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«Problems Related to Water»: the situation in Lake Victoria basin, East Africa

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INTRODUCTION

This paper presents an outline of the changing ecology of Lake Victoria, the second largest freshwater lake in the world and the largest in the African continent. The socio-economic problems arising from both natural and anthropogenic forces in the lake region are discussed. Most of these rotate around the availability of clean water for domestic, industrial and agricultural uses. With low economic return and dwindling market prices for fish and fishery products the paper emphases the need for applied research to encourage sustainable management of the lake's resources in order to conserve biodiversity, alleviate poverty and assure food security in the region. The weak institutional framework and arrangement in the whole management of lake environment and resource is addressed. The endeavour of the three riparian governments of Kenya, Uganda and Tanzania to set up a regional institution, the Lake Victoria Fisheries Organization (LVFO), to foster regional cooperation in all matters pertaining Lake Victoria is discussed.

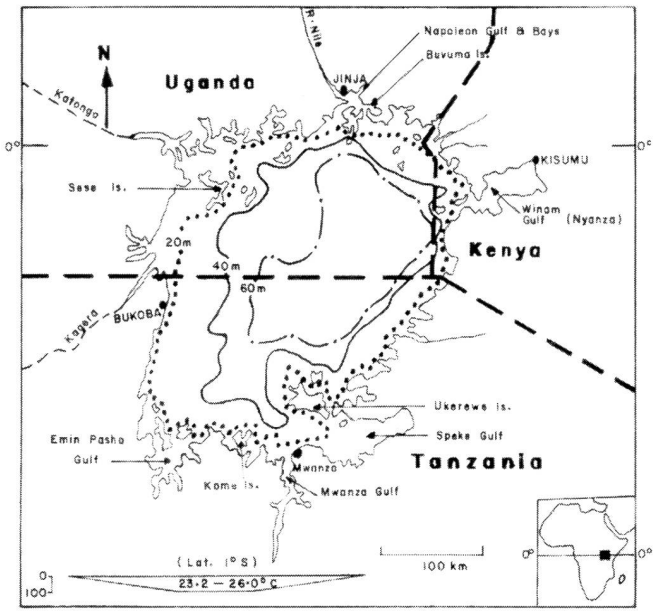

Fig. 1 - Bathymetric map of Lake Victoria and its location (inset) with some of its physical features depicted in the bottom left.

THE LAKE VICTORIA ECOSYSTEM

Ecological and geographical perspective

Lake Victoria (Fig. 1) is the largest lake in Africa (68,000 km^2) and the second largest freshwater body in the world.

The lake is shared among Tanzania (49%), Uganda (45%) and Kenya (6%). There are up to 25 main rivers comprising of well over 60 tributaries and streams draining into Lake Victoria with the Victoria Nile being the main river draining out of the lake into Lake Kyoga in Uganda. The catchment is 184,000 km^2, but if the area extending up to Rwanda and Burundi is considered, the estimated area of the lake basin is 193,000 km^2. Much of the shoreline is fringed with papyrus (*Cyperus papyrus*), which may extend into swamps. The lake level has fluctuated over the years but the 1960s rise of 2m was the highest in history.

Table 1 shows some of the ecological and hydrological characteristics of Lake Victoria. The long term variability of some climatic and environmental factors in Lake Victoria, between 1960 and 1990 are shown in figure 2.

Characteristic	measure
Position: Latitude	0° 20' - 3° 00' S
Longitude	31° 39' - 34° 53' E
Altitude (m above sea level)	1134
Catchment area (km^2)	184,000
Lake basin area (km^2)	68,500
Lake area as % catchment	37
Shore line (km)	3,440
Max. length (km)	400
Max. width (km)	240
Mean width /km)	172
Max. depth (m)	84
Mean depth (m)	40
Volume (km^3)	2,760
Inflow ($km^3.yr^1$)	20
Outflow ($km^3.yr^1$)	20
Precipitation ($km^3.yr^1$)	114
Annual lake level fluctuations (m)	0.4 - 1.5
Max. rise in lake level (m)	2.4
Flushing time (years)	138
Residence time (years)	21

Sources: (CRUL, 1995; SCHEREN, 1995; HECKY & BUGENYI, 1992)

Tab. 1 - Morphometry, hydrological balance and geographical features of Lake Victoria.

