

Publications on Water Resources: No 11:1

Lake Victoria Basin National Resources under Environmental Stress

**Report for Sida from a Fact Finding Mission to Kenya,
Tanzania and Uganda April 1997**

Main Report

Ehlin Consulting



SWEDISH INTERNATIONAL DEVELOPMENT
COOPERATION AGENCY

Department for Natural Resources
and the Environment

Publications on Water Resources

This series covers issues on water resources from a development cooperation perspective. Sida's Department for Natural Resources and the Environment believes that the publications will be of interest to those involved in this field of work.

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Foreword

Sida has since long supported initiatives on sustainable management of water resources in regions where water is scarce or water quality threatened. The support has focused primarily on capacity building and awareness at different levels of society, prevention of domestic and international conflicts, environmental surveying, methods for better water use efficiency and research.

The pressure on resources is high in the densely populated Lake Victoria Basin and health and environmental conditions are poor. The water demand is high which is accentuated by an increasingly poor water quality due to insufficient treatment of waste water from industries and settlements.

In this context a consultant team was contracted containing experts from the three riparian states. The team leader, Ulf Ehlin, was chosen because of his experience in the Helsinki Commission (HELCOM), an international co-operation for the protection of the Baltic Sea environment.

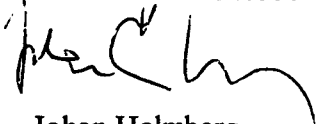
The study consist of an inventory of i) the environmental, economic and social conditions in the Lake Victoria Basin, ii) organisations operating in the region and iii) on-going and planned activities.

We hope that the report will contribute to the understanding of the complexity in the management of this vital water resource. In addition to this main report a special report with annexes is available including more detailed country information.

The proposals for possible Sida funded activities given in the report are subject for further investigation, and Sida will in due course decide whether the initiative should be carried on further.

We are grateful to Ulf Ehlin and his team for presenting an informative and stimulating report.

Stockholm in October 1997



Johan Holmberg

Director, Department for Natural Resources and the Environment

LAKE VICTORIA BASIN

National Resources under Environmental Stress



**REPORT FOR SIDA FROM A FACT FINDING MISSION TO KENYA,
TANZANIA AND UGANDA 5-25 APRIL 1997**

Ehlin Consulting

31 July 1997

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PREFACE

The environmental conditions in Lake Victoria and its drainage basin are under a considerable stress due to a rapidly growing population, intensive agriculture, increasing industrial activities, intensified fishery, expanding traffic etc. The riparian states Kenya, Tanzania and Uganda are addressing the situation but actions take time and adequate resources are lacking to secure a sustainable development in the area. Supported by a number of international organizations, financial institutions, bilateral donors etc., the three states have, however, a large number of ongoing or planned projects which will influence and improve the environmental conditions in the Lake Basin.

The Swedish International Development Cooperation Agency, Sida, has since long actively supported a number of projects in the fields of water, sanitation, health and soil conservation. Sida now felt a need to study the present Sida-funded activities related to the threatened environment in the Lake Basin and evaluate them in relation to other ongoing or planned programs and projects, to consider the possible need for coordination or modification of present activities and possible need for additional Sida-funded activities.

Sida therefore contracted a team of consultants to carry out such a study according to terms of reference as enclosed in Attachment 1. The names and addresses of the members of the Consultant Team are listed in Attachment 2.

The Team visited during three weeks ministries, governmental and municipal authorities, industries and non-governmental organizations in the riparian states and made as well a couple of field excursions. The travel plan including meetings held and persons interviewed can be found in Attachment 3.

The main report describes the conditions in the Lake Basin as a whole, while more detailed country-wise descriptions are given in annexes. The gaps and needs pointed out in the later part of the main report are based on information received during the mission and this information is partly described in annexes. The descriptions might not give a full coverage of the needs.

The Team was welcomed on all places in a very positive way. We are grateful for all the information, help and services we got. We would like to express a specific thanks to the Sida Regional Adviser Mr. Rolf Winberg who planned the itinerary and took all necessary contacts prior to the mission.

Ulf Ehlin, Team Leader

Enoch Dribidu Arne Eriksson Maggie Mabweijano Kyomukama

Meraji Msuya Nancy Nevejan E.N. Nyaga

EXECUTIVE SUMMARY

Lake Victoria, located on the equator is one of the main fresh water resources of the world and its surface area is the second largest 68,800 km². It is a shallow lake with a mean depth of only 40 m and a maximum depth of around 80 m. The area drained to Lake Victoria is approximately 194,200 km². The riparian states of the Lake are Kenya, Tanzania and Uganda. Parts of Burundi and Rwanda also belong to the Lake Victoria Basin.

The water balance of the Lake is dominated by precipitation and evaporation which components are much bigger than the inflow of water with rivers and the outflow from the Lake to the Nile river. Major changes in land use including e.g. altered agricultural practices are under way due to a rapid growth of the population in the Basin. This is estimated to influence the inflow of water to the lake and the evaporation to such an extent that the water level of the lake will decrease by about 300 mm over the next 30 years.

Almost 26 million people are living in the Lake Victoria Basin, 11 million in the Kenyan part of the Basin, 5 million in Tanzania, 5 million in Uganda and an additional 5 million in Burundi and Rwanda. The majority of the population live in rural areas characterised by poverty and lack of infrastructure and services as safe water supply, electricity, medical facilities and schools. A strong urbanisation process is, however, ongoing with an influx of people from rural areas to urban growth centres and towns. In some towns and municipalities the annual population growth is estimated to be as large as 7 %. The population growth in the basin as a whole is estimated to be 3 % per annum.

In general the health status of the population in the Lake Basin is poor. Malaria, shistosomiasis, intestinal worms, diarrhoea are frequent water related diseases. Cholera outbreaks have been registered in main cities and there is a high incidence of sexually transmitted diseases. The HIV/AIDS situation around Lake Victoria is especially alarming.

The socio-economic status of women is low in comparison with that of men. Womens' decision making in the family is, for example, restricted by old cultural traditions. The sources for income for women are limited. The commercial fishing and processing has e.g. particularly denied women in the fishing communities their source of income. The education status of women tends to be lower than that of men, as fewer girls than boys complete schooling.

The development of the environmental situation in the Lake Victoria Basin is mainly related to the very rapid growth of the population. Increased agricultural activities and livestock husbandry without sufficient soil conservation activities causes soil erosion and transports of silt and nutrients with watercourses to Lake Victoria. Wetlands around the Lake are used for agriculture and grazing reducing the filtering capacity of the wetlands. Municipalities and industries without or with non-functioning treatment facilities are discharging their waste waters to watercourses or directly into the Lake.

The eutrophication of Lake Victoria is increasing resulting in intensified algal growth and decreasing oxygen concentrations in the deeper water layers. The conditions for growth of water hyacinths are excellent and the result is vast water surface areas covered with the weed.

The plants are blocking fishing villages, water intakes to municipal water supply systems, hydropower stations etc. The introduction of the Nile Perch some decades ago has totally changed the balance between different fish species in the lake and many indigenous species are extinct or close to extinction. The Nile Perch is the dominating fish exported from Lake Victoria.

Water supply and sanitation systems exist only in central parts of the main cities leaving the majority of the population to satisfy their needs with water from shallow wells and pit latrines. This increases the health risks.

The Governments in the three riparian states Kenya, Tanzania and Uganda have started a number of activities to organise and develop necessary institutional framework and infrastructure in the region to improve the situation. A great number of activities are supported both by international financial and sectoral institutions and by national aid agencies on a bilateral basis. However, there is still a great need for all kinds of external support.

The Team found during its contacts with representatives of ministries, governmental and municipal authorities, NGOs etc., an understanding for the need of joint international actions in order to improve the environmental situation in Lake Victoria and its basin. Such actions could comprise international agreements on e.g. limiting the discharges of pollutants, planning the use and protection of natural resources, and monitoring the environmental situation.

Based on the findings during the three week study tour in the Lake Victoria Basin the Consultant Team has identified a number of needs for foreign support and initiatives. These needs concern international co-operation, minimising pollution discharges, management of water and land, capacity building on all levels of decision making and administration, specific action concerning the water hyacinth, public awareness and participation as well as co-operation among donors.

The Team proposes that Sida concentrates its activities in the Lake Victoria Basin to

- facilitate the long term environmental co-operation among the governments
- facilitate the elaboration of plans and strategies to minimise the pollution load
- contribute to the ongoing work on water resources management
- contribute to capacity building at all levels in the environmental, land and water sectors
- facilitate the co-operation among donors

The Team further proposes Sida to take some specific initiatives and points out a number of projects which might be of interest for Sida to give support.

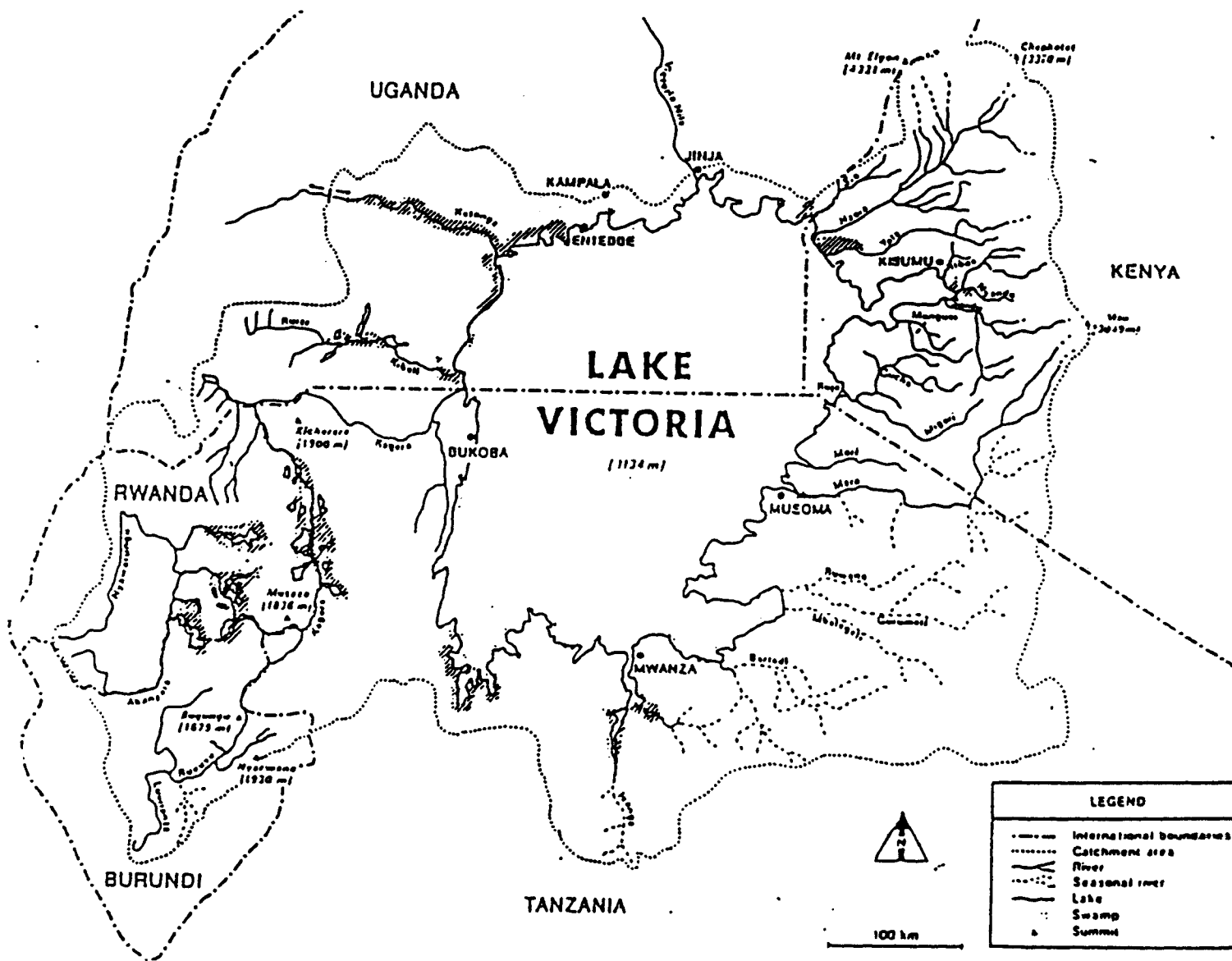


Figure 1:1. Topographic Map of the Lake Victoria Basin. Source: Crul (1993:20).

1. THE LAKE VICTORIA BASIN

1.1. The lake and its drainage area

Lake Victoria (Fig. 1), located between latitudes $0^{\circ} 20' \text{N}$ and $3^{\circ} 0' \text{S}$, and longitudes $31^{\circ} 39' \text{E}$ and $34^{\circ} 53' \text{W}$ is the second largest fresh water body in the world with a surface area of 68,800 km². The altitude of the lake is 1134 m above sea level. It is a shallow lake with a mean depth of only 40 m and a maximum depth of about 80 m. The shoreline is long (about 3,500 km) and convoluted, enclosing innumerable small, shallow bays and inlets, many of which include swamps and wetlands. It also has a large number of islands. Because Lake Victoria is shallow, its volume is substantially less than that of other Eastern African lakes with a much smaller surface area. Lake Victoria holds about 2,760 km³ of water.

The riparian states of Lake Victoria are Kenya, Tanzania and Uganda, and they control 6%, 49% and 45% respectively of the lake's surface area. The drainage area is approximately 194 200 km² or 2.5 times the lake area and extends up to Rwanda and Burundi. It contains areas with agriculture land, forests and wetlands.

1.2 Water Balance

The major tropical rains in the area are associated with an atmospheric belt of low pressure, which follows the sun twice a year across the equator. The amount of rainfall varies considerably per season, with maxima in the period March-May (long rain season) and November-December (short rain season). The rainfall regimes around the lake are showing temporal and spatial differences. There are large differences in the annual amount of rainfall within the lake area.

Annual variations in rainfall have caused fluctuations in outflows and lake level from year to year. The historical minimum and maximum outflows have varied from 347 m³/s to 1721 m³/s. A historic sequence of lake levels from 1948 to 1996 is produced using end of month water levels recorded in Entebbe, Fig. 2. In late 1961 the water level rose more than one meter in a few months, and in 1964 the water level reached its maximum, which was more than two meters above the 1961 level and 1.4 meters above the previous highest water level of 1906. This was probably the consequence of an intensified precipitation. The lake increased approximately 5 % in volume and large areas of adjacent land were flooded. The question of overtopping the Owen-falls hydro power dam was raised and pier facilities at Port Bell were submerged. Breeding grounds for some of the fish species were submerged, resulting in change in ecology. From historical evidence over a longer period it is, however, clear that the 1961-1964 lake level rise was not unique and that other similar fluctuations had occurred in the past.

In addition to these annual variations, there are seasonal fluctuations following the rainfall pattern within the year. The lake level rises during the main rains in April and generally reaches a maximum in May-June. The lake level declines through the rest of the year, usually between 20 and 40 cm to a minimum water level in October.

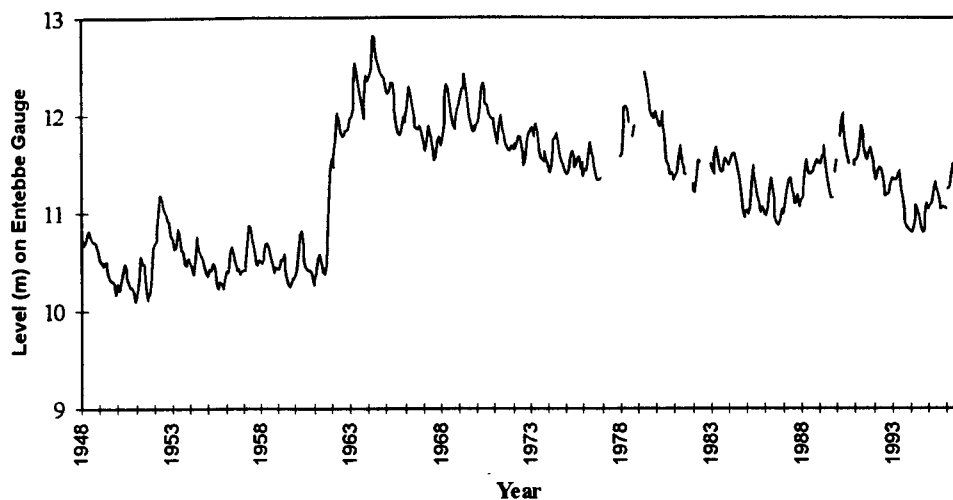


Figure 1:2. End of month Lake Victoria Level Variations (1948-1996).

