity and quality to meet domestic needs. Allocation for other needs (irrigation, hydropower, livestock, industrial) should be done considering the economic, social and environmental value of water.

Despite Government's recognition of the economic value of water, for reasons of equity, public health and amenity, the government continues to provide "free" basic water supply, especially in rural areas, and peri-urban slum areas which are predominantly inhabited by the poorest communities.

[1] Portable plastic containers used for collection of water

12.4 Cultural Value of Water

There are many cultural norms associated with different water bodies in Uganda. In many communities in Uganda, Waterfalls, hot springs and rapids are associated with traditional cultural heritages. An example is Bujagali Falls (see **Figure 12.1** below), which is considered to be an ancestral divine place for Basoga (one of the biggest tribes in Uganda). The site is believed to be possess which the believers claim have special healing powers for many common diseases. Though the site is also ideal for hydropower development, the close cultural attachment to the site has made it very difficult for the site to be developed due to the outrageous demands put on the would be developers by the cultural custodians of the site. Hot springs located in the mountainous areas of western and eastern Uganda are also considered to be special divine sites by the local communities who visit the sites regularly for supernatural cleansing, healing, and blessings from the ancestral spirits associated with these sites.

12.5 Specific Socio-economic Values of Water

12.5.1 Water for Agriculture and Food Security

Water is a key factor in the production of adequate food for Uganda. Water resources are a prime factor in irrigation, livestock watering, aquaculture, fisheries, food processing and other agro-industry, and fishing industries, which provides opportunities for employment to a large proportion of the rural and urban populations. The provision of water for water supply and agriculture to the poor segments of the society is a development imperative, both for reasons of social equity as well as food security and economic development.

A detailed description of the role of water in ensuring food security is given in **Chapter 7**.

12.5.2 Water for Hydropower Production

Hydropower is the major source of electrical power in Uganda. With a total estimated potential of 2,000 MW, it is the most abundant and cheapest electrical power source in the country. Uganda has a comparative advantage in hydropower resources in the region. Most of Uganda's hydropower potential is concentrated along the White Nile. In addition, there are also several small rivers in different parts of the country, with a potential for mini and micro hydropower development.

Uganda relies solely on hydropower for energy production needed for all socio-economic activities. The current installed capacity of only 260MW is grossly inadequate to meet the national demands. The current low level of economic development in Uganda is partly attributed to the inadequate power, which cannot support large-scale manufacturing industries and agro-processing factories.

A detailed description of the role of water in energy production in Uganda is given in **Chapter 8**.

Figure 12.1 – Bujagali Falls

12.5.3 Water for Domestic Consumption

Access to clean and safe water and improved sanitation facilities and practices leads to improved health and are essential investments in human capital and therefore have a direct and immediate impact on the quality of life, thus contributing to long-term socio- economic development of the country and eventual elimination of poverty.

The burden of water collection falls mainly on women and children who are the most vulnerable members of society. Owing to the long distances they travel to collect water, this significantly reduces their productive time and subsequent contribution to the economic development of the country.

Investments in water supply and sanitation services has direct socio-economic impacts by relieving the burden on women, improved hygienic conditions through better access to

water and sanitation services, and reduced water pollution through the construction of wastewater treatment plants and other mitigation measures. Increasing access to safe water is equally vital to the health and welfare of the population.

The current safe water supply coverage (58% in rural areas and 60% in urban areas) is still low and there is a need for a concerted effort by the government to invest the necessary resources to ensure that all Ugandans have access to safe water supply.

A detailed description of water for domestic consumption is given in **Chapters 4** and **5.**

12.5.4 Environmental Water Requirements

With the growing awareness of environmental issues in Uganda, the natural environment is slowly being considered a legitimate water user. It is, therefore, a requirement under the current Environment and Water legislation that any planned water use takes into consideration water requirements for the environment within its vicinity. This is being enforced through the mandatory Environment Impact Assessment conducted for all water related projects, which ensures that all environmental concerns are addressed during the planning and implementation of the projects.