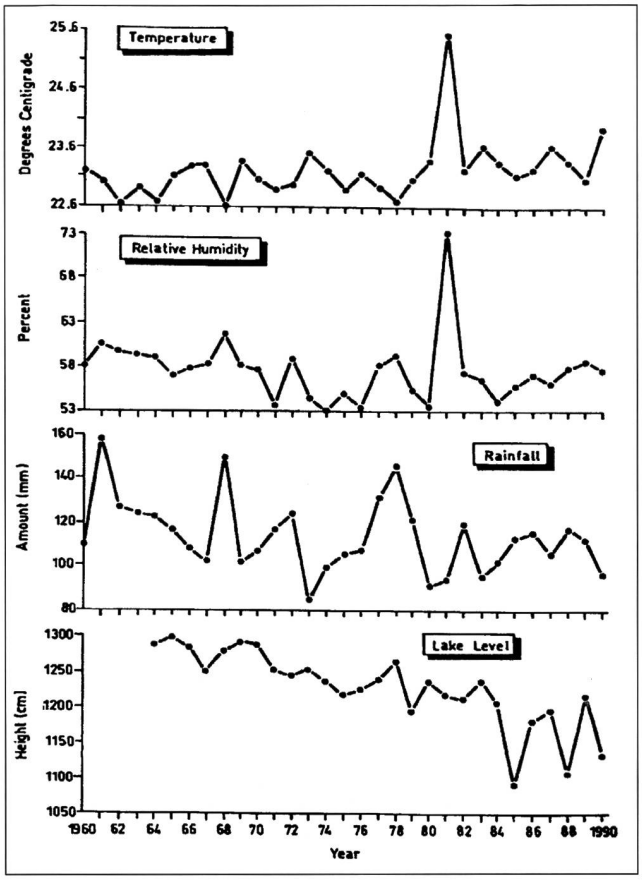

Fig. 2 - Variability in some climatic and environmental factors in Lake Victoria, Kenya (1960- 1990, NTIBA, 1997).

LAKE'S HYDRODYNAMICS AND NUTRIENT CHEMISTRY

Due to rapid changes in the density of water with temperatures prevailing in Lake Victoria (24-26°C), as in other tropical lakes, small temperature differences may result in stable density stratification of the column. On the basis of his own observations in 1956 and 1960-61 at the open lake station (TALLING 1957a, 1966), and on observations of GRAHAM (1929), WORTHINGTON (1930), FISH (1957), and NEWELL (1960), Talling concluded that the offshore waters of Lake Victoria are probably monomictic and he distinguished three phases in the annual stratification cycle. Phase one was during the months of September to December which is characterized by a marked rising in temperature at the surface from 24 to 25.4°C and at the bottom from 23.5 to 24°C. Phase two was during the months of January to May during which the heat content of the water reaches the maximum after which it starts cooling. This creates stratified conditions with a single discontinuity between 30 and 60 meters. The third phase was between June and August which was characterized by cooling of the water to the minimum. This was also the most windy period of the year. The main determinant of the stratification cycle is the wind, as solar radiation is relatively constant throughout the year. Breakdown of stratification in June to August is due to increased evaporation as a result of an increase of the S.E. trade winds. There may be also a substantial loss of heat by radiation at night, as this is a period of relatively clear skies. There is some evidence that the breakdown of stratification takes place first over the shallower western areas of the lake, and then spreads over to the north and the east in relation to uneven surface cooling. Talling (1962) observed at the surface in Bukoba temperatures below 24.6°C while elsewhere in the lake these temperatures were only observed in deep water below the thermal discontinuity.

Lakes in the tropics deep enough to stratify show a tendency to mix completely once a year. Mixing of lakes in Africa is mainly caused by loss of stability resulting from evaporative cooling of the upper water column, although influx of cool rainwater and reduced insolation can also be significant (LIVINGSTONE and MELACK 1984). Mixing during stratification is confined to the upper water layers. Thickness of the upper mixed layer fluctuates strongly in tropical lakes (LEWIS 1973, 1983, 1984). Stratification may be broken by surface and internal waves bringing anoxic hypolimnion water to within the mixing depth at some points or by violent storms deepening the wave-mixed layer to reach the lower anoxic layer. KITAKA (1972) gave evidence of another mechanism of mixing by a cyclonic storm in the offshore waters of Lake Victoria: cyclonic upwelling which may bring hypolimnion waters to the surface.