Although several studies were conducted during the last 30 years, the water balance of the Lake has not been well understood. The main uncertainty has been estimation of the net contribution of rainfall and evaporation on the lake surface, and impacts of land-use changes on inflows. To better understand the hydrology of the Lake would require detailed studies of these aspects. Such understanding is, however, essential for a responsible planning of future developments such as port facilities, irrigation, drinking water supply, and hydropower.

The average annual water balances of the Lake (1948-70) prepared by HYDROMET (1974) is summarized in Table 1.1.

Table 1.1 Water Balance of Lake Victoria (Averages over 1948-70)

Parameter	Contribution km ³ /year	% Total Inflow
Rainfall on Lake	114	86
Runoff from Catchments (rivers)	19	14
Evaporation from Lake Surface	100	
Change in Storage	5	
Outflow	29	

Source: HYDROMET, 1974

The two dominating factors in the water balance of Lake Victoria are direct rainfall and evaporation from the lake surface. These two terms nearly balance each other. The water entering the lake comes mainly through rainfall on the lake surface, some 85%, and to a lesser extent as riverine flow, some 15%. The most significant of the rivers, the Kagera, contributes roughly half of the riverine flow or 7 % of the total inflow. The Kagera River rises in the highlands of Burundi and Rwanda, flows through Tanzania and discharges into the lake just north of the border between Tanzania and Uganda.

Some 85% of the water leaving the lake evaporates directly from the lake surface. The remaining 15% is discharged via the Owen Falls into the White Nile. The average outflow of the lake is 914 m³/s (1948-1970). Prior to the construction of the Owen Falls Dam which is operated for hydropower production since 1954, the outflow was controlled by the Ripon Falls and was therefore related to lake levels. Operation of the dam controls the flow in such a way that the outflow from the lake is equal to the natural river discharge as calculated from an agreed curve between Britain (on behalf of Uganda) and Egypt in 1949, relating lake levels to pre-construction discharge measurements.

1.3 Impact of land use change on the lake level

There has been a rapid growth in the population in the catchment and major changes in land use are under way. The types of changes include altered agricultural practices (clearance of natural vegetation for cultivation, land and swamp drainage, increased irrigation) and land degradation due to overgrazing. Other changes emanate from increasing urbanization, e.g. increase in the area of impermeable surfaces, vegetation clearance, improved land drainage and road construction. These changes may have an effect on inflows to the lake and hence on the lake water level. A preliminary assessment of the impact of these changes by the Institute of Hydrology (1993) predicts an overall drop in level of the Lake by about 300 mm over the next 30 years.

1.4. Socio-economic situation

1.4.1. Population

Almost 26 million people are living in the Lake Victoria Basin. There are 11 million people in the Kenyan part of the basin, 5 million in Tanzania, 5 million in Uganda and an additional 5 million in Burundi and Rwanda. The total population of the three riparian countries (Kenya, Tanzania and Uganda) is 74 million. Women compose slightly over 50% of the population.

Within the lake region, the highest population concentrations are found in the Kampala and Jinja areas of Uganda, Karagwe and Mwanza regions of Tanzania and in the Nyanza province of Kenya. Figure 3 shows the population density in the lake region.

The majority of the population of the lake region live in rural areas which are characterized by poverty and general lack of the necessary infrastructure and services such as safe water supply, electricity, medical facilities and schools. The standard of living of the people is low and dependent on a number of factors including employment opportunities, access to services and education standard.

Urbanization has been a major phenomenon in the region with an influx of people from the rural to the urban growth centers and towns. This has resulted in rapid and often unplanned development of towns and municipalities, the main ones being Entebbe, Kampala and Jinja in Uganda, Kisumu, Homa Bay and Kericho in Kenya, and Mwanza, Bukoba and Musoma in Tanzania. Kampala in Uganda has an estimated population of around 1 million people. Kisumu in Kenya has some 600,000 inhabitants (1996) and an annual growth rate of 7.2%, partly due to immigration. Mwanza in Tanzania has an estimated population of 460,000. Large proportions live in squatter areas in all main cities.

The population growth rate in the region is estimated at 3 percent per annum.

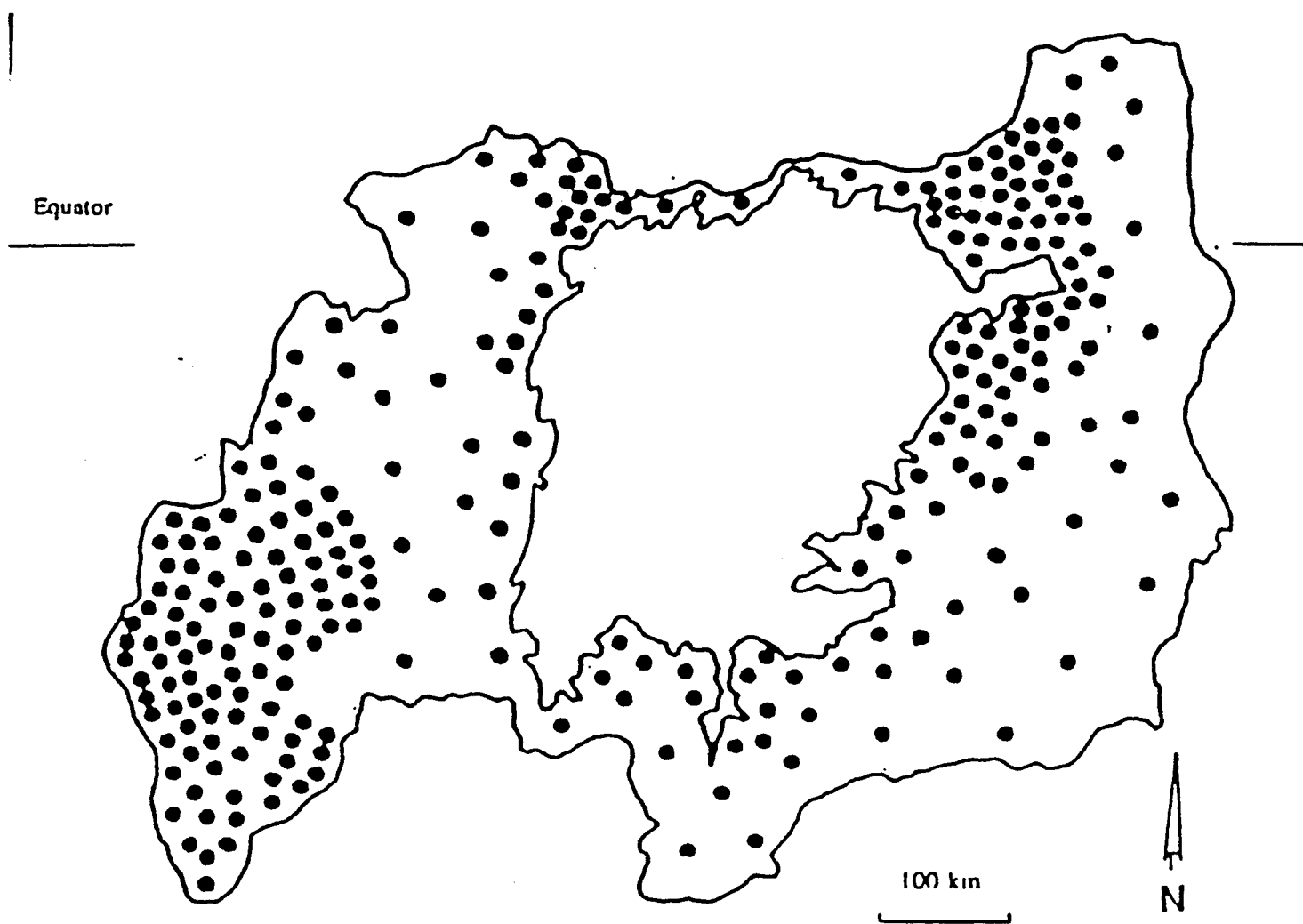


Figure 1.3. Population Density in the Lake Victoria Basin. Each dot represents 100,000 people. Source: Crul (1993:5)

1.4.2. Health

In general the health status of the population in the Lake Victoria basin is poor. The deterioration of the water quality of the lake caused by pollution has meant worsened health conditions for the population in the lake region, which uses the lake as a source of drinking water. Water born diseases are prevalent and the major diseases related to poor water and sanitation conditions are malaria, schistosomiasis, intestinal worms and diarrhea. Cholera outbreaks have been registered in municipalities such as Mwanza and Kisumu where sanitation conditions are particularly worse during rainy season.

The HIV/AIDS epidemic is one of the major health hazards within the region. The high prevalence of HIV/AIDS is closely correlated to the equally high incidence of sexually transmitted diseases (STD's) such as gonorrhea, chancroid and syphilis.

The governments of Kenya, Tanzania and Uganda have all undertaken rigorous AIDS control programs based on the multi-sectoral approach to the control of the epidemic with a focus on behavioral change among the people. Despite these efforts, high risk behavior prevails and is mainly associated with the fast growing urban centers. In the lake basin region, fishing villages and towns are notorious for high incidences of sexual promiscuity and prostitution as a result of the influx of immigrants into the fishing communities.

The HIV/AIDS crisis has also resulted in a large number of AIDS orphans, children whose parents have died of AIDS. The communities are overwhelmed by these orphans and collaborative effort of the Government, local communities, NGOs and donors is required to tackle this problem.

In table 1.2 the number of deaths caused by some of the most frequent diseases in the Sub-Saharan Africa (no figures were available for Lake Victoria Basin) are shown as well as the projected numbers for the years 2000 and 2020.

Table 1.2 Deaths (thousands) by diseases in Sub-Saharan Africa 1990 and projected to 2000 and 2020

Disease	1990	2000	2020
Tuberculosis	385	522	848
HIV	239	658	465
Diarrhoeal diseases	950	892	553
Childhood-cluster diseases	863	803	481
Malaria	732	668	397

Source: Ch. J.L. Murray and A. D. Lopez 1996?

It can be seen from the table that during the next coming years the deaths of tuberculosis and HIV are expected to increase considerably, while there is a slight decrease expected in the other diseases.

Life expectancy in the three countries is low. Kenya's life expectancy is 59 years for men and 63 for women. For Tanzania life expectancy stands at an average of 55 years and in Uganda life expectancy is 51 and 46 for women and men respectively.

The fertility rates (TFR) are considerably high in the region although the past years both Uganda and Kenya have witnessed a slight reduction in the total fertility rate, which stands at 6.7 for Kenya and 6.9 for Uganda. Tanzania's TFR is 6.0.

1.4.3. Economic development

The three riparian countries of Kenya, Tanzania and Uganda are among the poorest economies in the world, with a regional income per head of about 200 US \$ a year. Overall the economy of the three countries is dependent on agriculture which accounts for over 50% of the countries GDP. The 1980ies saw the deterioration of the standard of living of the people as a result of economic stagnation. At present the economies of the member states have been substantially liberalized and the macro-economic environment has substantially improved, as reflected by higher economic growth rates accompanied by declining inflation rates.

The last decade has also witnessed an upsurge of economic activity in the lake basin region. A lot of activities have emerged in the fishery sector as a result of the growth of fishing in the lake. Economic development has also been centered around rapid urbanization, the growth of industries and numerous other commercial activities focused on providing services to the growing population. If the people in the region are to experience an improvement in their standard of living, the economics of the three states will have to grow at a sustained rate of above 5% annually between now and the year 2000. The specific economic situation of the three riparian countries is given in the country reports in Annexes 1 - 3.

1.4.4. Labour market

There are no compiled figures of the total labour force in the Lake basin. However, on an average 80 % of the labour force is employed in the agriculture sector, the majority of which is not in wage employment. A major problem is the lack of viable employment opportunities especially among the youth.

1.4.5. Gender concerns and the situation of women

The three lake basin countries share a similar population structure where women are slightly over half of the entire population.

The livelihood of the rural communities is derived from the land where people live as peasant farmers and pastoralists. In the fishing communities, the major economic activities are centered around fishing on the lake, fish processing and marketing.

The socio-economic status of women is low in comparison to men in the region. Although there are some variations in the socio-economic well-being of the people living in the lake shore region, the situation as observed during the study can be described generally based on the pertinent gender concerns identified as follows.

A. Access to resources

Resources as a means of production are a key element in development. Women have limited access to resources such as land and credit and this in turn limits their decision making over these resources. Ownership of property is an aspect that has long traditional and cultural foundations that deny women ownership of land. This is of significant concern in the Nyanza Province of Kenya. For example, among the Luo community, a woman can not make a decision regarding the use of land such as planting (sowing the first seeds) or harvesting

without the consent of the husband. In most cases, women can not obtain credit, since they are not able to secure a loan without a title deed.

B. Poverty

Poverty is the leading socio-economic problem in the lake shore region. The adverse effects of the socio-economic changes in the region over the last 20 years have meant that many communities and households have lost their initial source of income.

Due to the social cultural and traditional practices that limit women's access to resources and their decision making power, women bear a heavier burden of poverty. Among the fishing communities, commercial fishing and processing has deprived most households and in particular women, of their source of income. Women were previously engaged in fish processing and marketing.

Rural-urban migration has resulted in women and children being left on the land while men migrated to towns for search of employment. In this case, the ability of women to produce sufficiently from the land is limited.

C. Women's health status

HIV/AIDS is an outstanding health hazard in the region. Prostitution is prevalent in the urban and growth centres such as Musoma and Mwanza as well as in the numerous fishing villages and towns in the lake basin. A report (Ndatulu et al. 1996) states that the increase in economic activity related to fishing has also led to an increase in sexual promiscuity and prostitution in fishing villages in the Mwanza area.

Widow inheritance amongst certain tribes is another phenomenon that has aggravated the spread of AIDS among the people in the region. Early marriages for girls is a common practice. Women's heavy workload related to their productive, reproductive and community management roles is a major cause of women's poor health coupled with the fact that they have limited access to health care facilities due to lack of money.

D. Education

Education status of women tends to be lower than that of men as fewer girls than boys complete schooling. This is exemplified by high illiteracy rates among girls and women. Adolescent girls have children, or marry at an early age giving rise to high drop-out rates for girls of school age. This is coupled with the prevalence of traditional attitudes that devalue girls' education.

2. ENVIRONMENTAL CONDITIONS AND NATURAL RESOURCES

2.1. Major environmental issues for lake Victoria

Lake Victoria has undergone large changes in its chemistry and biology during the last decades. The introduction of the Nile Perch in the fifties attributed to a reduction of stocks of endemic species and to a decline of biodiversity. The destruction of native species has probably accelerated the eutrophication of Lake Victoria.

The infestation of water hyacinth (*Eichhornia crassipes*) is a recent problem that requires urgent measures to control. Pollution is increasing with the rapid population growth in the lake basin area. Urban centers around the lake have a defunct sewerage system, releasing raw

sewerage into the lake. The industries have not been pressurized enough to build efficient effluent treatment plants and they often dump their effluent directly into the rivers or the lake. In Tanzania, the gold rush puts an additional stress on the environment. Land use in the catchment zone plays a major role in the pollution process since soil erosion leads to higher loads of sediment and nutrients in the rivers. On the other hand, wetlands are being converted into agricultural land or land for peri-urban settlement and industries.

2.2. Water quality

Lake Victoria had a good water quality in its natural state. The ionic composition is a product of the weathering profiles of granite and metamorphic rocks of the African plateau. The lake has undergone large changes in chemistry, especially over the last 30 years, which are not yet fully understood.

Recent studies have noted that significant eutrophication is taking place in Lake Victoria. Data from sediment samples taken from the bottom of the lake indicate that nutrient deposition increased steadily over the past 150 years. This suggests that the increasing human and livestock populations in the lake basin may be major contributors of the nutrients into the lake. The introduction of the Nile Perch in the fifties attributed to a reduction of stocks of endemic species and this most probably also had its impact on the trophic level of the lake. The Haplochromines played a major role as phytoplankton and detritus feeders. This helped in the past the lake to cope with increased productivity and in recycling biomass and nutrients, thus retarding the accumulation of rotting biomass in the deeper portions of the lake. But with the collapse of the native species the food web, the trophic structure of the lake, is altered. Algae material gradually increased and accumulated in the deeper water layers and increased micro-biological processes resulted in oxygen depletion.