In order to ensure the integrity of the environment, the Government has also introduced water abstraction and waste discharge permits, which are used to regulate water abstraction and discharge of waste into water bodies. These permits have proved to be very effective regulatory instruments whose use has greatly enhanced environmental conservation and management in Uganda.

POLLUTER PAYS PRINCIPLE

Under the current Environmental law, Government has instituted the 'Polluter Pays' principle as a way of controlling pollution of water bodies. As part of implementation of this principle, a comprehensive regulatory mechanism has been established under which the Government levies a pollution charge on all major polluters (especially point source pollution e.g. industries). This initiative has been very successful in encouraging potential polluters to invest in efficient onsite treatment systems to reduce their polluting discharges and thus minimize their pollution charges. Enforcement of this principle is done through issuance of wastewater discharge permits. The pollution charges are levied on specified pollutant discharges on the basis of the BOD loading and concentration of the effluent, with the charge reflecting the likely environmental damage attributed to the pollutants in the effluent. The pollution charges, though not high, reflect the environmental costs of pollution and have proved to be a useful source of funds for environmental restoration initiatives.

Table 12.2 below shows the pollution charges levied in Uganda as provided for in the Wastewater Discharge Regulations, 1998.

Table 12.2 – Pollution Charges (Waste Discharge Fees)

BOD Load 10^3kg Oxygen/year	*Unit Charge (U.Shs. Per Kg Oxygen)*	*Annual Charge U.Shs.*
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

A detailed description of the role of water in environmental conservation is given in **Chapter 6**.

12.5.5 Water for Industrial Production

Water plays a very crucial role in the mining and manufacturing sectors. The sectors are among the major consumers of bulk water, which is used as an intermediate input in their production processes.

The major industries in Uganda include: Breweries, Soft Drinks, Soap, Textile, Steel Rolling, Diary processing, Fish processing, Sugar, Tea, Tobacco, Paper, Cooking oil. In addition, there are a few mining activities being carried out in the country i.e. Cement, Lime, Cobalt, Gold, Copper (mining ceased a few years ago), Salt, Phosphates.

In general, water costs are a small fraction of the total production costs in industries (the cost of water is very low when compared to other inputs like raw materials, technology). The primary decisions on technology and output determine the amount of water required per unit of output in the specific industrial production process. Therefore, the importance of water lies mainly in the role of water-reuse in industrial processes. Thus the internal cost of water re-circulation is often used to estimate the value of water in industry. Another less direct measure is by using the alternate cost framework of providing the same water quality through pre-treatment of effluent; this cost is assumed to be the value of water for that industry.

12.5.6 Recreation and tourism

Tourism is an important sector in Uganda as it provides jobs and foreign exchange earnings to the country. There are a number of water related tourist attraction e.g. White water rafting along the Nile in Jinja, Sport fishing on the major lakes, and Boat riding, Swimming and Beach Volleyball along Lake Victoria.

In addition, wildlife in the Game parks and reserves thrive on the fresh water resources in these areas.

12.6 Economic Value of Wetlands

Wetlands cover about 30,000km^2, or 13% of the country and play an important role in the socio-economic development in Uganda. Wetlands have intrinsic attributes, perform functions, and produce goods and services. Wetlands represent considerable ecological, social and economic value. Wetlands maintain the water table, control floods, provide habitat for animals and plants.

Human activities based on natural wetland resources generate a wide range of products that are consumed both locally and internationally. Valuation is being used to give a more complete picture of the economic desirability and long-term viability of wetland reclamation. For example, according to an evaluation carried out recently estimated the economic value of the services provided by Nakivubo wetland in Kampala to be US$1.7million a year. The most of valuable service attributed to this wetland is wastewater treatment and purification. In addition approximately US$100,000 is estimated to accrue from wetland goods and products through crop cultivation, papyrus harvesting, brick making and fish farming. In rural areas each household engaged in papyrus harvesting is estimated to be deriving as much as US$200 a year from their wetland activities.