Winds move water masses. Wind strength and direction determine the currents in the lake besides its effects on the vertical temperature distribution. The wind regime on Lake Victoria is dominated by south-east trade winds, especially from May to July. The effect of the winds would be a gradual displacement of the surface water to the north (GRAHAM, 1929). Current measurements by NEWELL (1960) indicated a general northward flow of surface water in response to the wind. This was accompanied by a compensating flow of deeper water southwards. In June 1957 a north to south section showed the presence of cooler bottom water in the south (TALLING 1966).

In Lake Victoria surface water movements are common, as the fetch of the lake is huge, about 400 km. (FISH 1957) showed that the hydrology of the lake is to a large extent controlled by the action of the wind on the surface water. Wind conditions in inshore gulfs and bays may differ considerably from those offshore. For example wind circulation in the Nyanza Gulf is controlled by the topography of the region, as the hills bordering the gulf form a barrier to the free flow of winds (OCHUMBA 1986).

Stratification and mixing control the annual cycle of nutrient concentrations in the mixed layer of the lake. Recent data (Hecky 1993) show that silicon concentration have decreased from 70 to 7 µM due to photosynthetic activity of diatoms and may now even be lower than 1 µM. Total P concentrations are similar or somewhat higher than in 1961. Due to deep water deoxygenation denitrification increased in the present Lake Victoria. This resulted in low ratio of Total N to Total P from 16:1 in the mixed layer to 8:1 in the hypolimnetic waters. This has favored the growth of blue-green algae. Differences occur between offshore

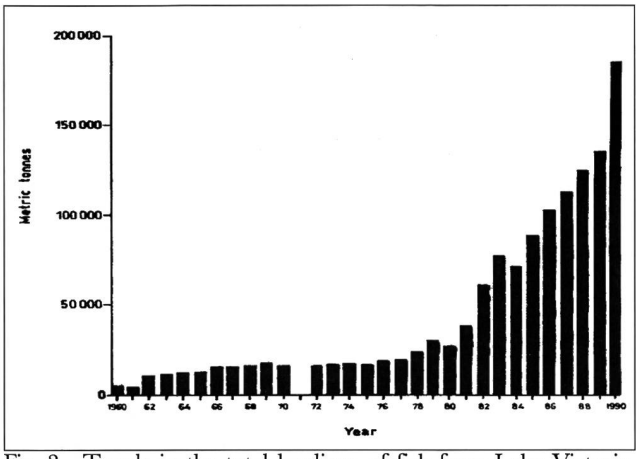

Fig. 3 - Trends in the total landings of fish from Lake Victoria, Kenya (NTIBA 1997).

and inshore waters. In inshore waters denitrification occurs only in the sediments when the depth is less than the offshore mixed layer. Total N concentrations and N:P ratios are higher inshore than offshore allowing higher photosynthetic rates and maintaining chlorophyll concentrations 2-3 times higher than offshore.

Rivers contribute a significant amount of nutrients due to the activities in the catchment. Rain falling direct onto the lake may contribute to significant quantities of minerals and nutrients. The observed increase in phytoplankton biomass may be caused by an increase of supply of nitrogen and sulphur from the atmosphere, as silicon and phosphate supplies arising mainly from soil weathering are unchanged. Another important supply of nitrogen is fixation of the elemental nitrogen in the air by both blue-green algae (e.g. *Anabaena*) and bacteria. Phytoplankton composition of Lake Victoria changed towards a dominance of nitrogen fixing blue-green algae (Hecky 1993).

THE FISHERY AND BIODIVERSITY

Fishing and post-harvest activities have been the most important economic activity in and around Lake Victoria . As native fish stocks were reduced by overfishing in the 50s, the high demand for fish led to a call for introduction of alien species into Lake Victoria.

Nile perch, *Lates niloticus*, and the tilapias *Oreochromis niloticus*, *O. leucostictus*, *Tilapia zillii* and *T. rendali* («*melanopleura*») were introduced into the lake during the 1950s and early 1960s. These introduced species resulted in increased commercial catches (Fig. 3) and at present the lake produces over 400,000 metric tons of fish, predominantly Nile perch and 'dagaa' (*Rastrineobola argentea*).