Numerous sources may be contributing to nutrient deposition in the lake. Untreated or semi-treated domestic wastewater from urban centers and rural settlements in the catchment represents a source of nutrients to the lake and have a high BOD level. Overflows or leakages of pit latrines and septic tanks leak into underground water or are washed away with run-off water into the rivers and the lake. Solid wastes, including market refuse as well as blood and fat from slaughter houses, carry high loads of BOD and are not taken care of properly. Detergents used when washing on the shores are contributing to the nutrient load. Raw material effluent from many industries contains high levels of organic compounds like sugars, proteins, alcohol and waste yeast. The inorganic industrial effluent composition contains sodium, potassium, nitrogen, calcium and sulphide. Fish industries release fish particles and wastes directly into the lake. Land clearing and forest burning for agriculture and grazing of livestock may also be important contributors to the nutrient budget. Nutrients from these sources can be transported into the lake through runoff and through eroded silt and sediment particles. Nutrients in air emissions and airborne particulate may be transported into the lake by precipitation.

Although some attempts have been made to quantify the amounts of nutrients being discharged into the lake in each country there is at present insufficient information to determine the total nutrient budget. The use of fertilizers by the farmers is limited due to financial constraints and therefore has contributed little to the eutrophication of the lake.

Another potential change in water quality may be due to discharges from toxic compounds. Mercury compounds discharged into surface streams flowing into the lake from the gold mining areas near Geita and the eastern part of Lake Victoria in Tanzania pose a serious potential threat to the lake fisheries and human health. The discharge of chromium compounds

from partially treated effluent from the tanneries, dioxin as well as other toxic by-products from chlorinated bleaching processes from paper and pulp mills and dyes from textile industries is hardly monitored in the lake region. Oil and grease is discharged from garages and petrol stations, oil companies and factories. The use of pesticides in the Lake Basin occurs on a small scale by the individual farmers, and cash crop plantations such as sugar, tea, cotton and coffee seem to use acceptable levels of internationally recommended pesticides. Research was carried out on pesticide residues in the Kenyan part of the Lake during the eighties and the nineties, but they were found absent.

Another significant water quality change in Lake Victoria is the depletion of dissolved oxygen. For the deep off-shore waters, oxygen concentrations is affected strongly during periods with thermal stratification, and very low oxygen concentrations (below 10% saturation) appear.

As can be seen in figure 2:1 the deep offshore waters contained less oxygen during most of 1990 than in 1960. Anoxic conditions below 45 meters was also frequently encountered during the stratified period of October-March 1990-1991, affecting up to 50% of the lake's bottom area. During such periods limnic organisms which cannot escape to other levels with oxygen will die.

Inshore areas are generally well oxygenated from surface to bottom.

2.3. Land use

The lake basin covers a wide range of ecological zones, from the forests on the slopes of Mt. Elgon, through intensively cultivated areas down to range-lands and irrigated lowlands around the lake (for details see under land use in the country descriptions in Annexes 1-3). Population pressure has resulted in intensified land use in fragile areas causing land degradation mainly through lack of soil conservation measures on cultivated land, overgrazing and deforestation. There is lack of terracing in steep farmlands resulting in severe top soil erosion. This results in a transport with the watercourses of sediment and nutrients which ends up in the lake.

Planting of trees like Eucalyptus in wet places causes the area to dry up as trees grow. Clearing of bushes and other vegetation like papyrus takes place along river banks and lake shores. Extensive cattle grazing in wetlands is common in some areas. The poor agricultural practices and land use causes high siltation. Gold mining has affected the wetlands. The use of soft clay for pottery and sand-mining along the rivers have interfered with most wetlands in the region.

2.4. Wetlands

The lake has a long indented shoreline. Swampy areas are common in the flat land in the northern and southern part of the lake. Like most other African swamps, they are characterized by the presence of the papyrus plant (*Cyprinus papyrus*).

An extremely important feature of the swamps is their buffering capacity. The swamps provide a natural filtering of inflows as they act as sediment traps for the heavily sediment loaded rivers passing through. They are also very important as fish breeding sites. The papyrus and other swamp vegetation provide raw material for mats and for building houses and fences.

The wetland ecosystem within the lake Victoria basin, just as in other parts of the world, are under a severe threat of extinction. Some of the major factors that threaten the habitats in this region include clearing of wetland areas for agricultural production and human settlement. Others include overgrazing, mining activities (gold, clay and sand) siltation and introduction of exotic species like Eucalyptus. There is also the problem of poor harvesting techniques which

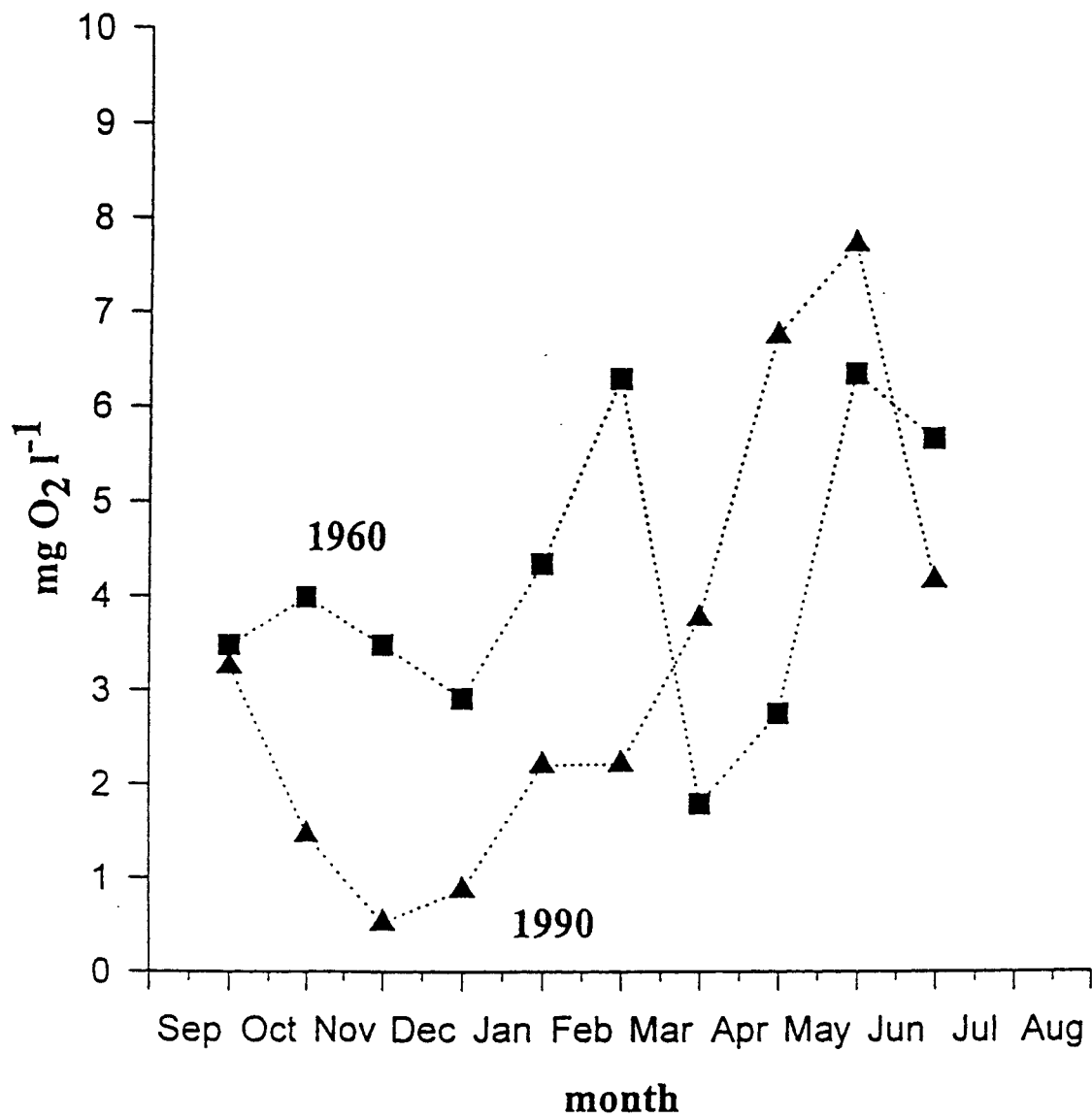


Figure 2:1. Dissolved oxygen levels averaged over the 40-60 m zone of Lake Victoria - 1960 and 1990 compared [data plotted from Hecky *et al*] (from Lake Victoria Environmental Management Programme, Task Force II, Final Report by the Regional Consultants)

do not allow already harvested areas to regenerate. It is also evident that another threat to the wetland ecosystem is the communities' lack of awareness of their ecological value to the environment. Attitudes towards wetlands are commonly negative.

Reclamation of the remaining swamps may have serious implications for the lake as the reduced natural buffering capacity would lead to a further eutrophication of the lake.

2.5. Water hyacinth

The water hyacinth (*Eichhornia crassipes*) is a free floating weed that, however, roots if the water is shallow enough. It originally comes from South America (Venezuela or Brazil). It was introduced to the African continent in the early part of this century first in Egypt, followed by South Africa. It consequently spread to the other countries in southern Africa and appeared in the Zaire River and the upper Nile swamp in Sudan in the 1950's. At present about 15 African countries have problems with this plant.

The Lake Victoria ecosystem has been seriously affected since the water hyacinth was first spotted entering the lake from Kagera River in the late 1980ies. The plant has spread rapidly and is now present in the form of large mats fringing substantial areas of the shores in all three countries. Huge amounts of the weed enter the lake through the Kagera river, down which the mats flow from lakes far up in Rwanda and Burundi. The weed obstruct fish landing sites, fouls fishing nets, and obstructs water supply intake sites and hydroelectric power generation facilities such as the Owen Falls. The hyacinth physically interferes with commercial transportation services for people and goods on the lake. It also adds to the cost of purifying water with higher concentrations of suspended, decaying organic matter. The rate of the hyacinth growth varies with nutrient availability and ambient conditions. Under favorable conditions the hyacinth population can double in 13-15 days. The hyacinth has a direct effect on Lake Victoria water quality. It blocks sunlight for organisms below and its decomposition depletes dissolved oxygen and leads to anaerobic conditions. The mats of hyacinths seem to offer ideal habitats for snails, leeches and insects which promote a prevalence of waterborne diseases like malaria and bilharzia.

On the other hand, the extensive root system of the hyacinth offers an excellent breeding place for catfish (*Clarias crassipes*) and lungfish (*Protopterus aetiopicus*) and their number has increased considerably. An additional reason for that might be the reduced fishing pressure in the coastal areas due to the weed.

The governments, scientists and stakeholders are desperately trying to control the weed. There are three main methods of control, biological, chemical and physical. The relative merits of these methods and their applicability in different situations is still under discussion. Many instances are, however, totally against the use of chemical substances due to the use of the lake water for water supply in several municipalities. The most promising approach involves harvesting the hyacinth mechanically and using it for compost or for biogas.

There is also a common understanding that there is a need to reduce the input of nutrients into the lake in order to reduce the rate of growth of the water hyacinth.

2.6. Fishing and Biodiversity

Fishing and related post-harvest processing have been a very important economic activity in and around Lake Victoria, and a rapidly growing population in the catchment area depends on the lake fisheries as a source of protein. After the introduction of gill nets in Lake Victoria in 1905, catches of the endemic fish species gradually declined due to the increased fishing effort. A further increase of fishing effort during the 1940's with the use of illegal undersized mesh sizes and the introduction of nylon nets and outboard motors in the 1950's resulted in overfishing and a sharp reduction in the catches in the inshore areas.

The high demand for fish led to the introduction of exotic species into Lake Victoria. The tilapias (*O. niloticus*, *O. leucostictus*, *T. zillii* and *T. rendalii*) were introduced during the 1950's and 1960's and eventually replaced the indigenous species. The Nile Perch found its way into Lake Victoria in the early 1950's, by unofficial and official means, before the results of a pilot experiment carried out in Lake Kyoga in the 1950's to determine the advisability of stocking Lake Victoria were available.

The introduced species resulted in increased commercial catches, although the once multi-species fishery has been reduced to a fishery based on three species. Predation by Nile Perch and competition with introduced tilapias have caused a severe decline, and in some cases total disappearance of native species. Of the acclaimed 300 *Haplochromis* spp., only an estimated third survived the Nile Perch introduction. Original *Tilapia* spp. such as the *Tilapia esculentus* and *Tilapia variabilis*, disappeared as well from the main lake. The drastic change is clearly demonstrated by figures on the composition of fish landings between 1970 and 1990. In 1978, haplochromines contributed about 80% of the biomass and the Nile Perch less than 2%, the remainder comprised the introduced Nile Tilapia and the native non-cichlides. By 1983, the Nile Perch comprised 80% of the catch, while the rest comprised the Nile Tilapia, and a single indigenous species, the omena and few other native fish.

In 1989 the lake produced over 500 000 tons of fish, predominantly Nile Perch (63%), Dagaa (19%) and Nile Tilapia (9%). The ecosystem is still largely unstable and the level at which the fish production of the lake will stabilize is simply not predictable.

Fish has always been an important source of food for the people around the lake. The increased production of table fish from 44000 to 405000 tons between 1975 and 1989 must have had a significant impact on the food availability around the lake basin and also to more distant urban centers in the three countries. The presence of Nile Perch drastically changed the nature of fishing operations, fish processing and marketing. The total value of production at market level has been estimated at 270 million US \$. In Kenya and Tanzania the value of production increased by 500% and 750 % respectively between 1985 and 1990.

New industrial large-scale fishing trade with export of fillets to overseas markets has developed in the last decade in addition to traditional, local, small-scale fishing. In 1991 exports of fillets from Kenya reached over 10 000 tons, valued at 20 million US \$. The growing export trade is now becoming a matter of great concern, because the production of the filleting industry in Uganda and Tanzania, where new plants are being built with capacities up to 50 000 tons, will have severe consequences for the local market in terms of fish availability and fish prices.

There are indications that the Nile Perch catches have been leveled off and even declining over the last 2-3 years. The fish sizes are declining, indicating over-fishing pressure. Pessimistic scenarios predict the total collapse of the Nile Perch fisheries. It is important to note that fishermen concentrate more and more on the *Rastrineobola argentea* (dagaa, omena), a

sardine-like fish. Its contribution to the fish production rose from 20% in the eighties to 40% in the mid-nineties.

The explosion of the Nile Perch also had a profound impact on the local diet of the people. Prior to the early 1970ies, haplochromines comprised an important component of the local diet and a major source of protein. However, in recent years, although fish yield from the lake increased significantly, the composition of the yield largely comprised of the Nile Perch, much of which is now exported to urban centers of East Africa, to Europe and Israel. Fishing is now largely a commercial enterprise influenced by few powerful, private interests. This change has detrimentally affected the local diet.

Cooperative Fishing Societies are not working efficiently. On some places there is a lack of management skill perpetuated by conflict between fishermen, the Fisheries Department, and the Ministry of Cooperative Development. Lack of services to members, lack of accountability by officials, weaknesses in marketing and lack of control of fish prices have led to collapse of several fishermen cooperative societies.

There is a great need for improved handling of fish at the landing sites in order to avoid diseases and keep a good quality of the fish. Also, no clear policy exists in the fishery sector for infrastructural development. In all districts, there is a lack of good roads, electricity, storage facilities, piped water, sanitation, sheds, smoking and drying facilities.

In the three countries, fishing by trawling has been banned. There are, however, indications that trawling takes place anyhow every now and then on the lake.

3. WATER RESOURCES DEMAND AND REQUIREMENTS

3.1 Rural water supply

The general situation of rural water supply in the lake basin is characterised by a very low level of access to safe water within reasonable walking distance. Coverage ranges from 30% in Uganda, 46% in Tanzania to 51 % in Kenya. In order to address the situation all the three countries have in place rural water supply programs or projects which emphasises a decentralised community-based approach, whereby the communities are fully involved in the implementation of low cost facilities for water supply, and take full responsibility for operation and maintenance. The strategies also emphasise integrated approach to water and sanitation, community mobilisation, health and hygiene education - to improve the impact of safe water provision. However, the coverage levels are still below the national objectives which aim at providing safe water to all the people.