Approximately 5 million people in rural areas in Uganda depend directly on wetlands for their water supply. The economic value of this service alone has been estimated to be US$25million per year. Wetlands contribute to water supply not only to neighboring communities, but also to most people through groundwater recharge, water storage and water purification. Wetlands form the backbone of the entire drainage system in Uganda. Most of Uganda's surface water is absorbed and stored in wetlands. The wetlands function as fresh water reservoirs that slowly release the water, either underground to replenish aquifers, or laterally towards the major drainage basins. The slow release of water increases water availability during the dry season for domestic use, edge cultivation and livestock watering, and keeps boreholes, shallow wells, and springs functioning. In addition wetlands also distribute water widely throughout much of Uganda thus bringing water close to the rural communities.

Wetlands do not only provide a continuous, reliable supply of water to a large population, they also ensure that it is relatively clean, by trapping silt and pollutants, thereby making an important contribution to public health and reduction in health costs.

Table 12.3 shows some of the major wetland values derived from different attributes, functions, goods and services.

Table 12.3 – Typical Wetland Values in Uganda

Direct Values	*Indirect Values*	*Option Values*	*Non-use values*
Production and consumption goods and services such as: ✓ Fish ✓ Fuel wood ✓ Building poles ✓ Sand, gravel and clay ✓ Thatch ✓ Water ✓ Wild foods ✓ Medicines ✓ Agriculture/ cultivation ✓ Pasture/grazing ✓ Transport ✓ Recreation	Ecosystems functions and services such as: ✓ Water quality ✓ Water flow ✓ Water storage ✓ Water purification ✓ Water recharge ✓ Flood control ✓ Storm protection ✓ Nutrient retention ✓ Micro-climate regulation ✓ Shore stabilization	Premium placed on possible future uses and applications: ✓ Pharmaceutical ✓ Agricultural ✓ Industrial ✓ Leisure ✓ Water use	In terms of: ✓ Cultural values ✓ Aesthetic values ✓ Heritage values ✓ Bequest value ✓ Existence value

Source: Economic Tools for Valuing Wetlands, IUCN, 1999

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ANNEX A

TABLE A.1 - SURFACE WATER MONITORING STATIONS	
STN_NO	STATION NAME
82243	R. Sipi at Mbale - Moroto Rd
82241	R. Simu at Mbale - Moroto Rd
82240	R. Sironko at Mbale - Moroto Rd
82231	R. Kelim (Greek) at Mbale - Moroto Rd
82228	R. Namalu at Mbale - Moroto Rd
82227	R. Kapiri at Kumi - Soroti Rd
82222	R. Abuket at Kumi - Serere Rd
82221	R. Agu at Kumi - Serere Rd
82218	R. Malaba at Jinja - Tororo Rd
82217	R. Mpologoma at Budumba
82213	R. Namatala at Mbale - Soroti Rd
82212	R. Manafwa at Mbale - Tororo Rd
82203	R. Victoria Nile at Mbulamuti
81269	R. Sio at Luhalali near Bunadeti
84212	R. Mpanga at Kampala - Fort Portal Rd
83219	R. Kigwe at Semuto - Wobulenzi Rd
83218	R. Mayanja at Kapeeka - Kakunga Rd
82225	R. Sezibwa at Falls
81268	Nakivubo Channel - Railway Bridge
81267	Nakivubo Channel - 5th Street
81266	L. Wamala at Lubajja
81260	R. Kibimba at Kinoni - Mubende Rd
81259	R. Katonga at Kampala - Masaka Rd
81216	R. Kakinga Index Catchment
81202	L. Victoria at Jinja Pier
87218	R. Nyagak at Nyapea
87217	R. Albert Nile at Laropi
87212	R. Ora at Inde - Pakwach Rd
87208	R. Oru at Arua - Yumbe Rd
87206	R. Anyau at Arua - Moyo Rd