Predation by Nile perch and competition with introduced tilapias have caused a severe decline, and in some cases, total disappearance, of the native species (Figs. 4 and 5).

The introduction of Nile perch has revolutionized the fishing industry with the mushrooming of fish processing plants for the export trade. There are currently thirty fish

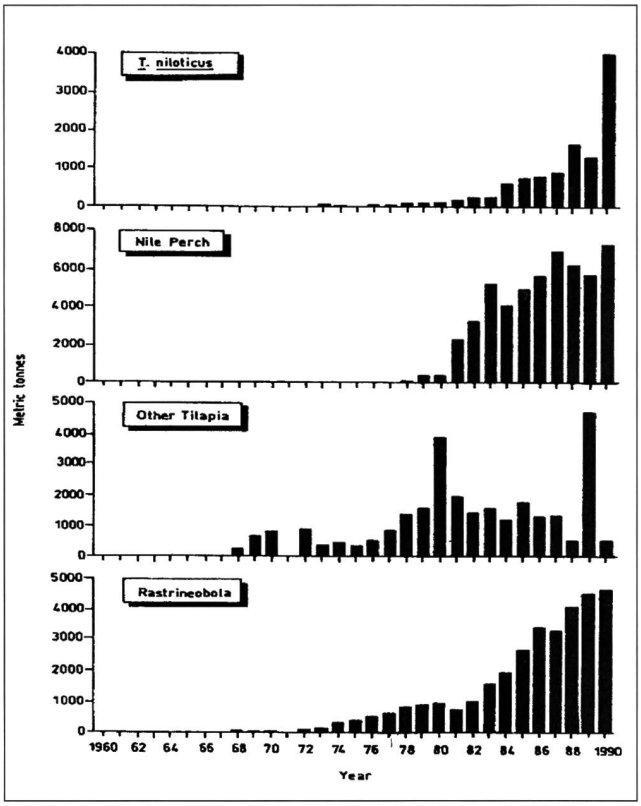

Fig. 4 - Trends of landing of introduced fish species in Lake Victoria, Kenya (NTIBA 1997).

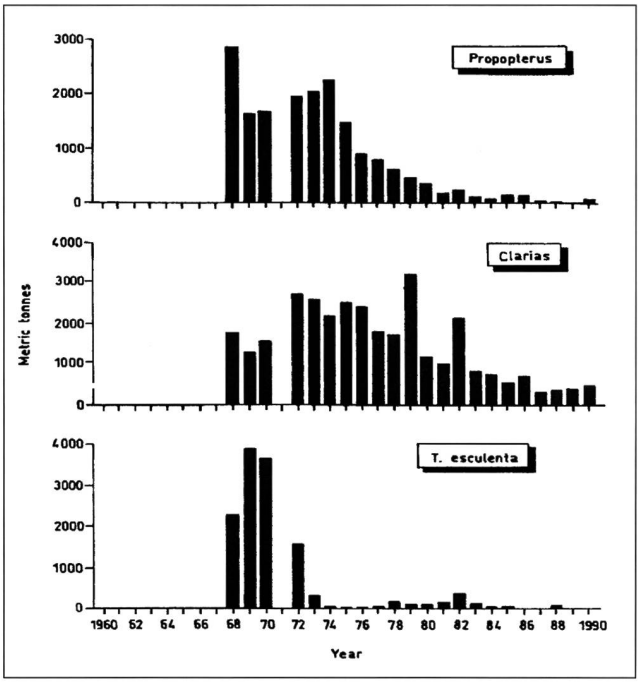

Figure 5: Trends of indigenous fish species in Lake Victoria, Kenya (1960 - 1990).

processing plants around the lake earning an estimated income of US$ 3-4 billion.