3.2 Urban water supply

The piped urban water supply coverage in major towns on the shores of Lake Victoria (Kampala, Jinja, Entebbe, Kisumu, Homa Bay, Musoma, Mwanza and Bukoba) and other towns in the catchment (such as Masaka, Mbarara, Kitale, Eldoret, Bungoma, Webuye, Kakamega, Kericho, Kisii, Migori, Biharamulo, Tarime, Shinyanga) is very low, estimated at below 50 %. In Mwanza with a population of about 460,000, the existing system capacity is 40,000 m³/day against a demand of 70,000 m³/day; in Kisumu with a population of 600,000 the existing system capacity is 22,000 m³/day while the demand is 42,000 m³/day; while in Kampala the existing system only covers 50% of the population. The rest of the population in these towns rely on springs, bore holes, wells and polluted surface water sources. For most of the towns, especially in Kenya, there are no existing or immediate planned programs to improve the urban water supply. Even in the towns with existing or planned programs the designs basically concentrate on rehabilitation and limited expansion in the central parts of the towns, leaving gaps in peri-urban areas.

3.3 Industrial demand

There are several industries concentrated to the Lake basin particularly in Kampala, Jinja, Kisumu and Mwanza. The industries are generally connected to the urban water supply network. However, individual industries with special requirements or in isolated places not served by urban supplies may have their own water supplies. The states and requirements of these supplies vary from industry to industry.

3.4 Sewerage and sanitation

The situation in the basin is characterised by extensive use of simple sanitation techniques. The vast majority of the population in towns rely on pit latrines. All the major towns have public sewerage systems but these only cover the core areas of the towns, thus serving a minor part of the urban population. It is estimated that only 15% of the population in these towns are served. The general state of the sewage treatment facilities is very poor. This implies that raw sewage is discharged into small rivers or streams or directly into Lake Victoria. For example in Mwanza the sewerage pumping station broke down two years ago and raw sewage is discharged directly into Lake Victoria. Some of the population is served by septic tanks but the majority use pit latrines with very poor hygiene conditions; the rest of the urban population has no adequate sanitation facilities, relying on extremely unhygienic communal facilities or defecate wherever they might find some privacy. Again in Mwanza, settlements on the rocky hill makes construction of pit latrines very difficult. Excrete is washed directly into the lake after rains. Due to the low coverage of sewers in towns, household wastes containing organic matter, are left on the ground or in surface runoff channels and is eventually washed during heavy rains to the receiving waters. In low lying areas floods bring wastes in suspension and create health hazards due to bacterial contamination.

Less than 50% of solid waste, including household wastes, in the bigger towns and cities is collected by the city council and disposed of.

Within the rural areas the coverage of sanitation is estimated to be 50%.

3.5 Livestock water supply

Livestock water demand is a significant water use, especially in the semi-arid pastoral areas of the lake basin, where surface water sources are seasonal and where long dry seasons are experienced. In the dry areas south and west of the lake the main activity is pastoralism which often encroaches on the nature reserves (e.g. L. Mburu National Park) and settled neighbouring communities, in search of water and pasture. Provision of adequate livestock water supply in the pastoral areas is an important requisite for livestock development.

Dams and valley tanks were constructed, but most of these facilities have silted up or are dry due to poor siting, lack of maintenance, poor animal watering methods and soil erosion as a result of overstocking and poor agricultural practises.

3.6 Hydropower generation

Most electric energy in the three riparian countries is hydropower. The total installed capacity is 1500 MW and the demand exceeds the supply in all three countries. Electricity accounts for only 5% of the countries energy demands and the demand is increasing at a rate of approximately 6-10% per year, estimated to increase to over 6000 MW by the year 2020.

One of the most important uses of the lake today is generation of hydropower at the Owen Falls power station on the outflow of Lake Victoria. The installed capacity is 180 MW. Part of the produced electricity is exported to Kenya and Tanzania. There is a large potential for hydropower production on the tributary rivers and on the Nile downstream of the lake. The estimated potential is around 2700 MW.

The addition of the Owen Falls Extension will mean that the combined capacity of the existing Owen Falls and Owen Falls Extension projects will need outflows well in excess of the Agreed Curve which will thus become a limiting constraint. There is need to develop an optimal Lake Victoria regulation and hydropower operation plan that considers the hydroelectric projects on the lake basin as one system, as a basis for reviewing existing international agreements (the Agreed Curve). Lake level regulations will be constrained by the impacts of increased levels on the lake-shore infrastructure, villages and lake and wetland ecology.

3.7 Irrigated agriculture

The present irrigation use of water from Lake Victoria is not widespread, with exception of the sugar plantations, horticultural and floricultural farmers practising small scale irrigation, and small-holder and few large scale rice schemes. The unreliable rain-fed agriculture in the lake basin has often highlighted the need to achieve higher agricultural production per unit area and improved food security through a more efficient use of land and water resources.

The technical irrigation potential in the Lake basin is over 170,000 ha. The development in irrigation requirements, however, seems rather difficult to estimate. There is need to assess irrigation potential in the basin including socio-economic assessments and actual water use and requirements.

3.8 Lake transport

Lake Victoria has been used for transport of goods and passengers between Mwanza, Bukoba, Kisumu, Kampala and Jinja for a long time. During the existence of the East Africa Community, the East African Railways and Harbours corporations transported more than 500,000 passengers and 500,000 tonnes of goods in 1972 with ships ranging from 1000 to 1500 metric tonnes.

After the break-up of the East-Africa Community in 1976, transport of passengers was made impossible and cargo transport reduced considerably. The transports on the lake have since then not reached its former capacity.

The lake transport facilities include ferry terminals on Lake Victoria at Port Bell, Jinja, Musoma, Bukoba, Mwanza, Kisumu and Hhoma Bay. Water level variations have a significant impact on the use of the port facilities. More urgently, the water hyacinth has a negative impact on the lake transport, making access to ports difficult and blocking landing sites for fishing boats. Further more, there is no regulation of shipping vessels and pollution from shipping activities, the last bathymetric survey was undertaken in 1907, meteorological services and communication are inadequate.

4. ORGANIZATIONS AND PROGRAMS

In this chapter the most important organizations and programs in the region related to water and environment are described.

4.1 Regional

4.1.1 The Technical Cooperation Committee for the promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE)

TECCONILE was established as a transitional body in December 1992 to succeed the former HYDROMET Survey Project which had been in operation since 1967 and collected hydro-meteorological data and undertook studies to better understand the hydrological regime of the Upper Nile basin (Lakes Victoria, Kyoga and Albert basins). The membership consists of the riparian states of Egypt, Rwanda, Sudan, Tanzania, Uganda and Zaire. Burundi, Kenya and Ethiopia participate in all activities of the project as observers. The long term objectives of the TECCONILE are to promote basin wide cooperation for the integrated and sustainable development.

With the support of the CIDA a Nile River Basin Action Plan (NRBAP) has been formulated and approved in February 1995 by the Council of Ministers for Water Affairs of the Nile Basin states. The Action Plan aims at promoting cooperative water management in the whole Nile River Basin and includes 22 individual projects, with an estimated cost of about US \$ 100 million. The projects concern integrated water resources planning and management, capacity building, training, regional cooperation, and environmental protection and enhancement.

Substantial financial and technical resources for the full implementation of the Action Plan are still required. Of particular interest is the Water Balance of Lake Victoria for detailed assessment of the water resources of the basin and potential impact of land-use and climate change on the study of wetlands.

4.1.2 East-African Cooperation

The East African Commission (EAC) is an intergovernmental organization established to steer the newly rekindled spirit of cooperation between the republics of Kenya, Tanzania and Uganda.

The cooperation's roots date back to the days before the defunct East African community which collapsed in 1977. The Commission is composed of ministers responsible for the agreed areas of cooperation and is headed by ministers responsible for regional cooperation.

The EAC's objectives are to :

- strengthen and consolidate cooperation in agreed fields with a view to bringing about equitable development among the member states and thereby uplift the living standards and quality of life of the people
- promote sustainable utilization of the region's natural resources and effective protection of the environment
- enhance the role of women in development
- promote peace, security and good neighbourliness in the region.

The EAC has identified economic cooperation as the key priority for the region. In this regard, the Cooperation's areas of immediate focus are in sectors which promote economic development in the partner states.

A Secretariat (see Annex 5) is responsible for coordinating the work of the Commission. The Secretariat was launched in March 1996 and has its offices in Arusha, Tanzania. The core budget of the EAC's Secretariat is funded by equal annual contributions from the member states. Projects and programs are funded through the mobilization of resources from both within and outside the region. The main responsibility of the Secretariat is to convene meetings of representatives of sector ministries in member states. It is then the role of the sector ministries to implement the decisions agreed upon.

According to the Secretariat, the major concern for Lake Victoria is the lack of coordination among the many players who operate on the Lake, stating that this situation is a potential area of conflict in the region. The main players carrying out operations on the lake include fisheries, railways, transporters and the security agencies (police and anti-smuggling units). Other main concerns with regard to the lake include management of the water hyacinth, safety navigation, hydrographical mapping and protection of the lake as a major resource in the region.

There are at present plans to upgrade the tripartite agreement into a treaty that will exert more authority for cooperation among the three countries. The Secretariat will soon undertake a review of all laws and regulations in the member states to identify any conflict areas that may not conform to the agreement of cooperation. The Secretariat has facilitated collaboration between the East African Law Society, the Employers Association, E-A Chamber of commerce and the Manufacturers' Association.

4.1.3 Lake Victoria Environmental Management Project (LVEMP)

This is a comprehensive program aimed at rehabilitation of the lake ecosystem for the benefit of the people and the global community. The program objectives are to a) maximize the sustainable benefits to the riparian communities from using resources within the basin to generate food, employment and income, supply safe water, and sustain a disease-free environment and b) conserve biodiversity and genetic resources and c) harmonize national management programs to reverse increasing environmental degradation. Formulation of the LVEMP was initiated by the Governments of Kenya, Uganda and Tanzania on 5 August 1994 when the three Governments signed a Tripartite Agreement for program preparation with support of the GEF under the World Bank funding, and technical assistance provided by FAO, UNDP and UNEP. Following successful program preparation and negotiation, a funding of US \$ 70 million has been secured from World Bank and GEF with a further US \$ 7 million to be provided by the governments.

The program was declared operational in the beginning of March 1997. Basically, it has four major components: (1) Fisheries Management; (2) Water Hyacinth Control; (3) Water Quality Management; and (4) Land Use including Wetlands. Each component has a number of sub-programs which are addressing specific issues within the respective problem area.

Three national Secretariats have been established and staffed, one of them has been given a coordinating role, a joint Executive Secretary has been appointed and the implementation work has started.

The program will, however, not address the water quantity/availability issues in the lake basin (hydrometric data collection, water balance and hydrological modeling and decision support system for water use and demand), notwithstanding the fact that there can only be partial improvement of the management of the lake water resources without adequate data/information on water quantity. The water hyacinth component focuses on long term control measures (biological control and control of pollution). However, the present extent of the water hyacinth and the impact it has posed on the three countries, requires emergency actions while awaiting long term measures. In recognition of this, the Regional Secretariat of the LVEMP after consultations with the World Bank intends to seek further support for an emergency water hyacinth control program.

A more comprehensive description of LVEMP can be found in Annex 6.

4.1.4 Lake Victoria Fisheries Organization (LVFO)

The LVFO, drafted with FAO Project TCP/RAF/2373(A) "Assistance to the Establishment of Lake Victoria Fisheries Commission" was signed by all three countries on 30 June 1994. The objective of the organization is to promote better management of fisheries on the lake, coordinate fisheries management with conservation and use of the lake resources, collaborate with agencies and programs on the lake, coordinate fisheries extension and advise on introduction of non-indigenous organisms. The LVFO is governed by the Council of (fisheries) Ministers assisted by the Executive Committee of Heads of Departments for Fisheries Management and Research, a Management Committee and a Scientific Committee. It has a permanent secretariat based at Jinja, Uganda. The Secretariat became operational in December 1996. LVEMP intends to implement a fish levy trust to i.a. sustain the organization.

4.1.5 Lake Victoria Water Resources Project (LVWRP)

Following the agreement between FAO and the Governments of Kenya, Tanzania and Uganda, a project GCP/RAF/304/JPN "Information System for Water Resources Monitoring and Planning in the Lake Victoria Region" or shorter - Lake Victoria Water Resources Project - is being implemented in the region with Japanese funding and FAO technical assistance since January 1996. The main objective of the project is to establish and strengthen the technical capacity to monitor water resources and to develop modeling tools for sustainable regionally coordinated water resources planning and management. To this effect, the main project goals are to: establish water resources monitoring network, establish and strengthen remote sensing (PDUS) and hydro-meteorological data (MDD) reception facilities; establish a coordinated geographically referenced data base (GIS); and develop a GIS based water resources simulation model for spatial estimation of rainfall regime, rainfall-runoff and river flow simulation, and a control/decision support system for reservoir operation and water management.

However, the project budget is not adequate for accomplishment of the intended objectives and outputs. The LVWRP cannot therefore respond to all the identified gaps in water quantity and quality information requirements. The Project has prepared a proposal to fill these gaps but no funding source has been identified.

4.1.6 Water Resources Management Policy and Institutions in the Lake Victoria Region (TCP/RAF/2365)

This project was in response to the need felt by the Lake Victoria countries to address common interest in water resources development, management and protection of the Lake region. Activities under the project were initiated in July 1993 and culminated on 27 & 28 July 1995 at the Regional Meeting on the Promotion of a Lake Victoria Management Institution, which was attended by high level Government delegations from Kenya, Tanzania and Uganda, and FAO representatives. The major outcome of the meeting, that has direct bearing on the RAF/304 project, is reflected in the conclusion that the Steering Committee of the LVWRP be mandated as a transitional arrangement for coordinating water management activities pending the formulation of more complete proposal for a Lake Victoria Management Institution.

4.1.7 Regional Soil Conservation Unit (RSCU)

Sida's Regional Soil Conservation Unit (RSCU) was established in Nairobi in 1982. Since then the Unit has grown from a small training outfit to a broad-based program focusing on technology transfer and capacity building in the East Africa Region, defined as Eritrea, Ethiopia, Kenya, Uganda, Tanzania and Zambia.

RSCU's mandate is to "promote soil conservation, broadly defined as activities and techniques of environmentally sound production of food, fodder, wood and other commodities based on a sustainable land use ". Initially the Unit mainly focused on improved soil conservation techniques on cultivated land. A gradual shift from promotion of mainly physical structures towards biological soil conservation methods can be noticed. The emphasis is now on land husbandry, using various conservation techniques to sustain agricultural production.

The RSCU activities include training and networking; development, production and distribution of technical handouts and training materials; regional capacity building in the form of fellowships and regional consultancies; methodology development through support of pilot projects and finally dissemination of new techniques/approaches by assisting in arrangement of seminars and workshops. Furthermore, RSCU plays an advisory role to Sida on improved land husbandry issues in the region.

One of RSCU's main objectives has been to facilitate the dissemination of experiences gained by the Kenya National Soil and Water Conservation Program. The Program has been supported by Sida since the mid-seventies and is implemented by the Soil and Water Conservation Branch (SWCB) at the Ministry of Agriculture. With assistance from SWCB, RSCU has over the years managed to arrange for about 1600 people from the region to attend courses and/or study visits to Kenya. RSCU has established a Regional Advisory Committee (RAC) to guide and assist the RSCU management. From July 1994, the Unit has become an independent regional project financed by Sida.

Following a review of RSCU carried out in 1996 there is now a proposal that the RSCU mandate be broadened and the Unit expanded. According to the proposal RSCU should be transformed into RELMA, Regional Unit for Land Management, with effect from 1 July 1997. It should be given a broader mandate than RSCU but still within the area of land management. The work will include both technical issues related to land management and institutional, social and economic aspects.

The Regional Advisory Committee (RAC), consisting of two representatives from each country, should continue its advisory function to RELMA. The composition and working approach should be gradually changed to cover a broader mandate which is suggested to read: "Improving livelihoods and enhance food security among small-scale land-users in the region".

From having had 4-5 professionals in RSCU it is proposed that the future RELMA could have up to ten positions for professionals.

4.1.8 Vi Tree Planting Project (Vi TPP)

Vi TPP is a Non-Governmental Organization financed by the Swedish Foundation *Vi PLANTERAR TRÄD*. The foundation is supported by the Vi-magazine which is the voice of the Swedish Consumers' Association. Funds are basically raised by private donors and from Sida. The over-riding goal is to raise the living standards of the target groups through tree planting; small scale farmers, with special support to women and other poor people. As a long-term goal Vi TPP would like to see trees planted around the whole of Lake Victoria.