85217	R. Waki II at Biiso - Hoima Rd
85212	R. Nkussi at Kyenjojo - Hoima Rd
85211	R. Muzizi at Kyenjojo - Hoima Rd
83213	R. Kafu at Kampala - Gulu Rd
83212	R. Tochi II at Gulu - Atura Rd
83209	R. Kyoga Nile at Paraa
83203	R. Kyoga Nile at Masindi Port
85201	L. Albert at Butiaba
82205	L. Kwania at Kachung
81201	L. Victoria at Entebbe Pier
81223	R. Kagera at Masangano
81224	R. Ruizi at Mbarara Water Works
81248	R. Nyakizumba at Maziba
81258	R. Bukora at Katera
81270	R. Bukora at Mutukula - Kyotera Rd
81271	R. Kisoma at Mutukula - Kyotera Rd
81272	R. Ruizi at New Waterworks
81273	R. Lwanda at Kyotera - Rakai Rd
81274	R. Kisoma Upper Stream at Kyotera
82201	L. Kyoga at Bugondo Pier
82220	R. Enget at Bata - Dokolo Rd
82245	R. Akokorio at Soroti - Katakwi Rd
82254	R. Mpologoma at Tirinyi-Mbale Rd
82252	R. Omunyal Upper at Tiririri Rd
83206	R. Kyoga Nile at Kamdini
84206	L. Edward at Katwe
84207	L. George at Kasenyi
84215	R. Mpanga at Fort Portal - Ibanda
84227	R. Chambura at Kichwamba
84228	R. Nyamugasani at Katwe - Zaire Rd
84267	R. Mitano at Kanungu - Rwensama Rd
87221	R. Albert Nile at Laropi (87221)
87222	R. Albert Nile at Panyango. (8722
82239	R. Longiro - Near Kotido
84251	L. Bunyonyi at Bwama Island
85205	R. Semliki at Bweramule
85214	R. Wambabya at Buseruka

86201	R. Aswa I at Puranga
86202	R. Aswa II at Gulu - Kitgum Rd
86212	R. Pager at Kitgum
86213	R. Agago at Kitgum - Lira Rd
87207	R. Ayugi at Atiak - Laropi Rd

TABLE A.2: GROUNDWATER MONITORING STATIONS

STATION	*TYPE OF AQUIFER*	*MONITORING PURPOSE*
001 - Nkokonjeru	Bedrock	Monitor effects of production borehole (groundwater abstraction)
002 - Pallisa (Asera Home)	Bedrock	Monitor regional change/ seasonal groundwater fluctuation
003 - Kangole (Moroto)	Bedrock	Monitor effects of production borehole (groundwater abstraction)
004 - Moroto prison	Bedrock	Monitor effects of production borehole (groundwater abstraction)
005 - Bombo Barracks	Regolith and bedrock	Monitor effects of production borehole (groundwater abstraction)
006 - Hoima Hospital	Regolith and bedrock	Monitor effects of production borehole (groundwater abstraction)
007 - Rakai (Civic centre)	Regolith and bedrock	Monitor regional change / seasonal groundwater fluctuation
008 - Lyantonde (Kyabazara)	Regolith and Bedrock	Monitor regional change / seasonal groundwater fluctuation
009 - Mbarara UNICEF Camp	Bedrock	Monitor regional change / seasonal groundwater fluctuation
010 - Rukungiri	Bedrock	Monitor effects of production borehole (groundwater abstraction)
013 - Apac-DWD Offices	Regolith	Monitor regional change / seasonal groundwater fluctuation
012 - Apac-Loro CPAR offices)	Regolith	Monitor regional change / seasonal groundwater fluctuation
014 - Soroti	Bedrock	Monitor regional change / seasonal groundwater fluctuation
015 - Nkozi University	Regolith and bedrock	Monitor effects of production borehole (groundwater abstraction)
016 – WRMD (Entebbe)	Bedrock	Monitor regional change/ seasonal groundwater fluctuation