The fishery management concerns in the lake fall under a number of related problems. First, many fish species

in the lake are possibly strongly habitat-type restricted in their movements. If this is the case (OGUTU, personal communication) and bearing in mind that local over-fishing takes place fairly rapidly, then recolonization by the nearest neighbor stocks can be a slow process. Second, research findings on the state of the stocks clearly indicate that major fish species are currently being subjected to recruitment over-fishing at or near the breeding grounds (ANON., 1999). Furthermore non-recommended fishing gears yield close to 70% of the fish (ANNON., 1999) including catching of juveniles and immature fish. Third, there are currently weak legislation and enforcement regulations coupled with serious demand for Nile perch in the export market which has led to growing fishing effort being exerted on the entire fishery resources. The current uncontrolled fishing effort will, certainly, lead to tremendous decline in the abundance levels of the exploited stocks. There is thus a need to study the current procedure of access to the fishery to come up with policy recommendation for implementation. Fourthly it is clearly evident (NTIBA, 1997) that the lake's fishery has undergone remarkable changes in the last three decades from 1960. Thus a multi-species fishery prior to the 1970's has, since the 1980's, become dominated by three species (Table 2). Last, the lake fishery and its socio-economic contribution to the livelihood of the riparian communities and the economics of the East African member states is threatened due to fish products quality assurance which lead to loss of over half a billion US$ in foreign market trade (LVFO, 1999).

CHANGING LAKE VICTORIA ECOSYSTEM.

Due, principally, to anthropogenic forces the lake has undergone a number of environmental and climatic changes which have impacts on water and sustainable management of the living natural resources therein in the last two decades, there have been increasing quantities of untreated effluent spills into the lake, along with residues of soil and agro-chemicals. The principal urban centers around the lake harbour a host of industries, which discharge waste products into the lake thus enhancing pollution. The lake catchment is dominated by subsistence agriculture so that the need for increased production of food crops has led to increased use of agro-chemicals, land clearing, burning of vegetation, tree felling and massive deforestation. Especially from Kenya, the agro-chemical residues and eroded soils are entering the lake via streams, rivers and rainfall run-off. This has resulted in increasing eutrophication and anoxic water. Water hyacinth, a noxious aquatic weed has invaded the lake. The weed chokes up bays, inlets, and channels physically interfering with fishing activities, transport and recreation amongst other environmental problems. Related to the water hyacinth problem is that of mounting levels of planktonic algae in many parts of the lake. Blooms of such algae have normally resulted in anoxic conditions in the bottom waters of the lake, which endanger the life of both benthic and aquatic living resources and thus reduces biodiversity. Last, but not least, wetlands along the shores of the lake are threatened by encroachment by man's activities in the lake. This is a matter of great concern recognizing the many functions of wetlands in the face of rising human population in the lake region, currently estimated to be close to 30 million people.

SOCIAL ISSUES

The quality of Lake Victoria waters is being polluted from the urban, industrial and agricultural sources. This freshwater is life to many people who dwell in the lake basin areas using it for household, institutional (such as hospitals, schools and catering), industrial and agricultural purposes. The most vulnerable group among the resource users are the fisher communities who depend largely on the lake.

Lake Victoria is the habitat for biodiversity, the most known being the fish species which are food, source of employment and foreign exchange earner through exports for the riparian communities and the countries of East Africa (Kenya, Uganda and Tanzania) (LVEMP, 1996). The increase in human population in the lake basin results in pressure on the natural resources. Man is largely responsible for the degradation of the lake environment and the depletion of biodiversity.

The misuse and poor management of the Lake Victoria resources as well as external factors such as water hyacinths and pollution might have far reaching effects than what can be envisaged now. It is therefore important to put in place corrective and preventive measures to stop the situation.

HEALTH AND SANITATION

The riparian communities, particularly the fisher communities and island communities are prone to suffer waterborne diseases. This mainly arises from the poor sanitation conditions in those areas.

Several municipalities, towns and urban centers on the shores and in the catchment areas discharge untreated sewage effluent either directly or indirectly into the lake. The principal urban centers around the Lake are: Port Victoria, Kisumu, Homa Bay (Kenya); Masaka, Entebbe, Kampala, Jinja (Uganda); and Musoma, Mwanza, Bukoba (Tanzania). This is largely due to the poor sewerage system, inadequate sewage treatment facilities, equipment and personnel coupled with overloading of sewage plants. These including the poor sanitation facilities in the fishing villages contaminate the water rendering it unsuitable for household use.