For 1997 the organization has a budget of 24 million SEK. An application has been sent to Sida for support of 17,5 million SEK. Also the Norwegian Aid Agency NORAD contributes. Project funding is secured for one year at a time only, something that frustrates program planning. The project would like to see a situation having 3-5 years funding secured.

Vi TPP started to work in 1983 and is now operating in three areas around Lake Victoria; Kitale in Kenya, Masaka in Uganda and Musoma in Tanzania. It started to operate nurseries with the primary objectives to demonstrate tree growing methods and to provide experience in propagation methods of different tree species. They are also used to produce seedlings which are given out free of charge to small scale farmers.

During the financial year 1996/97 there are substantial changes to the project approach, with the aim of increasing the number of farmers that can be reached with available resources and also making them self reliant. A Participator Rural Appraisal (PRA) team has also been established in the project. A goal is to conduct at least one PRA-exercise in each extension area within a year.

Vi TPP work has been successful in all three project areas, even in the dry areas North of Kitale. The project also educates people in the villages in soil conservation, how to collect water and how to reduce erosion.

Vi TPP has gained outstanding experience on land reclamation and in different methods of tree propagation. In particular, experience from work on direct seeding of a variety of tree species is most valuable, and could hopefully be documented for the benefit of others working in this sector.

More information on the Vi TPP activities in the three different geographical areas is given in Annex 7.

4.1.9 Other regional organizations and programs

In Annex 4 the following organizations and programs are described:

- Kagera Basin Organization (KBO)
- FAO Project GCP/RAF/286/ITA "Operational Water Resources Management and Information System in the Nile Basin Countries"
- FAO Project GCP/RAF/231/JPN and GCP/RAF/232/JPN "Remote Sensing for an Early Warning System in Eastern and Southern Africa"
- FAO Project TCP/RAF/2365 "Water Resources Management Policy and Institutions in the Lake Victoria Region"
- FAO Project GCP/RAF/287/ITA "Land Cover Mapping of East Africa Based on Satellite Remote Sensing"

4.2 National Organizations and Programs

In Annexes 1 - 3 the following national programs are described.

Kenya:	Soil and Water Management Programme National Soil and Water Conservation Programme (NSWCP) Development of Small-scale Fish Farming Project Rural Domestic Water Supply and Sanitation Programme Wetland Programme by Kenyan Wildlife Service Primary Health Care Programme
Tanzania:	Health through Sanitation and Water (HESAWA) National Wetlands Programme
Uganda:	Rural Water Supply Programme Rural Towns Water and Sanitation Programme National Water and Sewerage Corporation Uganda Water Action Plan Emergency Action Plan for Control and Management of Water Hyacinth Environmental Management Capacity Building Projects Uganda Soil Conservation and Agroforestry Pilot Project (USCAPP) National Wetlands Conservation and Management Programme UNICEF Water and Environmental Sanitation Programme (WES) Sexually Transmitted Infections Project (STIP) District Health Services Project

5. COMMENTS, IDENTIFIED GAPS AND NEEDS

5.1 The main problems

The environmental and socio-economic problems in the Lake Victoria Basin are mainly related to the very rapid growth of the population. Especially in the municipalities the number of people is increasing very fast. The unemployment is high and most of the people are poor. There is an increasing demand for food and water as well as for firewood.

The health situation in the Lake Victoria basin is alarming. The mortality in several diseases is high and the ability to decrease the spreading is not improving. The situation is especially bad concerning diarrhea's, malaria, tuberculosis and HIV/AIDS.

The HIV/AIDS epidemic has reduced the life chances of both men and women living in the Lake Basin. Some areas within the region such as Bukoba in Tanzania, Kisumu in Kenya and Rakai in Uganda are known to be greatly affected by the AIDS scourge. Despite intensive awareness campaigns, there are no indications that the spread of the disease has been controlled. The AIDS death is now striking almost every family in some villages and many children are left without parents and without necessary support. The Team was deeply concerned by this fact after a field visit to the Kusa fishing village outside Kisumu, Kenya. The Commissioner of the Nyanza Province highlighted the need for support in reducing the effects of the AIDS epidemic and especially in improving the situation for the AIDS-orphans, when he addressed the Team.

It is the opinion of the Team that activities contributing to a better health situation should be given high priority.

Seen from the Lake Victoria Basin point of view the growing population causes changes in land use, increased demand for water for consumption, increased amount of pollution and increased use of available natural resources. The environmental conditions are deteriorated and the health situation for the people has changed for the worse. The interrelations between population growth and the environmental and ecological situation in Lake Victoria basin are visualized in figure 5.1.

The changes in land use is due to the need for more agricultural land for food production and grazing land for livestock as well as deforestation by overgrazing and for the purpose of getting firewood. Due to lack of land conservation activities coupled to these processes, the result is soil erosion and increased transport with water of silt and nutrients. Parts of wetlands are also used for agricultural purposes as well as grazing of cattle and this results in a decreased filtering effect on the water entering the lake via watercourses. The lake receives more nutrients and organic material which contributes to a rapidly increasing eutrophication resulting in algal growth, oxygen consumption and anaerobic conditions in the lake's deep water.

The increased discharges of the mostly untreated or poorly treated municipal waste water from sewerage systems in major cities and municipalities has the same effect on the water quality. There are no sewerage systems in the peripheral areas of the cities where most of the people live, and the population increase is the highest. The people in these areas have their private pit latrines or have no organized toilet facilities. During rainy periods pollution is washed out into the lake from such areas. The industries have very poor waste water treatment of their own, if any, or are discharging their waste waters to the existing poor municipal waste water systems or directly into streams and the lake.

The result is an increasing load of nutrients, organic material and other pollutants on the Lake Victoria in which the eutrophication is rapidly proceeding. The result is a fast production of organic material in the form of algae, plants etc. and a change in the water quality. The whole ecosystem is influenced and new species are taking over the dominating role. The conditions are ideal for the spreading of plants as the water hyacinth which is now covering bays and vast lake surface areas along the shores. Fishing places are blocked as well as water intakes for water supply facilities etc..

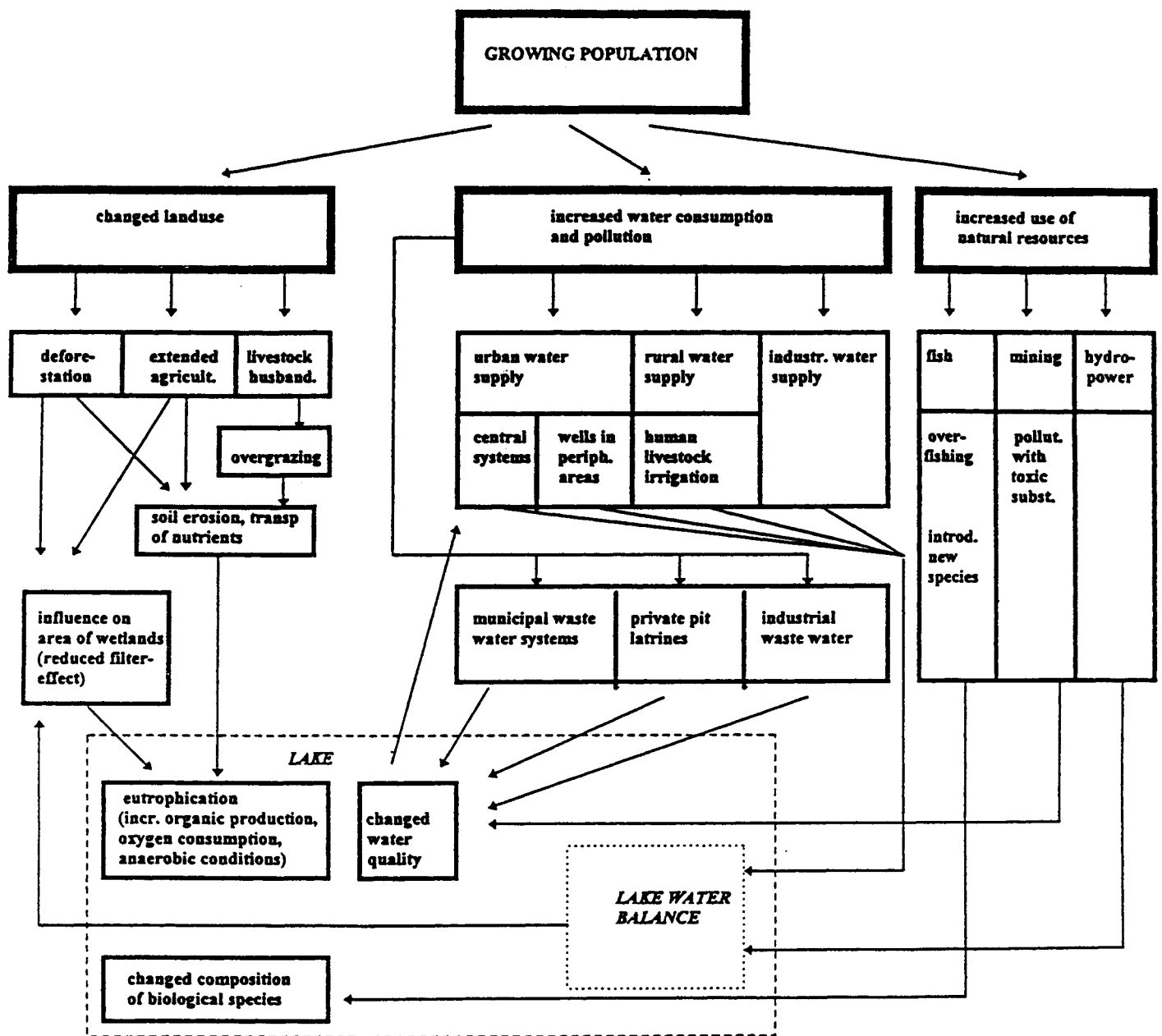


Figure 5.1 Environmental effects of the growing population in the Lake Victoria Basin

Areas covered with Water Hyacinths are perfect breeding places for different kinds of organisms which leads to an increased threat to the population from diseases as malaria and bilharzia.

The decreased water quality constitutes a great risk for the part of the population using lake water directly as drinking water and causes extra costs for the municipalities using lake water as raw water for tap water production.

The fishing in Lake Victoria is expanding and fish products are marketed both in the main domestic cities and on the export market. The fish processing industries have a considerable capacity and are buying most of the fish caught by the local fishermen. The result is less fish available to the local population around the lake and the diet has changed among the people close to Lake Victoria. Further, women are losing their traditional involvement in the fishing and the handling of caught fish for local consumption.

There exists no tradition to handle the fish in a proper way from a hygienic point of view and the fish is landed just on the shore among grazing cattle, strolling dogs and people. That causes increased risks for the spreading of diseases.

The growing population also brings with it an increasing demand for use of water as drinking water, for industrial purposes and for irrigation. The central water supply systems in the main cities only cover part of the population, often not more than one third of the inhabitants. Most of the people in the cities have to rely on shallow wells, mostly unsafe regarding pollution transported by surface runoff. This causes a risk for spreading of diseases.

The need for water for irrigation and for livestock water supply is expanding in pace with the need for increased food production. Irrigation causes changes in the water balance in the catchment areas and reduces the flow in the watercourses. If the irrigation will expand considerably - which is not unlikely - the water balance of Lake Victoria might be influenced to such a degree that the outflow of the lake to the river Nile will be decreased and there might be a risk of an international dispute.

5.2 Ongoing programs and support activities

There are many different activities going on to improve the environment and socio/economic situation.

The East-African Cooperation Agreement includes these subjects but very little has so far been achieved. There also exists an agreement on the LVEMP signed by the three riparian states.

The LVEMP, the LVWRP and bilateral activities have earlier been mentioned. The LVEMP is a five year program focusing on water quality questions and with the aim to maximize the sustainable benefits from using resources within the basin to generate food, employment and income, supply safe water, and sustain a disease-free environment, conserve biodiversity and genetic resources and harmonize national management programs to reverse increasing environmental degradation. The LVEMP does not have any water quantity related components even if its aims are strongly dependent on the water quantity situation. The implementation of LVEMP has just started and staff and other resources have been allocated according to the

agreed plan. Except for the investments planned for waste water treatment within LVEMP a number of other waste water treatment plants need to be built or reconstructed.

The LVWRP is concentrating on water quantity. Its main objective is to establish and strengthen the technical capacity to monitor water resources and to develop modeling tools for sustainable regionally coordinated water resources planning and management. The project is suffering from limited financial resources and a number of activities of great importance for the future need financing.

The bilateral activities are i.a. focusing on water administration and legislation and activities concerning water supply, sanitation, health and soil conservation. DANIDA is active especially in Uganda and has there contributed to the development of a water action plan and its implementation. Sida has during many years been active in soil conservation, water supply and sanitation in the three riparian countries.

6. ACTIONS NEEDED

6.1 International agreement on the use and protection of the natural resources and the environment of Lake Victoria and its basin

National legal, institutional and policy framework concerning environment and natural resources are in place or about to be approved in all the three riparian countries of Lake Victoria. The strategies to implement policy and legal frames have been formulated and there are existing or proposed programs to build capacity on national level to implement the policies.

It is obvious that the riparian states also must have a joint close co-operation concerning how to make use of and how to protect Lake Victoria and its basin for the future. Agreements should be made on how the available water should be used e.g. for irrigation, industrial and municipal consumption and hydropower production. Discharge limitations for different substances should be elaborated. Monitoring activities in the basin and in the lake should be harmonised, assessments of the collected data should be made jointly and information on monitoring results and environmental conditions should be made available to the public.

The East African Commission became operational with the establishment of a Permanent Secretariat on 14 March 1996. The areas of co-operation identified under the Tripartite Commission as it relates to Lake Victoria includes provision of adequate and reliable infrastructure including energy, general protection of the environment of Lake Victoria and utilisation of the resources of the lake for the socio-economic development of the three countries.

The LVEMP has also recognised the need for harmonisation especially in the area of pollution control and establishment of a sustainable institutional set up in the basin.

The Team found during the discussions with representatives of ministries and authorities in the three riparian countries that there exists an opinion that joint efforts must be taken to restore and protect the Lake Victoria environmental conditions. The time might therefore be ripe to initiate discussions on a tripartite agreement or a convention on the protection of the environment of the Lake Victoria Basin, the exploitation of natural resources and nature conservation. That would be in line with the efforts taken within e.g. the Global Programme of

Action for the Protection of the Marine Environment from Land-Based Activities (GPA) under the leadership of UNEP. Regional Conventions and action programs of this kind have resulted in reduced pollution loads and restored ecological conditions in some areas, as in the Great Lakes in North America and the Baltic Sea in Europe. The Baltic Sea Convention 1992 was used as model when elaborating GPA.

6.1.1 Proposal to initiate an international agreement

The Team proposes a workshop to be held with representatives of the three riparian states and the Secretariat of the East African Commission with the aim to discuss the possible advantages and content of an international agreement or convention on the use and protection of the natural resources and the environment of Lake Victoria and its basin. It should also be discussed how a possible such agreement/convention should be elaborated. The workshop should be based on and demonstrate the experiences of such already existing conventions/agreements.

6.2 Minimising pollution

The most important action in order to save the Lake Victoria water quality is to cut the pollution load from point sources - municipalities and industries - as well as non-point sources, agriculture, livestock husbandry and to stop soil erosion. No comprehensive plan concerning the deletion of the worst pollution sources exists.

6.2.1 Point sources

A dominating part of the pollution load on Lake Victoria emanates from strong point sources in the form of municipalities and industries.

Many of the municipalities around Lake Victoria lack appropriate sewerage systems and waste water treatment plants or have great problems with existing systems. Because of frequent blockages, the sewerage pumps are damaged and the municipalities fail to provide the necessary spare parts or regular maintenance. The pumps in Mwanza, for example, have not been working for the last two years, meaning that raw sewerage has been entering the lake for the same period. Extensive investments in sewerage systems and waste water treatment plants are needed. Some projects are pointed out in LVEMP but several others remain to be planned and implemented.

The municipalities have also inefficient water supply systems. The pumping and treatment capacity is too low to supply water to the existing network. The majority of the inhabitants are not even connected (almost 2/3 in some towns) to the water network.