TABLE A.3 - WATER QUALITY MONITORING STATIONS	
SITE_ID	SITE NAME
MIP011	Natete Stream
MIP017	Kinawataka swamp
PWS004	Nyaruzinga Water Works - Bushenyi(Intake)
PWS004A	Nyaruzinga Water Works - Bushenyi(Treated Water)
STS002A	Fort Portal Sewerage Works (After discharge)
GS 1943	Apac Hospital Borehole
GWS001	Port Bell Ground Water Site at PortBell - Kampala
GWS002	Nkokonjeru Ground water Site - Mukono
GWS003	Mbarara Ground Water Site at UNICEF Camp - Mbarara
GWS004	Bombo Ground Water Site at Bombo Army Barracks - Luwero
GWS005	Busia Ground Water Site
GWS006	Soroti Ground Water Site at DWD Camp,Otuchopi - Soroti
GWS007	Morulinga Ground Water Site at Kangole - Moroto
GWS008	Moroto Ground Water Site at Prison Barracks - Moroto
GWS009	Kabong Ground Water Site at Kabong Hospital - Kotido
GWS010	Apac Ground Water Site at DWD Offices - Apac
GWS012	Rakai Ground Water Site at Civic Centre - Rakai
GWS013	Lyantonde Ground Water Site at Kyabazala, Lyantonde - Rak
GWS014	Kasese Ground Water Site at Kasese Cobalt Co. Ltd - Kases
GWS015	Loro Ground Water Site at CPAR Tree Nursery, Loro - Apac
GWS016	Hoima Ground Water Site at Hoima Hospital - Hoima
GWS017	Osera Ground Water Site - Pallisa
GWS018	Nkozi Ground Water Site - Mpigi
GWS019	Rukungiri Ground Water Site - Rukungiri
MIP001	R. Ruizi at NWSC New Water Treatment Works
MIP002	R. Ruizi at NWSC Old lagoons
MIP002A	R. Ruizi at NWSC Lagoons(After discharge)
MIP003	NWSC Lagoons - Mbarara (Effluent Discharge)
MIP004	R. Ruizi Down stream of FREBA Tennery
MIP005	Nakayiba stream at NWSC Lagoons (Before discharge)
MIP005A	Nakayiba stream at NWSC Lagoons (After discharge)
MIP006	Nakayiba stream at Nyendo - Masaka road
MIP007	Nakayiba at Mbarara by Pass (Kyakumpi)

MIP008	Masaka NWSC Lagoons(Effluent Discharge)
MIP009	Nakivubo Channel (Bridge over Portbell Railway Line)
MIP010	Nalukolongo Channel
MIP012	Bwaise stream (Up stream)
MIP013	Bwaise stream (Down stream)
MIP014	Lugogo Channel
MIP015	Kitante stream
MIP016	Bat Valley stream(Spring)
MIP018	Kyambogo stream
MIP019	L . Victoria at Kirinya Bay opposite NWSC Lagoons
MIP020	L . Victoria at Masese
MIP021	R. Nile at Owen Falls Bridge
MIP022	Mbale NWSC Old Lagoons(Effluent Discharge)
MIP023	Mbale NWSC New Lagoons (Point of Confluence)
MIP024	Mbale Soap Works (Railway Bridge)
MIP025	Mbale Soap Works (Up Stream)
MIP026	River Lwakhaka (Road Bridge Kenya - Uganda Border)
MIP027	R. Nyamwamba at Kasese - Kilembe road
MIP028	R. Rukoki at Kasese - F/Portal road
MIP029	R. Rukoki at Kasese - Kampala Railway Bridge(Before disch
MIP029A	R. Rukoki at Kasese - Kampala Railway Bridge(After disch
MIP030	R. Sebwe at Kasese - F/Portal road
MIP031	R. Rukoki(KCCL Effluent)
PWS001	Soroti Water Works(intake)
PWS001A	Soroti Water Works(Treated Water)
PWS001B	Soroti Water Works(Distribution)
PWS002	Masindi Water Works(Intake)
PWS002A	Masindi Water Works(Treated Water)
PWS002B	Masindi Water Works(Distribution)
PWS003	Arua Water Works(Intake)
PWS003A	Arua Water Works(Treated Water)
PWS003B	Arua Water Works(Distribution)
PWS004B	Nyaruzinga Water Works - Bushenyi(Distribution)
SWR027	R.Ruizi NWSC Treated water reservoir
STS001	Soroti Sewerage Works (Influent)
STS001A	Soroti Sewerage Works (Effluent)
STS002	Fort Portal Sewerage Works(Effluent)