The increase in population has led to the development of semi-urban fishing villages. The sandy soils and the high level of the water table hinder the construction of appropriate sanitary facilities (latrines) in the fishing villages. This is aggravated by the fact that the fisher

communities and other rural dwellers draw untreated water direct from the lake for household usage. Diarrhoea, vomitting, skin rashes and other waterborne diseases are prevalent. These diseases offset the benefits accrued from the immunization programmes for the children against the commonly known killer diseases (measles, polio, diphtheria and others), thereby, increasing the mortality rate of the children in the riparian communities.

The riparian communities are also prone to chemical contamination arising from industrial, and agricultural sources. The major urban centers have many industries which discharge effluents including toxic materials directly or indirectly into the lake, enhancing pollution. The use of agro-chemicals increasing particularly on large scale farms. Mining in the lake basin also contributes to toxic conditions.

There is need to study the socio-economic effects of pollution on the lifes of the riparian communities with a view of suggesting appropriate programmes to address them.

DEFORESTATION

The catchment area of Lake Victoria is slowly being degraded due to deforestation. The people encroach on the forests for agricultural land, timber, firewood and habitation. This deforestation, coupled with bad agricultural practices have degraded the soil leading to siltation along the rivers into the lake. Deforestation, soil erosion, and increasing human and livestock populations have all contributed to increased nutrient loading because of changing land use patterns.

The fisher communities cut trees and other vegetation for household use and to smoke fish for sale. On the other hand the island forests of Lake Victoria are being depleted unabated due to the increasing demand on the mainland for timber used in buildings and furniture as well as for export. There is need to study the alternative sources of energy to fuel-wood in order to offset the pressure from the forests. There is need to study the environmental effect of deforestation on Lake Victoria and come up with measures that will ensure sustainable utilization of the forest resources.

RIVERS

The rivers flowing into Lake Victoria play an important role to sustain its water levels. To many people living along rivers, they are the only source of clean water for household usage, fish and to some extent water for irrigation. Due to the increase in economic activities in the catchment area, at one point or another many of these rivers are being polluted with effluents from the industries, agro-chemicals and siltation. They offload all these environmentally dangerous materials into the lake, further degrading the ecosystem. Very few studies, have been done to assess the contribution of the rivers to the welfare of the communities. There is also need to study the impact of these rivers on the lake ecosystem and biodiversity.

WETLANDS

Wetlands, which offer buffering services and normally filter the water before entering the lake are under stress. Wetlands are reclaimed for agriculture, industrial development and human settlements, while others are drained to control human disease vectors. Some are excessively harvested for making mats, baskets, and chairs. Many of the wetlands have received too much pollution to the extent that they cannot perform their filtration function efficiently. Therefore, pollutants normally retained by wetlands enter the lake unchecked, thus further contributing to the deterioration of our lake water.

Most socio-economic and ecological work so far reported do not give much information on the biodiversity of wetlands associated with Lake Victoria and yet this is a major ecosystem which still contains diverse biological resources (OKEYO-OWOUR, 1999). It is, therefore, important to develop the project on the use and sustainable utilization of wetlands implemented in Jinja town in Uganda, by the University of Zurich and other Swiss organizations, into a regional project, to cover the Lake Victoria catchment area in the three countries of East Africa (Kenya, Uganda and Tanzania).

EXTERNAL FACTORS

Water Hyacinth

Lake Victoria is infested with the water hyacinth, a noxious water weed. Proliferation of water hyacinths on Lake Victoria is a symptom of nutrient enrichment of the water environment (TWONGO, 1998). The countries of East Africa are spending a lot of money to control it using an integrated approach of manual, mechanical and biological technics. The use of chemical has not been approved as studies are still going on in controlled satellite small lakes to find out the environmental and social impact of this method. The weed has also infested other inland lakes and rivers in Kenya, Uganda, Tanzania, Rwanda and Burundi. The rapid expansion of this weed in Lake Victoria is already showing serious economic, social, health and environmental impacts in the riparian states. To the riparian communities it blocked fishing grounds, interfered with water sources for household use and increased diseases due to its providing habitat for vectors. A regional task force for the control of water hyacinth has been set up under the East African Co-operation (EAC), Arusha. Although those socio-economic implications are cited no socio- economic study has been under taken to quantify the loss in social welfare and economic benefits at the local, national and regional levels arising from the weed infestation.