Quite a number of industries are not connected to the municipal sewerage systems and are supposed to treat their own effluent before discharge. In most cases, treatment is not done up to standards and little legal action is undertaken to force them to do so. Recent development indicates a growing concern about industrial pollution. As an example can be mentioned the pulp and paper mill in Webuye belonging to the Panafrican Paper Mill Ltd., which was visited by the Team. The plant is a main polluter of the Nzoia river and the Lake Victoria. The effluents contain high BOD, nutrients and a number of other chemical substances. As the mill contains a chlor-alkali plant there is a risk of pollution by mercury. The Company needs to improve the treatment facilities in the plant and reduce the discharges.

A specific and serious problem is the situation in the peripheral areas of the main municipalities. Because of the urbanisation process many towns are growing very fast. Kisumu for example, grows at a rate of 7% per year. The rate is probably even higher for Mwanza, a local metropole buzzing with activities and flourishing economy, attracting people from rural areas to town. This immigration leads to unplanned settlements in areas where no water supply and sanitary provisions exist. People are digging shallow wells for drinking water and use pit latrines from which pollution is washed away by surface run off at rainy periods. The pollution influence the water quality both in the shallow wells, in watercourses and in Lake Victoria. These peri-urban settlements are not officially recognised by the municipalities and regarded as illegal because the well owners have not applied for permissions for using them. A long term strategy on how to deal with the problem should be elaborated.

Solid waste collection is also an important problem in the big municipalities. Lots of waste is dumped on streets and market places and the municipal authorities have not enough resources to take care of it. Generally, little attention is paid to the pollution by solid wastes, although it is the most obvious form of pollution, an eyesore for people living in the town.

There is obviously a lack of both human capacity and financial resources in the municipalities to operate and manage water supply systems, waste water treatment and the handling of solid waste. There is also a great need for competent staff able to plan and lead improvements. The possibilities should be considered to provide support to the municipalities in the form of advisors with experience of municipality owned facilities and operations who can participate in planning, procurement and implementation of improved water supply, waste water treatment and solid waste handling systems. The assistance could possibly be given via twinning arrangements with cities in developed countries.

6.2.2 Non-point sources

The non-point source pollution is mainly connected to soil erosion initiated by expanding agriculture, livestock husbandry, overgrazing and deforestation without sufficient soil conservation activities. These problems are commented in paragraph 6.4.

6.2.3 Proposals on minimising pollution

A prioritised action program for deletion of the worst pollution sources in the Lake Victoria Basin should jointly be elaborated by the three Governments and in co-operation with the appropriate financial institutions, aid agencies and NGOs. As the other two states in the Basin, Rwanda and Burundi, are contributing to the pollution of the Lake Victoria, they should be invited to participate as well. Such an action program would facilitate raising of funds for investments, making the best use of available resources and speed up the process for curbing the pollution discharges from point sources.

A discussion on the peri-urban settlements and their need for water supply and sanitation should be initiated. This can be done in the form of international workshops or conferences, with the aim to support the municipalities to elaborate a sustainable strategy for handling the problem.

Twinning arrangements between municipalities in the lake basin and in developed countries should be promoted with the aim to give support to planning, procurement and implementation of improved water supply, waste water treatment and solid waste handling systems.

6.3 Water resources management

There is an increased demand for water for irrigation, water supply in urban and rural areas, water supply for livestock, fish farming, industry and hydro-power production. At the same time water is needed for the sustainability of ecosystems in water courses and wetlands.

6.3.1 Water resources information system

The use of water for these different purposes influence the water balance of the Lake Victoria Basin while increasing the evaporation. This results in a decrease of the water flow to the lake, a lowering of the water surface and a subsequent reduced outflow to the Nile River. Downstream the Lake Victoria on the Nile River the riparian countries might feel their interests threatened and a conflict can possibly develop. Therefore it is important that the Lake Victoria countries plan the use of their water resources extremely well and assess the consequences of their water activities. To be able to do so they need reliable information on the status and variations of the water resources in short and long term.

The Agenda 21 (UNCED, 1992) Chapter 18 on freshwater and the report of the International Conference on Water and the Environment (ICWE, 1992) both recognise that knowledge of the water resources in terms of quantity and quality is the essential basis for efficient water management. All the three governments have underpinned these basic guiding principles in their national water resources policies. However, reliable water resources information systems, both at national and regional levels, which is the basis of water resources assessment, monitoring and management is inadequate in all the three countries.

There are two basic projects i.e. the Lake Victoria Environmental Management Programme (LVEMP) and the Lake Victoria Water Resources Project (LVWRP), which in part address some of the numerous water resources and environmental issues of the Lake Victoria Basin. LVEMP only focuses on the lake ecosystem and water quality, while LVWRP, although having a vision on comprehensive strengthening of water resources monitoring capacity in the Lake Victoria basin, does not have adequate resources.

It is obvious that there is a gap with respect to the establishment in the Lake Victoria Basin of a water resources information and decision support system. Such a system containing data, information and tools on water resources availability, water use and water demand is of vital importance for a sustainable development and management of the Lake Victoria Basin. The three countries have expressed an urgent need to establish the basic infrastructure and tools for water resources monitoring and assessment (see e.g. the proposal for Lake Victoria Basin Water Office, Tanzania, in annex 2). The Team recommends a water resources and information system to be built up through national activities and with co-ordination through the East-African Co-operation Secretariat, and that a feasibility study should be fielded.

Such a study should i.a. include assessment of the needs for water resources information, evaluation of the existing water resources monitoring and assessment tools, preparing a first list of monitoring stations needed, and identifying the relationship of the proposal with other ongoing or planned projects.

6.3.2 Irrigation

Food security in the region has become a major issue, as the area often experiences food shortages during recurrent droughts.

To cover food demand from the growing population there is an acute need for increased agricultural production and irrigation is bound to increase. In the absence of international agreements on utilisation of the shared resources, increased agricultural water use in one or more countries might lead to conflicts especially with downstream countries. For such agreements to be reached and be implemented it is necessary to have reliable data on the projected water requirements.

The Team proposes that the three riparian countries should undertake a thorough inventory of existing irrigated areas and of the potential areas suitable for irrigation. Estimated rate of utilisation of available water resources will form a base for assessments of future irrigation water requirements. Such data will be essential for future negotiations on water rights.

6.3.3 Hydropower

The demand for electric energy in the basin countries far exceeds total installed capacity. The demand is rapidly growing and is expected to increase to over 6000 MW by the year 2020. Growth in many sectors (especially the industrial sector) of the economy in the three countries is already being constrained by the availability of electricity. Some of the industries have either shifted to the expensive thermal power and/or plan to install mini-hydropower stations to meet their demands. Yet the great potential for hydropower production in the basin has basically not been exploited. All the three countries aim to achieve self sufficiency in energy supply but none of them is self sufficient and all have unreliable supplies. The energy sector has therefore been identified as a key area for regional development under the East African Co-operation. This concern was expressed to the Team during consultations with the authorities.

The hydropower generated at the Owen Falls dam is being extended but the combined capacity of the existing plant and the extension will need outflows well in excess of the present run-of-river operating rule (the Agreed Curve). The wide fluctuations in the lake outflows also raises key issue of the reliability of the outflows for hydropower production. There is thus a need to develop an optimal Lake Victoria regulation plan in order to optimise hydropower production - taking into account the environmental and socio-economic impacts on the riparian states.

Besides the Owen Falls dam there is identified potential of over 2700 MW on the rivers Kagera, Mara, and Sundo-Migiui and on the Nile downstream of Lake Victoria.

As a first step towards a regional co-operation in the hydropower sector the Team proposes development of a hydropower master plan for the region. Such a plan may include proposals for further inter-grid connections, detailed assessment of the hydropower potential in the basin, development and updating of respective National Power Supply Master Plans, proposals for integrated projects on hydropower development in the lake basin and an assessment of the effects of a developed hydropower production on the lake water balance and ecology.

6.3.4 Proposal on Water Resources Management

The Team proposes a water resources information and decision support system be developed for the Lake Victoria Basin containing data, information and tools on water resources availability, water use and demand. A feasibility study should be fielded with co-ordination through the East-African Commission Secretariat and in close cooperation with FAO as responsible for the implementation of LVWRP. The potential and plans for future irrigation and hydropower production in the basin should be studied as well as the consequences for the lake water balance and ecology.

6.4 Integrated land and water management

Despite governmental and NGO efforts to improve the situation there are several areas within the basin being degraded through lack of soil conservation measures on cultivated land, and through overgrazing and deforestation. The result is transports of sediment and dissolved nutrients via water courses into the lake in which the eutrophication increases.

Lack of collaboration between key disciplines with a bearing on agricultural production is the reason for this situation. Improved program approaches are however now evolving from within the region and Sida supported programs have been spearheading this process. The Kenyan NSWCP, SCAPA and USCAPP are good examples on how programs have developed participatory extension methods and gradually also broad extension packages covering farmers production. There is a trend towards having interdisciplinary teams from agriculture, livestock and forestry running the programs. So far water resources management has not been well covered in the programs even if there are some promising initiatives being taken. For instance in UNCAP where the District Water Officer will be fully involved in the next phase of the project. The Kenyan NSWCP is further promoting integration with other actors (ministries, NGOs etc.) in selected pilot areas country-wide. This is part of an on-going work in developing a future strategy ("Local Level Initiative") with the ambition to integrate soil conservation with health and water components.

Within Lake Victoria Basin, Sida is actively supporting land management programs in Kenya (NSWCP) and in Uganda (USCAPP expansion) but in Tanzania there is so far no Sida support to land management programs implemented by the government in the lake basin.

6.4.1 Proposals on integrated land and water management

It is proposed that Sida's effort in spearheading land management programs in the region continues and is strengthened with activities directly related to improved environmental conditions and food security in the Lake Basin.

A broader view of land management to also cover water management is proposed. Water supplies for human and livestock use, such as small dams, valley tanks and other water harvesting and water storage facilities should be integrated into the programs.

With the introduction of RELMA (formerly RSCU) an additional capacity is being created in order to promote and develop this integrated approach to watershed management.

Sida's preliminary plans for "local level initiative" strategy where the three main Sida-supported sectors soil conservation, water and health are integrated in land management programs should be strongly supported and developed.

6.5 Capacity building

6.5.1 Education and training

One of the main observations made by the Team is the need for improved thinking and doing in the Lake Basin management. It seems to be a tendency to look in the traditional way sector by sector and not discuss basin management in a fully integrated way.

It is the opinion of the Team that there is a great need for education and information on all levels in governmental and municipal administration on integrated management, the advantages it can give and what mistakes can be avoided. In such educational efforts success stories could be highlighted as well as the risks of working in the old traditional sector-wise way.

The many initiatives for environmental and water resources management in the Lake Victoria Basin call for increased capacity and competence of implementing agencies in the region. Training of professional cadres at postgraduate level is a key to the development of this competence. There is also a need to sustain the achievements which will be realised from these initiatives through building regional institutes of excellence in selected fields, in order to continually update the developed tools.

The Team identified needs in high level education and training in water resources management, environmental economics and environmental law. Competence in all these three sectors is fundamental for a sustainable development in the region. At least two higher institutions have potential in the above fields; The Water Resources Engineering Program in the University of Dar-Es-Salaam, and School of Environment in Moi University, Kenya (environmental economics and environmental law).

Support for institutions active in the mentioned sectors could be in the form of providing fellowships to students from the region, and strengthening the institutions through twinning with similar institutions in Sweden or elsewhere.

6.5.2 Water Quality Laboratories

Reliable water quality laboratories are needed in the region for monitoring, research activities and product control. This is recognised by the LVEMP which will support some laboratories with equipment and infrastructure.

Under the Uganda Water Action Plan DANIDA is supporting a “ Water Resources Assessment Project ”. DANIDA intends to improve the technical, analytical and managerial skills of the Water Resources Management Department (WRMD) in Entebbe to be fully equipped to analyse water from natural bodies, water treatment plants and sewage treatment plants. The laboratory will then sell services and operate on a commercial basis.

A lot of efforts have been put into the harmonisation of the water quality monitoring for the Nile Basin Countries by the Global Environmental Monitoring System, GEMS/Water (UNEP). Sampling methods, sampling preservations and analytical methods are compiled in a handbook. In spite of that many departments and laboratories dealing with water are not aware of the existence of the GEMS/Water program.

The Team has been approached by several institutions and organisations with requests for support with equipment for water analysis because there is a great need for hygienic control of drinking water in urban areas supplied via municipal networks, surface waters and wells. It is the opinion of the Team that it is the responsibility of the municipalities to carry out that kind of control. The main municipalities should get support to build up capacity, both equipment and training, for water control analysis. External organisations and private interests should be charged on a commercial basis for the analysis in order to cover the future costs of the activity.

6.5.3 Capacity building at local level

All three riparian countries have the strategy to decentralise the implementation of development policies, programs and legislation including those related to environment and natural resources management.

It is noted, however, that within the region, sufficient capacity for community participation does not exist at the local level and this has to be built up. Capacity building in this respect can only be achieved through involving all stakeholders, educate, inform and make use of existing experience. The participation of both men and women in their capacity as primary users and managers of the natural resources in the region should be ensured.

The Lake Victoria Environmental Management Project (LVEMP) has a component for capacity building. Discussions held with various stakeholders in the implementation of the LVEMP indicate that the successful implementation of this component depends on the strategy each National LVEMP-Secretariat will take in elaborating or translating the provisions of this component, which ideally should focus on building capacity at the lower levels.

An entry point for community participation and capacity building is the clear understanding of the social dynamics of the communities in terms of perceptions, attitudes, roles and responsibilities of men and women, as well as benefits occurring to them from the utilisation of the natural resources. The three countries are committed to achieving gender equality. Uganda and Tanzania have put in place specific policies for addressing gender concerns in all development programs. Kenya has a draft gender policy that is yet to be adopted. There exists a need for support in the following sectors;

1. awareness creation and training of the environmental related staff in districts and communities, extension staff in environmental related sectors, NGO's etc.
2. identification of gender concerns and mobilisation of women's involvement in integrated land and water management.
3. identification and funding of community micro-projects
4. organisation of communities i.e. fishing community and provision of credits for viable small scale projects.

6.5.4 Vi Tree Planting Project

Within the Lake Basin Sida supports the Vi Tree Planting Project (Vi TPP), that has concentrated on tree planting and land reclamation in some degraded semi arid areas. The project is now widening the scope to take on a more comprehensive extension package on improved land management including tree management, agroforestry practices, soil fertility improvement and agricultural production aspects. This change in approach will facilitate a closer collaboration between Vi TPP and soil conservation/land management programs run by the governments in all the three countries, as project policies now are harmonised, especially considering eventual subsidies to farmers.

The new Vi TPP approach has been developed as a result of experience from within as well as without the program. Expectations on Vi TPP are now high and the Team is convinced that the project will successfully contribute to improved land and water management in the project areas. It is therefore proposed that the project will be given continued support. In order to facilitate the planning of the project the support should be given for a longer time period than

one year, e.g. three years, and with a regular follow up of project performance in order to provide guidance for the implementation.

6.5.5 Proposals on capacity building

Support should be given for education and training of staff at all levels at governmental and municipal administrations involved in environmental, water and land management.

Support should also be given for high level education, training and research in the fields of water resources management, environmental economics and environmental law. The support could be given in the form of fellowships, twinning arrangements, research funds, etc.

The main cities should get support to build up capacity, both equipment and training, for regular control of the quality of provided tap water and the efficiency of waste water treatment plants.

Activities leading to awareness creation, training of local staff, mobilisation of women's involvement, etc. should be promoted with the aim to develop local capacity.

The Vi Tree Planting Project should be given continued support, if possible for more than one year at a time.

6.6 Wetlands

Uganda is the only riparian country that has a policy concerning the protection of wetlands (1994). The National Wetland Protection Programme falls under the Ministry of Natural Resources. The program is supported by several donors (NORAD, DGIS) through IUCN. Wetland units were composed at national, district and community level. An awareness campaign on the value and wise use of wetlands is launched. Applied research is conducted in collaboration with other ministries and universities. In the current phase of the project, the focus is put on the development of methodologies for wetland management at community level, on building capacity at district and national level and training.

Although the LVEMP has incorporated the wetland component, certain areas need additional support. IUCN is proposing a Regional Wetland Support Program, which wants to "develop and sustain the capacity for wetland conservation and sustainable wetland management in East-Africa for the benefit of people, both nationally and internationally".

IUCN aims to provide support to national inter-ministerial wetlands committees, to national wetlands programs, to NGO's involved in wetlands and to link national programs.

IUCN is inviting donors to contribute to the planned program, and the Team support the ideas of IUCN.