STS002B	Fort Portal Sewerage Works (Before discharge) R.Mugunu
SWL001	L . Nabugabo at Green View
SWL002	L . Kijjanibarora at Kibona Village
SWL003	L . Nakivali at Rukinga Fishing Village
SWL004	L . Wamala at Kitinika Fishing Village
SWL005	L . Kyoga at Bukungu
SWL006	L . Kwania at Nabyeso
SWL007	L . Albert at Butiaba
SWL008	L . George at Kasenyi
SWL009	L . Edward at Katwe
SWL010	L . Bunyonyi at Kyabahinga
SWR001	R. Katonga at Kampala - Masaka road
SWR002	R. Katonga at Kabamba - Nkonge road
SWR003	R. Bukoora at Kasensero road
SWR004	R. Sezibwa at Sezibwa Falls
SWR005	R. Nile at Masindi Port
SWR006	R. Lumbuye at Kaliro - Nawaikoke road
SWR007	R. Mpologoma at Budumba
SWR008	R. Malaba at Busitema
SWR009	R. Manafwa at NWSC Treatment Works
SWR010	R. Simu at Mbale - Moroto road
SWR011	R. Sipi at Mbale - Moroto road
SWR012	R. Namalu at Mbale - Moroto road
SWR013	R. Olumot at Soroti - Moroto road
SWR014	R. Omaniman at Kangole Trading Centre
SWR015	R. Lokorimoru at Nyakwai - Matany road
SWR016	R. Alamacha at Lopei
SWR017	R. Moroto at Aloi - Adwari road
SWR018	R. Tochi at Lira - Kamdini road
SWR019	R. Nile at Mbulamuti Cable Way
SWR020	R. Kafu at Kampala - Gulu road
SWR021	R. Nkuzi at F/Portal - Hoima road
SWR022	R. Muzizi at F/Portal - Hoima road
SWR023	R. Mpanga at Kamwenge - Ibanda road
SWR024	R. Mpanga at Mubende - Fortportal road
SWR025	R. Mubuku at F/Portal - Kasese road
SWR026	R. Mitano/Mirara at Rukungiri - Kambuga road

TABLE A. 4 - DISTRICT RURAL WATER COVERAGE - ACCESS TO SAFE WATER IN RURAL AREAS (JUNE 2002)