El Niño

The rise in the water levels of Lake Victoria due to the El Niño rains had an adverse effect on the people living along the shorelines and the island communities. Homes and crops were destroyed, people and animals died and some were marooned on islands. The effects of such catastrophes have not been studied nor have emergence measures to deal with such situations been put in place. It is important for the East African countries to institute such measures similar to those used in hurricane situations. A study in this area with technical guidance to assist putting in place the necessary measures is required. There is also need for assistance in the weather projections so that the fishers and farmers can plan their fishing and planting seasons with more precision rather than leaving it to chance.

COMMUNITY PARTICIPATION

The increasing pressure on the lake's ecosystem, through conflicting use of water, land and biological resources, poor infrastructure development, poor land use including the wetlands, deforestation of lakeside and island habitats; industrial, urban and agricultural pollution has socio-economic implications for the riparian populations and economies of East Africa in general. An unhealthy ecosystem means polluted water, depleted fish stocks, and many other ill-effects.

Communities around the lake have a role to play in the conservation of the environment and the lake if they are sensitized, mobilized and involved. They have to be given responsibility to protect, conserve, and manage the environment. A programme to involve the communities and industries should be developed (LVFO, 1999) for it will go along way to ensure that the waters of Lake Victoria are of good quality for the benefit of the social welfare of the riparian population and nations. The strategic vision for Lake Victoria should be used as a referral point to identify studies and projects that can be developed for the health of the lake ecosystem, sustainability of the resources and for the socio-economic development of the riparian communities and nations.

INSTITUTIONAL CAPACITY AND LINKAGES

Problems

The solution to the present ecological and socio-economic problems eminent in the Lake Victoria basin must first take into account the fact that the lake is a shared heritage as both, water and living resources recognize no political boundaries. Then there has to be a concerned effort to mobilize human and financial resources at national, regional and international levels in order to sustainably manage and conserve both the environment and the resources of the Lake Victoria basin.

The shared nature of the lake implies that management decisions taken in a portion of the lake in one country affect those portions of the lake in other countries. Further, recent experience among the East African Member States has been that problems currently facing the lake i.e. pollution, eutrophication, over-fishing, use of illegal fishing methods, cross border trade, noxious water weeds such as the water hyacinth and others related to climate change are certainly beyond the capacity of any single riparian state working individually.

Thus if is a need to establish an institution that would provide a forum for discussions and taking joint actions on problems similar to the ones cited above. This approach would enable the riparian states to develop uniform management measures as appropriate, to be implemented by national laws and regulations. Similarly, this approach would enable Kenya, Uganda and Tanzania to jointly develop an adequate scientific basis for the management measures to be taken.

LAKE VICTORIA FISHERIES ORGANIZATION FOR REGIONAL COOPERATION IN LAKE VICTORIA

Establishment

Out of the need for joint decision making regarding the management of Lake Victoria environment and its resources, for the benefit of the present and future generations, the Governments of the Republic of Kenya, the Republic of Uganda and the United Republic of Tanzania established the Lake Victoria Fisheries Organization through a Convention (Final Act) signed in Kisumu, Kenya on 30 June 1994. These countries, being the «Contracting Parties» amended the convention on 12 November 1998 in Nairobi, Kenya.

History of the establishment:

Fisheries collaboration in East Africa, particularly between Kenya, Uganda and Tanzania, is perhaps one of the oldest in Africa. As early as 1928, it was recommended that a collaborative lakewide authority for regulation and collection of fisher statistics be established. The East African Freshwater Fisheries Research organization (EAFFRO) was established in 1947. A consolidated collaboration was established and further intensified with the formation of the East African Community in 1967.

When the East African Community collapsed in 1977, this important regional co-ordinating mechanism crumbled. However, since the riparian countries felt the need to continue collaborating in the development and management of fisheries of Lake Victoria a sub-committee of FAO, Committee for Inland Fisheries of Africa (CIFA), for Lake Victoria was established in December 1980 at the 4th session of the committee held in Blantyre, Malawi. This provided a unique forum for regional collaboration in the development and management of the fisheries of Lake Victoria.