6.6.1 Proposal on wetlands

The Team is in favour of the ideas of IUCN and recommends the proposed Regional Wetland Support Program for funding.

6.7 The Water Hyacinth problem

The Water Hyacinth causes great problems for fishery, transports, water intakes etc. around the Lake. In many small fishing villages the fishing boats are blocked by the weed and the

fishermen cannot catch fish either for own consumption or for selling. The food security is in danger in many places.

LVEMP has a component concerning the Water Hyacinth and in Uganda a specific action program exists. However, while within these programs the long-term solution on the weed problem is discussed the situation for people in many local communities is getting worse and is now of emergency character. Immediate action is needed to give the people in question access to open water. This can be done with mechanical harvesters clearing up the area outside the fishing villages or with simple floating bridges which can be anchored from the shore out to open water.

6.7.1 Proposal on the Water Hyacinth problem

The Team proposes that an emergency action is initiated and that a qualified technical expert be sent to the area to elaborate a concrete proposal concerning method and places for action.

6.8 New bathymetric map

There is a great need for a new bathymetric map for Lake Victoria. The only existing one dates from the 1920ies and is based on old and few measurements. Especially for the navigation safety a new map is urgently needed but there is also a strong need for fishing activities and research in the Lake.

The navigational safety needs even further improvements in the form of navigational means and weather forecasts.

6.8.1 Proposal on a new bathymetric map

It is proposed that a new bathymetric map is produced using modern technology. The map should be produced in co-operation among the appropriate authorities in the three countries and a technical consultant. The East African Commission Secretariat is proposed to co-ordinate the project.

6.9 Public awareness and public participation

6.9.1 OSIENALA

OSIENALA is a non-governmental organisation (NGO) in Kenya, described in Annex 1. The Organisation gets support from a number of donors to run different projects. The projects concern rehabilitation and conservation programs as well as community oriented programs, e.g. Community-Based Fisheries Management. OSIENALA also administrates research projects involving scientists from Maseno University and co-operates with foreign universities e.g. University of Linköping in Sweden. Some of these projects are supported by Sida.

OSIENALA further supports Kisumu Well-Owners' Association which try to improve the shallow wells used by the population outside areas reached by the Kisumu municipal water supply network.

OSIENALA has taken on the role of spokesman for the local communities and is doubtlessly contributing to the difficult work of increasing public awareness among the local population. In that capacity OSIENALA, according to the opinion of the Team, deserves foreign support.

One of the donors of research funds is Sida. It is the opinion of the Team that the resources spent on research in the region should contribute not only to scientific results but also to increased local knowledge and capacity for future research. This seems best be secured via a close co-operation with universities within the area. According to the information the Team has obtained, OSIENALA engages scientists from the Maseno university and aims at building up its own research capacity. The Team has not had time enough to find out whether the present administrative arrangement is the most efficient to improve the research capacity of the universities in the region. The Team proposes that this should be investigated.

6.9.2 NGOs as spokesmen

There is a great advantage for the development in a region to have a non-governmental organisation which actively acts as spokesman for the local people and their specific interests. OSIENALA has taken that role in Kenya. In Tanzania and Uganda, however, such organisations do not exist or have not been as active. Initiatives to establish or strengthen NGOs of that kind in Tanzania and Uganda should be promoted.

6.9.3 Proposals on NGOs

The Team proposes that OSIENALA should be given further support. It should however be studied whether funds for research should be used for developing own research capacity within OSIENALA, or the funds should be managed by a university.

Initiatives to establish or develop NGOs in Tanzania and Uganda should be promoted.

6.10 Fish handling and fish landing beaches

The European Union is funding the Lake Victoria Fisheries Project, which is inserted in the LVEMP and will carry out the Fisheries aspect of the program. The EU-project focuses on fish stock assessment of the lake, on gear technology, on the socio-economic aspects of the fish industries and on gathering of basic limnological data.

Several institutions interviewed by the Team have pointed out that the fish quality aspect is neglected. The conditions at the fish landing beaches are very often much below standard: there is no running water, no concrete slab to land the fish on and no insulating boxes with ice to store the fish while waiting for the customers. Cattle roam around freely along the shoreline, drinking and excreting as they please.

Cases of Salmonella in processed deep frozen fillets have been reported in Europe, leading to a temporary ban by Spain and increased pressure from the European Commission to improve the hygienic conditions of the beaches.

Although the source of the Salmonella bacteria is not established, whether from the beach or the factory, it will become more difficult for the East-African countries to sell their fish to Europe, if the whole chain of fish processing, from catching the fish to the filleting, does not conform with the EU regulations. This is partly due to the fact that the fishermen in Europe, and especially in southern Europe, form a strong lobby group which protects its European market vigorously.

Although the Directors of fisheries recognise this problem, it is not easy to find a proper remedy. The fish processing plants are not willing to sponsor proper infrastructure at the beaches, because they buy the fish from several beaches. They feel it is the responsibility of the

government. The co-operatives of fishermen, where they exist, on the other hand, have no incentive for the moment to spend their money in this kind of improvement, since the demand for fish is higher than the supply. The fish is always sold, no matter the condition.

The solution seems to be that the governments gazette official beaches for fish landings, so that monitoring of the quality is feasible in terms of logistics. The infra-structure can be maintained by imposing some tax to the fishermen who use it. In Tanzania, some concrete steps have been taken in that direction.

In addition the fish processors should agree on a common policy in order to guarantee a high quality export product and to restore the confidence of the consumer in Lake Victoria fish.

There is a need for a closer study of the problem leading to concrete proposals on the handling of fish, facilities on the landing beaches etc. Such a study could be supported by a foreign aid agency, but according to the Team the primary initiative should be taken by the newly established Fishery Commission.

6.11 Co-operation among donors

During the study the Team found it difficult to get information on planned or ongoing projects, especially projects with investment components. Representatives of potential receiving parties were sometimes not willing to tell about ongoing discussions or plans for projects together with other donors than Sida. Neither did the Team find any compilation of ongoing or planned projects and interested donors in the Lake Victoria Basin.

6.11.1 Proposal on co-operation among donors

An initiative to informal co-operation among the interested donors in the Lake Victoria Basin should be taken. Such co-operation could e.g. include a simple data base with information on potential and ongoing projects, state of the projects, interested donors and financial institutions, etc. A project preparatory committee, similar to the one used in the Baltic Sea area and for Eastern and Central Europe, could give donors and financial institutions a possibility to discuss joint actions and arrange for shared financing of projects.

Table 6:1 Summary of proposed activities

International agreement	- convention on environment and natural resources
Minimising pollution	- action plan to delete worst pollution sources - strategy for peri-urban areas - twinning arrangements
Water resources management	- Water Resources Management and Decision Support System incl. assessment of irrigation and hydropower potential and effects on water balance and ecology

Integrated land and water management	- soil conservation, water and health to be integrated in land management programs
Capacity building	- education and training of staff in administrations - support to high level education, training and research in water resources management, environmental economics and law - laboratory capacity in main municipalities for drinking water and waste water - activities for awareness creation, training of local staff, mobilisation of women etc. in communities - Vi TPP continued support
Water hyacinth	- emergency action to give blocked fishing villages access to open water
Bathymetric map	- production of a new bathymetric map
Public awareness and participation	- support to OSIENALA - policy concerning funding of research - support to possible NGOs in Tanzania and Uganda
Co-operation among donors	- initiative to improved co-operation and establishment of a project preparation committee

7. PROPOSALS FOR Sida FUNDED ACTIVITIES

The needs for foreign support and initiatives listed in the previous chapter are all important but of different extent and character. It seems unlikely that Sida has the possibilities to be involved in all of them. The Team therefore proposes that Sida concentrate its activities to

- facilitate the long term environmental co-operation among the governments
- facilitate the elaboration of plans and strategies to minimise the pollution load
- contribute to the ongoing work on water resources management
- contribute to capacity building at all levels in the environmental, land and water sectors
- facilitate the co-operation among donors

Sida should especially consider

(chapter 6.1, International Agreement)

- to offer the three Governments to host a workshop on intergovernmental agreements concerning environmental protection and nature conservation. In such a workshop the Baltic Sea co-operation could be taken as example and be demonstrated. The workshop could be organised by the East-African Commission's Secretariat and the results of the workshop then be followed up by the Commission. Such a workshop would also strengthen the role of the East-African Commission in environmental questions, one of the main topics on their agenda.

(chapter 6.2, Minimising Pollution)

- to facilitate the elaboration of a prioritised action programme for deletion of the worst pollution sources in the Lake Victoria Basin. A seminar for discussions on the aims of the programme, its content and the procedure for its elaboration should be offered. The three riparian Governments, the Governments of Rwanda and Burundi, financial institutions, aid agencies and main NGOs should be invited to the seminar which should be organised by the East-African Commission Secretariat.

- to host workshops with representatives of municipal, provincial and central governmental authorities as well as of NGOs with the aim to initiate the elaboration of strategies for safe water supply and sanitation in peri-urban areas

(chapter 6.3, Water Resources Management)

- to contribute to a feasibility study on the development of a water resources information and decision support system for Lake Victoria Basin containing data, information and tools on water resources availability, water use and demand. To contribute also to studies on potential and plans for future irrigation and hydropower production, and an assessment of the consequences in different scenarios for the water balance and the ecology of the lake. The feasibility study and the assessments should be carried out in close co-operation with appropriate authorities in the countries in the Lake Basin and with FAO, and be coordinated by the East-African Commission Secretariat.

(chapter 6.4, Integrated Land and Water Management)

- to strongly support and develop the preliminary plans for "local level initiative" strategy where the three main Sida-supported sectors soil conservation, water and health are integrated in land management programs. Further, to initiate and support workshops and seminars on integrated water, soil and vegetation issues for politicians and high level administrators in the three countries in order to facilitate a shift in thinking

(chapter 6.5, Capacity Building)

- to support capacity building in the form of education and training for staff at all levels involved in environmental, water and land management;
- to support high level education and research in water resources management, environmental economics and environmental law.
- to give further support to the Vi Tree Planting Project

(chapter 6.6, Wetlands)

- to contribute funds to the Regional Wetland Support Program proposed by IUCN

(chapter 6.7, Water Hyacinth)

- to organise as an emergency activity the opening up of fishing harbours blocked by Water Hyacinths. In order to achieve a powerful action the possibilities to cooperate with other Nordic aid agencies should be considered.

(chapter 6.8, Bathymetric Map)

- to support the production of a new bathymetric map on Lake Victoria.

(chapter 6.9, Public Awareness)

- to continue to support the NGO OSIENALA and to actively support the development of similar organisations in Tanzania and Uganda.

(chapter 6.11, Co-operation Among Donors)

- take the initiative to an informal co-operation among the interested donors in the Lake Victoria Basin. Such co-operation could e.g. include a simple data base with information on potential and ongoing projects, state of the projects, interested donors and financial institutions, etc. A project preparatory committee, similar to the one used in the Baltic Sea area and for Eastern and Central Europe, could give the governments, financial institutions and donors a possibility to discuss joint actions and arrange for shared financing of projects.

Department for Natural Resources and the
Environment
Engt Johansson

1997-03-05

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TERMS OF REFERENCE FOR A STUDY ON SIDA-SUPPORTED PROJECTS IN THE LAKE VICTORIA BASIN

1. Background

Lake Victoria is the world's second largest fresh water lake with a surface of 68.500 square km¹. The lake has three major basin states, namely Kenya, Tanzania and Uganda. Approximately 30 million people depend on Lake Victoria for their livelihood (2) and the population in the area is growing. The water quality in Lake Victoria has gradually deteriorated due to industrial effluents, small scale mining, deforestation, soil erosion and subsequent siltation, pesticides and fertilizer from agriculture, untreated sewage from cities and villages etc. Furthermore, the rapid growing of water hyacinths and the presence of the Nile perch severely affects the fish production.

The three major lake basin states have, with support from the Global Environment Facility (GEF), launched the Lake Victoria Environmental Management Program (LVEMP). The program aims at rehabilitating the lake ecosystem and includes activities in the areas of (i) fisheries management; (ii) management of lake pollution and water quality; (iii) wetlands management; (iv) water hyacinth control; and (v) watershed management and soil conservation. The program, at a total cost of US\$66.8 million, includes also (a) the signing of a tripartite agreement establishing the Lake Victoria Fisheries Organisation; and (b) investments by the three governments into a joint trust fund to finance research and extension services.

There is also a cooperation between the Nile basin states. The basin states are meeting annually in a Nile 2002 Conference to promote the comprehensive Water Resources Development of the Nile Basin. A Technical Cooperation Committee for the Promotion of Development and Environment Protection of the Nile, TECCONILE,

¹As a comparison - the largest lake in Europe, Lake Vänern has a surface of 5.600 square km.

has been established and has its headquarter in Kampala. The TECCONILE has prepared a Nile River Basin Action Plan (NRBAP), approved in February 1995. Burundi, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda and Zaire are participating in the Nile cooperation.

The Lake Victoria basin states have also a large number of national projects, supported by different donors, which directly or indirectly are influencing the Lake Victoria. Sweden has bilateral cooperation with Kenya, Tanzania and Uganda. Sida is funding activities in the Lake Basin directly influencing the Lake Victoria as well as activities geared towards policy and method developments, which in the long run can have a certain impact on the Lake Victoria. A list of some of the major Sida-funded activities is enclosed. Enclosure 1.

There is a need to further study the present Sida-funded activities related to the deterioration of the ecosystem in Lake Victoria and the GEF-supported LVEMP-programme, the possible need for coordination or modification of present activities and the possible need for additional Sida-funded activities. However, there is no presumption that Sida will support the ongoing LVEMP-programme.

This document forms the terms of reference for such a Study.

2. Objective

The specific objectives of the Study is; (A) to describe and discuss the environmental, economic and social condition in the Lake Victoria Basin; (B) to describe the main on-going and planned activities in the Lake Victoria Basin; (C) briefly assess the Sida-funded activities in the Basin in relation to the physical environment of the Lake Victoria; and (D) discuss the need for improvement of on-going and planned activities and possible need for additional Sida-funded activities in the Basin in relation to the environmental problems.

3. Scope of Work

The Study shall include a gender perspective i.e. analysis made, statistics and results presented should, when possible, consider impact and consequences for men and women and their respective roles. Aspects of ownership and community involvement shall be given special attention.

The consultant shall concentrate, but not necessarily be limited to, the following issues;

A. The environmental, economic and social condition in the Lake Victoria Basin:

- Make a brief summary of the economic and social condition in the Lake Basin including population and population trends, major economic activities, research initiatives, regional cooperation - formal and informal.
- Make a brief description of the environmental condition in the Lake Basin including the Lakes ecosystems regarding fish and plants species and the interaction with land based activities.
- Make a description of the main environmental threats to the Lake Victoria and its ecosystem including industrial effluents, small scale mining (mercury), deforestation, soil erosion and subsequent siltation, pesticides and fertilizer from agriculture, untreated sewage from cities and villages etc.
- Assess those environmental threats in relation to their short- and long term impact on the social and economic conditions for poor people living in the Lake Basin.
- Assess the awareness of the environmental problems and the institutional capacity, nationally and regional, to manage the environmental problems in the Lake Basin.

B. On-going and planned activities related to the Lake Victoria Basin

- Make a brief description of the LVEMP including objectives, major activities, organisation, present status in the implementation, budget, funding and possible need for additional funds.
- Make a summary of other major national and regional projects within the Lake Basin which directly or indirectly are affecting the water in the Lake Victoria.

C. Sida-funded activities in the Basin in relation to the physical environment of the Lake Victoria

- Make a description of the ongoing and planned Sida-funded activities in the Lake Basin which directly or indirectly are affecting the physical environment in the Lake Victoria.

D. Improvements of on-going and planned activities and possible need for additional Sida-funded activities in the Basin in relation to the environmental problems in the Lake

- Assess the need for additional exchange of experiences, changes in design or other improvements of the on-going and planned Sida-funded activities in the Lake Basin including organisational aspects.
- Assess the need for additional Swedish funding of activities in the Lake Basin, including contributions to LVEMP, support to regional projects, NGOs etc.
- Recommend Sida on how to prepare any possible support to additional activities related to the problems in the Lake Victoria.

4. Consultant

The Study shall be carried out by a team of two international consultants and one or two local consultants (hereinafter called the Consultant) covering relevant technical, socio-economical and organisational aspects. It is envisaged that the local consultant(s) have thorough knowledge of the opportunities and constraints in the regional cooperation as well as knowledge of the local social and environmental conditions.