Name of District	*Rural Population (Projected)*	*Pop With Access to water*					*% Coverage*
		Spring	Borehole	Shallow Wells	GFS	Total Served	
Bundibugyo	169,430	57,400	12,000	6,660	18,000	80,980	47.8
Bushenyi	744,140	260,000	126,300	25,200	54,750	402,620	54.1
Kabale	610,843	259,400	33,600	7,800	54,150	341,702	55.9
Kabarole	354,363	146,000	36,600	118,800	18,150	274,484	77.5
Kamwenge	238,430	165,800	17,700	45,000	13,200	187,710	78.7
Kyenjonjo	290,444	102,600	37,800	24,900	3,900	153,525	52.9
Kasese	421,237	158,400	62,100	-	194,550	289,279	68.7
Kisoro	257,222	76,800	4,200	-	13,650	93,390	36.3
Mbarara	975,983	208,600	240,000	21,900	51,600	474,958	48.7
Ntungamo	395,121	139,800	74,400	12,900	8,550	216,444	54.8
Kanungu	223,539	157,400	33,300	3,600	15,450	146,415	65.5
Rukungiri	316,448	251,800	44,700	16,200	77,700	252,830	79.9
Hoima	262,951	83,400	122,100	36,900	5,700	179,240	68.2
Kalangala	17,297	5,400	600	5,700	1,200	7,923	45.8
Kibaale	245,916	101,200	65,400	63,900	-	167,703	68.2
Kiboga	166,954	39,000	91,200	54,000	6,000	121,822	73.0
Luwero	494,056	27,600	222,300	106,200	-	293,685	59.4
Masaka	840,638	78,000	161,100	69,600	-	298,244	34.3
Masindi	354,410	72,800	156,300	30,900	1,650	226,082	63.8
Mpigi	424,050	106,600	112,500	108,300	4,650	243,730	57.5
Wakiso	679,734	60,200	59,400	88,500	4,350	168,080	24.7
Mubende	578,360	54,200	81,900	95,700	4,200	204,032	35.3
Nakasongola	112,025		57,600	17,100	-	60,507	50.0
Rakai	430,450	52,600	106,500	53,100	-	181,876	42.3
Sembabule	152,291		34,800	14,400	-	39,852	26.2
Adjumani	106,496	4,200	51,900	23,400	1,650	70,608	66.3
Apac	528,963	68,800	164,100	58,500	-	249,106	47.1
Arua	669,965	169,800	188,100	22,500	3,450	341,730	51.0
Yumbe	124,245	5,000	139,500	5,700	-	77,600	62.5
Gulu	448,334	120,000	102,900	21,600	-	229,560	51.2
Katakwi	247,825	8,800	92,100	20,400	-	99,925	40.3
Kitgum	234,511		160,200	24,300	-	129,150	55.1
Pader	242,531		57,900	9,600	-	57,375	23.7
Kotido	236,188	6,000	139,200	21,600	-	136,348	57.7
Kumi	352,061	33,000	81,300	40,500	-	131,658	37.4
Lira	612,752	146,400	132,600	66,300	8,100	321,576	52.5
Moroto	154,899	4,200	128,700	5,700	2,250	106,500	68.8

Nakapiripirit	124,205	800	77,400	1,200	-	59,750	48.1
Moyo	100,693	14,000	99,300	16,200	4,650	72,159	71.7
Nebbi	414,502	102,600	202,200	35,400	7,950	299,204	72.2
Kaberamaido	82,147	9,200	47,700	8,100	-	39,890	48.6
Soroti	342,778	22,600	157,800	59,400	-	196,360	57.3
Bugiri	266,690	7,000	96,300	16,200	-	157,000	58.9
Busia	202,405	17,600	64,500	12,600	-	120,400	59.5
Iganga	643,523	19,400	244,800	27,900	-	383,000	59.5
Mayuge	209,449	2,400	77,100	6,900	-	86,400	41.3
Jinja	394,068	37,600	53,400	40,500	-	162,800	41.3
Kamuli	610,882	1,200	391,300	41,100	-	300,360	49.2
Kapchorwa	144,511	56,800	9,900	-	15,000	80,512	55.7
Mblae	637,264	121,200	90,300	10,500	41,850	263,850	41.4
Sironko	271,342	82,400	18.300	10,200	1,950	111,425	41.1
Mukono	586,560	233,600	25,800	105,900	1,050	346,595	59.1
Kayunga	486,507	35,600	169,200	53,700	-	236,210	48.1
Pallisa	447,438	30,000	105,600	6,300	-	138,543	31.0
Tororo	503,232	19,600	259,200	1,200	-	233,128	46.3
TOTAL	20,183,297	4,044,800	5,523,000	1,800,600	639,300	10,337,735	51.2

N.B. *The No. of people per water source are: spring -200, b/hole and shallow well -300 at 80% functionality, GfS -150 per tap.*