Between 1991 and 1995 three seminars were held in the region, under the auspices of the FAO-CIFA sub-committee on Lake Victoria to discuss management issues, op-

tions and strategies for each of the riparian states. These seminars led to a regional meeting for the management of Lake Victoria and the creation of Lake Victoria Fisheries Commission. Further consultation between the riparian authorities with an FAO Mission led to the drafting of the convention establishing Lake Victoria Fisheries Commission. This draft was later approved by a legal and technical consultation meeting for the establishment of Lake Victoria Fisheries Organization (LVFO), in Dar-es-Salaam, Tanzania, 12th - 25th March, 1994. This was followed by signing and adoption of the convention at a conference of plenipotentiaries on 30th June, 1994 in Kisumu, Kenya. Operations at the secretariat headquarters in Jinja commenced on 15th July, 1997.

Objectives:

Overall, the objective of the organization is to foster co-operation amongst Kenya, Uganda and Tanzania on matters regarding Lake Victoria; harmonize national measures for sustainable utilization of the living resources of the lake, and develop and adopt conservation and management measures.

Functions/Responsibilities:

In order to achieve the broad objective as mandated in the convention, the LVFO has the function and responsibility to:

a. Promote the proper management and optimum utilization of the fisheries and other resources of the lake;
b. Enhance capacity building of existing institutions and develop additional institutions dedicated to, or likely to contribute to the purposes of the convention in co-operation with existing institutions established in or by the contracting parties and with such international, regional or non-governmental organizations as may be appropriate;
c. Provide a forum for discussion(s) on the impacts of initiatives dealing with the environmental and water quality in the lake basin and maintain a strong liaison with the existing bodies and programs;
d. Provide for the basis for research concerning the waters of Lake Victoria, without limiting the quality of such waters, in particular with respect to supporting the living resources of the lake and the nature, extent and pathways of its pollution and other forms of environmental degradation;
e. Encourage, recommend, co-ordinate and, as appropriate, undertake training and extension activities in all aspects of fisheries;
f. Control introduction of animals or plants into the waters of Lake Victoria or its tributaries and to adopt measures regarding introduction, monitoring, control or elimination of any such animals or plants;
g. Serve as a clearing-house and data bank for information on Lake Victoria fisheries and promote the dissemination of information without prejudice to industrial property rights, by any appropriate form of publication;
h. In respect of any or all of the foregoing, adopt budgets, seek funding, formulate plans for financial management and allocate funds to activities of the organization, or to such activities of the contracting parties as it may foster the purpose of the convention; and undertake such other functions as it may determine to be necessary or desirable in order to achieve the purpose of the convention.

Organizational structure

The Council of Ministers is the supreme organ of LVFO consisting of ministers responsible for fisheries in Kenya, Uganda and Tanzania. The council meets every two years. Its first session was held in December 1996 in Uganda, while its second session was in November 1998 in Kenya. The council held a special session on 26th June, 1999 in Dar-es-Salaam, Tanzania, and made key decisions on «A Collective Regional Strategy and a Plan of Actions Towards a Sustainable Fisheries Industry of Lake Victoria». The Third Session of the Council was held in November, 1999 in Dar-es-Salaam, Tanzania.

Policy steering committee comprise the permanent secretaries in the ministries responsible for fisheries development and management in the contracting states. Besides its normal functions, this committee adopts recommendations on policy which it forwards to the Council of Ministers. The National Committee, in each contracting state, falls under the permanent secretary who co-ordinates and reports its activities directly to the Council of Ministers.

The Executive committee is composed of the heads of the departments responsible for fisheries and heads of fisheries research institutes in each contracting state. The East African Co-operation (EAC) secretariat in Arusha, Tanzania and all heads of key regional programs/projects are also members of the Executive Committee.

One of the committee's functions is to review the activities of the LVFO and forward recommendations to the Policy Steering Committee.

Other Committees include, Fisheries Management committee, Scientific Committee and the National Committees. Working groups and ad hoc Committees may be set up whenever need arises.

THE FUTURE

Lake Victoria Fisheries Organization has, together with riparian governments and stakeholders developed a strategic vision to guide research, management, policy and other issues on Lake Victoria for the period 1999-2015. The vision covers five main areas: healthy lake ecosystem, coordinate research, integrated fisheries management, information generation/dissemination and partnerships and linkages. The future relies on the implementation of the strategic vision.

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