One of the members of the consultant team shall be appointed as a team leader and will be responsible for the elaboration of a joint report from the Study.

5. Reporting

The report is to be the product and responsibility of the two international consultants, each one contributing certain sections as agreed within the team and in addition, offering professional views on all sections of the report.

The team leader shall be responsible for the planning and coordination of the mission, the distribution of work and responsibilities among the team and in addition, offering professional views on all sections of the report.

The team leader shall be responsible for the planning and coordination of the mission, the distribution of work and responsibilities among the team members and the finalization and presentation of the report to Sida.

The Consultants shall present draft written conclusions to relevant Sida representative before departure from the region.

The consultant shall present a Draft Report to Sida in 5 copies not later than two weeks after finalizing the field-visits.

The Consultant shall present a final Report to Sida in 5 copies not later than two weeks after receiving Sida's comments on the Draft Report. The Report should be maximum 30 pages excluding annexes. The Report shall include a one-page Executive Summary.

6. Methodology and time schedule

The Study will be carried out during November/December 1996. It is envisaged that visits are undertaken during one week in each of the three major basin states. The consultant shall be briefed by Sida's Regional Advisor on Water and Sanitation in Nairobi at the arrival in Kenya. It is further assumed that the total time spent on the study should be maximum ten weeks for two international consultants. Part A and the main portion of part B and C shall be based on available reports and written information.

Enclosure:

Some major Sida-funded activities related to the Lake Victoria Basin.

ATTACHMENT 2

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Mr. E.N. Nyaga, MLRRWD, Nairobi, Kenya

ATTACHMENT 3

DIARY FOR Sida FACT FINDING MISSION TO LAKE VICTORIA BASIN

4-26 APRIL 1997

Date	Activity
Fr. 4	Travel to Nairobi
Sa. 5	Briefing with Counsellor Development Cooperation Mr. Anders Karlsson at the residence of Sida Regional Advisor Mr. Rolf Winberg. (Not the Ugandan participants in the team). Departure by car to Kericho, Tea Hotel.
Su. 6	By car Kericho-Kampala, Uganda. Meeting with the Ugandan participants at Fairways Hotel.
Mo. 7	Ministry of Natural Resources, Directorate of Water Development, Kampala: Mr. Patrick Kahangire, Director Ministry of Natural Resources, Kampala: Mr. Ben Dramadri, Permanent Secretary National Environment Management Authority, NEMA, Kampala: Prof. John Y. K. Okedi, Executive Director Ministry of Gender and Community Development, Kampala: Ms. Techla Kinalwa, Permanent Secretary Sida, Kampala: Mr. Anders Östman, Counsellor Development
Tu. 8	Ministry of Agriculture, Animal Industry and Fisheries, Entebbe: Mr. J. Omoding, Commissioner for Land Resources and Development; Mr. Kalule, Deputy Commissioner; Mr. Frank Akena Ministry of Agriculture, Animal Industry and Fisheries, Fisheries Department, Entebbe: Dr. Faustino L. Orach-Meza, Commissioner, Mr. Deo Mukiibi, Deputy Commissioner National Secretariat for LVEMP, Entebbe: Dr. Faustino L. Orach-Meza, Head of Secretariat, Mr. John Wambede, Operations Officer TECCONILE, Entebbe: Mr. Mrisho Mohammed Kivugo, Director, Mr. Hayder Y. Bakheit, Systems Analyst Lake Victoria Water Resources Project, CTA, FAO/304, Entebbe: Mr. M. M. Andjelic, Chief Technical Adviser

National Agricultural Research Organization, Entebbe : Dr. M. Kalunda, Deputy Director General

Fresh Water Fish Research Institute, FIRI, Entebbe;

Vi Planting Tree Project, Masaka: Mr. Lennart Thorstensson

We 9 Ministry of Finance, Kampala: Mr. Joseph Wright

World Bank, Kampala: Mr. Randolph L. P. Harris, Resident Representative; Mr. Garv Tata, Senior Operations Officer

DANIDA, Danish Embassy, Kampala: Mr. Hans Lillelund, Counsellor Development

Fisheries Research Institute (of NARO), Jinja: Mr. Constantine Odongkara, Socio-Economist; Dr. W. Ssali, Senior Research Officer, Mr. Nsonze Ignations, Finance Officer, Mr. Namuleno Gertrude, Research Assistant, Mr. Steven Sekiranda, Research Officer

Travel to Kitale, Kenya

Th. 10 Vi Tree Planting Project, Kitale: Mr. Olle Pettersson, Mr. Ulf Lindgren, Ms. Margaret Silali

Panafrican Paper Mills Ltd., Webuye: Mr. V. D. Saboo, General Manager; Mr. A.M. Gatimbu, Technical Manager

Nyanza Province, Kisumu: Mr. J. K. Kaguthi, Provincial Commissioner

Fr. 11 Kenya Marine and Fisheries Research Institute, KMFRI, Kisumu: Mr. James Ogari, Deputy Director and Mr. Kenneth E. O. Werimo, Centre Director

Kisumu Water and Sewage Works: Mr. R. G. Ngigi, General Manager

Nyanza Province, Kisumu: Mr. W. M. O. Matagaro, Provincial Water Engineer

Lake Basin Development Authority, Kisumu: Mr. Stephen M. Machooka, Managing Director,

T. J. Cottington Technical Services Ltd., Nairobi: Mr. S. W. Ohingo, Director

Sa. 12 OSIENALA, Kisumu: Mr. Obiero Ongángá, Executive Director, Mr. Kinya Munyirwa, Mr. Okitto-Okotto Joseph, Dr. Aloys Al Odeck Well-Owners Association, Kisumu: Dr. Adhu Awiti, Mr. Nick Arobi Chemilil Sugar Co Ltd., Kisumu: Mr. Pius Lazaro Atieno Agro Chemical & Food Company Ltd., Kisumu: Mr. Caleb Oguya, Deputy Works Manager

Chandri Achanda General Stationers, Kisumu: Mr. Gordon Stephen Oganyo,
Managing Director,
Mr. Patrick Oballa, Well-Owner, Kisumu

Su. 13 Travel to Mwanza

Mo. 14 Mwanza Municipality: Mr. Mihayo, Head of Water and Sewerage Department

Mwanza Municipality: Mr. J. K. Mayunga, Municipal Director; Dr. Z. Sekilasa,
Health Officer;

HESAWA, Mwanza: Mr. M. U. Mtui, National HESAWA Project Director,
Mr. Bosse Bergman, HESAWA Programme Advisor

Tu. 15 Tanzania Fishery Research Institute, TAFIRI, Mwanza: Mr. E. F. Katunzi,
Centre Director; Ms. O. C. Mkumbo, Senior Research Officer

Travel to Dar es Salaam

We 16 University of Dar es Salaam, Department of Civil Engineering:
Dr. R. K. Kachroo, Project Manager; Dr. Simon H. Mkhansi

Ministry of Natural Resources and Tourism, Dar es Salaam: Mr. Humson S.
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Embassy of Sweden, Development Cooperation, Dar es Salaam: Mr. Göran
Engstrand, Counsellor, Mr. Lennart Bondesson, Mr. Tomas Andersson,
Ms. Louis Lobo

Th. 17 Ministry of Water, Dar es Salaam: Mr. Washington Mutayoba, Project
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Saidi A-S. Faraji, Rufiji Basin Management Advisor; Mr. Datius G. Rutashobya,
Project Coordinator, Water Quality & Ecosystem Management Component of
LVEMP; Mr. I. E. Mwakalinga, National Hydro Information Specialist; Mr.
Jeremias M. Kobalyenda, Principal Water Officer; Julius M. Mihayo, Director of
Water Resources

University of Dar es Salaam, Institute of Resource Assessment: Mr. Mark
Mujwahuzi, Director

Ministry of Community Development, Women Affairs: Ms. Prisilla
Olekambaine, Director of Women Affairs

Vice Presidents Office, Dar es Salaam: Mr. Eric Kamoga Mugurusi, Director of
the Department of Environment

Lake Victoria Environment Management Project, Dar es Salaam:
Mr. Christopher M. Nyirabu, Executive Secretary

- Fr. 18 Internal Team Work
- Sa. 19 Internal Team Work
Travel to Arusha
- Su. 20 Internal Team Work
- Mo. 21 Secretariat of the Commission for East African Co-operation, Arusha: Dr. Sam Nahamnya, Deputy Executive Secretary, Finance and Administration; Mr. Wilbert T.K. Kaahwa, Legal Counsel
- Travel to Nairobi
- Tu. 22 Ministry of Natural Resources, Nairobi: Mr. William Mayaka, Permanent Secretary; Dr. Joseph Ojiambo, Head of National Secretariat, LVEMP
- UNEP, Water Branch, Nairobi: Ms. Terttu Melvasalo, Director; Mr. Gerhart Schneider, Programme Officer, Freshwater Unit; Mr. Kagumaho Kakuyo, Regional Coordinator, Africa; Mr. W. Franklin G. Cardy, Executive Coordinator, Natural Resources; Mr. Halifa Omar drammeh, Senior Programme Officer; Mr. Taka Hiraishi, Ass. Executive Director, Div. of Env. Information and Assessment;
- We 23 Ministry of Land Reclamation, Regional and Water Development, Nairobi: Mr. M. K. Migwi, Director
- Th. 24 UNEP, Resource Mobilization, Nairobi: Ms. Pia Sovio-Pyhälä, Programme Officer
- UNEP, Environmental Law: Professor J. Okidi
- Nairobi University, Agriculture Engineering Department, Soil and Management Programme: Dr. Francis Gichuki
- Fr. 25 Regional Soil Conservation Unit, Nairobi: Dr. Erik Skoglund, Director

LIST OF ABBREVIATIONS

CIDA	Canadian International Development Agency
EIA	Environmental Impact Assessment
FIRI	Fisheries Research Institute (Jinja, Uganda)
GDP	Gross Domestic Product
GEF	Global Environment Facility
IUCN	International Union of Conservation of Nature and Natural Resources
KEMFRI	Kenya Marine and Fisheries Research Institute
KRBO	Kagera River Basin Organisation
LBDA	Lake Basin Development Authority (Kenya)
LVEMP	Lake Victoria Environment Managing Project
LVWRP	Lake Victoria Water Resources Project
MLRRWD	Ministry of Land, Reclamation, Regional and Water Development (Kenya)
NEAP	National Environmental Action Plan (Kenya)
NGO	Non Governmental Organization
NSWCP	National Soil and Water Conservation Programme (Kenya)
OSIENALA	Friends of Lake Victoria (Kenya)
RELMA	Regional Unit for Land Management (Sida)
Sida	Swedish International Development Cooperation Agency
TECCONILE	Technical Cooperation Committee for Promotion of Development and Environmental Protection of the Nile Basin
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USCAPP	Uganda Soil Conservation and Agroforestry Pilot Project
ViTPP	Vi Tree Planting Project

ATTACHMENT 5

LIST OF LITTERATURE

1. Crul Ruud C.M.; Limnology and Hydrology of Lake Victoria, UNESCO/IHP - IV Project
2. Institute of Hydrology; A Review and Update of the Water Balance of Lake Victoria in East Africa, IH/ODA Report No. 93/3
3. Kenya, Tanzania, Uganda, Lake Victoria Environmental Management Project, Project Document, June 1996, Report No. 15541-AFR, Global Environment Division, Environment Department, World Bank
4. Lake Victoria Environmental Management Programme, Task Force II, Final Report by the Regional Consultants on Tasks 11, 16 and 17 (Water Quality, Land Use and Wetlands, FAO and Centre for Ecology & Hydrology, November 1995
5. Andjelic M.M.; Development of Management Tools for Lake Victoria, Draft Project Profile, FAO project GCP/RAF/304/JPN - Lake Victoria Water Resources, April 1997
6. FAO Trust Fund Project GCP/RAF/304/JPN; Information System for Water Resources Monitoring and Planning in the Lake Victoria Region, Approved Project Work Plan, September 1996
7. Uganda Water Action Plan, Water Resources Development and Management, Main Report, WAPDOC. 005, July 1994, Directorate of Water Development, Uganda, Ministry of Foreign Affairs /DANIDA, Denmark
8. Uganda Water Action Plan, Water Resources Development and Management, Executive Summary, WAPDOC. 014, July 1994, Directorate of Water Development, Uganda, Ministry of Foreign Affairs/DANIDA, Denmark
9. Hirji, Rafik and Duda, Alfred M.; A Comprehensive Approach for Managing the Lake Victoria Basin Ecosystem, The Nile 2002 Conference, February 13-16, 1995
10. External Evaluation of the National Soil and Water Programme, Kenya, Final Draft Report, Overseas Development Institute, UK, 1996
11. Secretariat of the Commission for East African Cooperation; East African Cooperation Development Strategy Paper (1997-2000), EAC/C6/3/96.
12. Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin, TECCONILE; The Nile River Basin Action Plan, 1995
13. Ministry of Agriculture, Animal Industry and Fisheries, Uganda; Medium Term Proposal for the Control of Water Hyacinth Nationwide, March 1997

14. The Permanent Secretary, MAAIF, Water Hyacinth Unit, Entebbe; Brief to donors on Water Hyacinth Control in Uganda, 10th March, 1997
15. HESAWA, Health through Sanitation and Water, Mid-term Evaluation 1996, Evaluation Report, IRC and NETWAS, The Hague, December 1996
16. Murray Christopher J.L., Lopez Alan D.; The Global Burden of Disease, The Harvard School of Public Health, 1997
17. Lema Anderson J.; Lake Victoria Waters in the Context of Irrigation Development in Tanzania, Institute of Resource Assessment, University of Dar es Salaam, February 1993
18. Conference on Safe Water Environments, Eldoret, Kenya, August 21 - 23, 1995; Water and Environmental Studies, Linköping University, Report 24, 1996, ISBN 91-7871-715-9
19. Hirji Rafik and Patorni Francois-Marie; Proceedings of the Seminar on Water Resources Management in Tanzania, Tanga, September 12 - 16, 1994; The Economic Development Institute of the World Bank
20. Kirugara David & Nevejan Nancy; Identification of Pollution Sources in the Kenyan Part of the Lake Victoria Catchment Area, Kenya - Belgium Joint Project in Freshwater Ecology, 1996
21. Torori Cleophas O. *et.al.*; Governance of Water Resources in Kenya, Ecopolicy 8, African Centre for Technology Studies, Nairobi, Kenya, ISBN 9966-41-093-7
22. Morgan Peter; A field study of shallow wells in Kisumu, Kenya, March 1997
23. Work Plan and Budget Proposal for the 1997 Fiscal Year; Vi Tree Planting Project, Kitale, Kenya
24. Lundgren Sten, Boethius Monica, Nyberg Tor; Boken om Vi-skogen, Tidningen Vi:s förlag 1995, ISBN 91-87020-06-8
25. Vi Tree Planting Project, Kitale; Projects impact study 1996
26. Pabari M.; OSIENALA, (Friends of Lake Victoria), Challenges of a Community based NGO, pamphlet
27. Akatch Samuel O.; Dying Lake Victoria, A Community-based Prevention Programme, OSIENALA, Initiatives Publishers, 1996, ISBN 9966-42-046-0
28. Lake Victoria Bulletin, December 1996; An OSIENALA Newsletter
29. SIDA Promemoria 1996-06-05, NATUR-1995-0002; Stöd till markvårdsprogrammet i Kenya 1996/97
30. SIDA Promemoria 1994-07-26, Dossier 1 Ken 52.6; Stöd till markvårdsprogrammet i Kenya 1994/95 - 1995/96

31. SIDA, Natur/Afrika, Programsammanfattning 1996-11-22; Stöd till uthålligt naturbruk i distrikt i Tanzania 1997 - 2000
32. SIDA, Infrastrukturbyrån, Promemoria 1995-06-01; Fortsatt stöd till landsbygdens vattenförsörjning och omgivningshygien i Kenya för perioden 1995/96 - 1998
33. SIDA, Infrastrukturbyrån, Insatspromemoria, 1994-03-17; Fortsatt stöd till landsbygdens vattenförsörjning, omgivningshygien och hälsoutbildning, Tanzania, 1994/95 - 1997/98
34. SIDA, Natur 95 0056, Promemoria 1996-08-08, Idépromemoria; Utvidgning av USCAPP, Uganda
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ISBN: 91 586 7562 0
ISSN: 1401 - 4300