TABLE A.5 - TYPES OF WETLANDS IN UGANDA

CLASS / TYPE	*DOMINANT FEATURE*	*LOCATION*
Fresh Water		
Fresh Emergent Reed Swamp	Papyrus swamps	L. Kyoga, L. Victoria, Nile River-line and associated flood plain, south-west Uganda.
	Miscanthus swamps	
	Vossia Swamps	Kazinga Channel, Albert Nile,
	Phragmites Swamps	R. Semliki, L. Kanyamukali,
	Cladium	Mubuku Valley near L. George
	Typha Swamp	Lumbuye Dam
Fresh Water Floating leafed	Nymphaea spp.	L. Kimunuo
	Potamogeton spp.	
	Trapa natas	
Fresh Water submerged rooted	Ceratophyllum spp.	
Macrophyte communities		
	Najas spp.	
	Potamegoton	
Fresh Water submerged not rooted macrophyte	Ceratophyllum spp.	
	Lemna trisulca	
Fresh Water Surface Floating	Pistia stratiotes	
	Eichhornia crassipes	Albert Nile
Seasonally Flooded Herbaceous	Echinochloa-Prinicum ripens-Cynodon Swamps	L. Opeta, L. Bisinia
	Loudetia-Cynodon-Setaria	L. Nabugabo
	Cynodon-Setaria-Hyparrhenia-Brachiaria	L. George
	Cyprus-Leerasia hexandra	
	Oryza	

CLASS / TYPE	DOMINANT FEATURE	LOCATION
Seasonally Flooded Wooded Grassland	Acacia-Hyparrhenia	L. Kafu, Lower Kalamoja
Freshwater palustrine forests	Permanent swamp forest dominated by Mitragyna, alchornea or Syzigium	Sse Islands, Ishasha Valley
	Spondiann thus	Sango Bay
	Phoenix or Raphia	L. Victoria Shores
	Macaranga	
	Seasonal swamp dominated by macaranga, croton, Podocarpus, etc.	Sango Bay
Fresh riverline forests	Acacia, Ficus, Combretum, Zizyphus	Mostly in central Uganda lake Victoria basin
Fresh Water Montane (bogs)	Sphagnum	Rwenzori
Salt Water		
Permanent Saline	Cyperus laevigatus	L. Katwe, Sempaya Hot Springs
Seasonally flooded saline	Sporobolus spp.	Munyanyange Forest
Man made		
Acquaculture	Fish and shrimp ponds	
Agriculture	Farm ponds, rice fields, canals, seasonally flooded arable land	
Salt Exploitation	Salt pans	
Urban/ Industrial	Excavations, Waste treatment areas, water storage reservoirs, Hydro-dams, etc.	

Source: NEMA 1999

TABLE A.6 – MEMBERS OF THE NATIONAL WORKING GROUP

NAME	*INSTITUTION*	*ROLE*
Mr.Patrick Kahangire	DWD	Chairman, Review and Editorial Panels
Mr.Nsubuga Senfuma	WRMD	Chairman NWG and Member of the Review Panel
Eng. Sottie Bomukama	DWD	Member of the Review Panel
Mr.Justin Ecaat	NEMA	Theme Leader – Chapter 6
Mr. Henry Bidasala	Ministry of Energy and Mineral Development	Theme Leader – Chapter 8
Mrs. Joyce Ikwaput Nyeko	Fisheries Department – MAAIF	Theme Leader – Chapter 7
Mr. Ben Torach	Farm Development Department – MAAIF	Assistant Theme Leader – Chapter 7
Mr. Disan Ssozi	Rural Water Supply Department – DWD	Theme Leader – Chapter 4
Mr. Patrick Okuni	Urban Water Supply Department – DWD	Theme Leader – Chapter 5
Mr.Abushen Majugu	Environment Affairs Department – MWLE	Theme Leader – Chapter 9
Mr. Joel Okonga	WRMD	Theme Leader – Chapter 2
Mr. Callist Tindimugaya	WRMD	Theme Leader – Chapter 3
Mr.Fred Kimaite	WRMD	Theme Leader – Chapter 10, and Secretary of the Editorial Panel
Mr.Joseph Epitu	DWD	Theme Leader – Chapter 11
Mr.Nicholas Azza	WRMD	Theme Leader – Chapter 1, and Member of the Editorial Panel
Mr.Mohammed Badaza	WRMD	Theme Leader – Chapter 12
Dr. Maimuna Nalubega	WSP/World Bank	Member of the Review Panel
Mr.Jean Barrat	WWAP Secretariat	External Review

NB: Besides the above core group, many more officers from different stakeholder institutions participated in the preparation of the report through information and data collection and stakeholder consultative meetings and workshops.