1.0 OBJECTIVES OF LVEMP AND ITS IMPLEMENTATION

(*presented by Christopher M. Nyirabu*)

Introduction

- The LVEMP is a comprehensive environmental regional program which aims at rehabilitating Lake Victoria and its catchment for the benefit of the people who live in the catchment as well as the global community.
- The Project was initiated by the riparian countries of Tanzania, Uganda and Kenya in 1992.
- On 5 August, 1994, they signed a Tripartite Agreement, which paved the way for the preparation and eventual implementation of an environmental program to cover the whole of the Lake Victoria Basin, with a Credit from IDA and a grant from GEF totaling US$70m.

Objectives of LVEMP

The major objective of initiating LVEMP is:

- To restore a healthy, varied lake ecosystem which is inherently stable and which can support, in sustainable way, the many and varied human activities in the basin.
- To maximize sustainable benefits to the riparian communities from using resources within the basin to generate food, employment and income, supply safe water as well as sustain a disease free environment.
- Conserve biodiversity and genetic resources for the benefit of the riparian communities as well as the global community.
- Harmonise national management programs in order to achieve, to the maximum extent possible, the reversal of increasing environmental degradation.

Threats/Problems Facing Lake Victoria and its Basin

Population increase and multiple activities in the lake basin have increasingly come into conflict. This conflict has contributed to rending the lake environmentally unstable. The lake has been facing the following problems in the last fifty or so years which have accelerated in the last three decades:

- Degradation of the water quality owing mainly to eutrophication caused by inflow of nutrients flowing into the lake.
- Land degradation caused by unsustainable agricultural, soil erosion, tree/forest cutting etc.
- Growth of massive blooms of algae which are dominated by the potentially toxic blue-green variety.
- Water hyacinth infestation covering about 2000 hectares in the Tanzania portion of Lake Victoria by 1998 and 15,000 hectares in the whole lake the same year.
- Water pollution by industrial and municipal discharges such as tanning paper, breweries, fish processing, agroprocessing etc.
- Introduction of the Nile Perch as an exotic fish species which has altered the food web structure.

Benefits of the Lake Victoria Basin

Lake Victoria and its basin is of great economic importance to the community in East Africa, the global community and particularly the community living within the basin. Major economic benefits from the Lake Victoria Basin include:

- Provision of fresh water for domestic, industrial and livestock use.
- Land for the production of food and cash crops.
- Has rich and unique terrestrial and aquatic biodiversity which include forests, wildlife, fisheries & minerals.
- Enables and facilitates transportation of goods in each as well as between the riparian countries.
- The gross economic product of the lake basin estimated to be in the order of US$4-5 billion annually supports about 30 million people in East Africa, thus providing livelihood to about a third of total population of the three riparian countries.
- Lake provides between 500,000 – 600,000 metric tons of fish with a landed value of about US$500 annually.
- About 3 million people are said to depend directly or indirectly for their living (Tanzania side).

- The lake is also of scientific importance, it is a place where fisheries, limnological and other researches are carried out.

The Focus of LVEMP

In the last four and half years, the LVEMP focused its implementation on the rehabilitation of Lake Victoria and its basin which entails improving management of the lake for sustainable development of the economy as well as carrying out an auxiliary investments, which are vital for the cleaning up of the lake and therefore reducing nutrient and pollution inflows to within acceptable parameters. The following areas were identified for implementation:

- Improvement in the management of fisheries activities by strengthening fisheries extension, monitoring, reviewing policies and Fisheries Act No. 6 of 1970.
- Improvement of fisheries research, information on ecology of the lake, biology of its flora and fauna, impact of environmental factors on the lake ecosystem, aquaculture development within the Lake Victoria basin.
- Management and control of water hyacinth infestation and other invasive weeds.
- Management of water quality and ecosystem management through elucidation of the nature and dynamics of the lake ecosystem to provide information on the characteristics of the waters, limnology changes, model and predict their short and long-term consequences.
- Management of industrial and municipal effluent and assess the contribution of urban run off to lake pollution.
- Land use and wetlands management which has involved management of pollution loading and buffering capacity of wetlands.
- Pilot activities:
  - Integrated soil and water conservation
  - Assessment of the Role of Agro-Chemicals in Pollution
  - Sustainable use of wetlands
  - Afforestation – tree planting
- Capacity building of the Zoology and Marine Biology Department of the University of Dar es Salaam.

Project Stakeholders

- Government of Tanzania represented by:
  - Vice President's Office; Ministries of Finance; Agriculture and Food Security; Natural Resources and Tourism; Water and Livestock Development.

- Other stakeholders include:
  - Department of Zoology and Marine Biology of the University of Dar es Salaam.
  - National Environment Management Council (NEMC)
  - Tanzania Fisheries Research Institute (TAFIRI)
  - Twelve (12) administrative districts in Kagera, Mara and Mwanza Regions
  - NGOs and CBOs
  - IDA and GEF represented by the World Bank.

Project Funding

- The LVEMP is a national executed Project with an IDA Credit of US$10.1m and a GEF Grant of US$10.3m, under an Agreement, between the World Bank representing IDA and GEF, signed on 6 September, 1996.
- The Government was supposed to contribute ten percent (10%) of the total in cash. However, due to economic problems, the Government has not.

- Under an Agreement in 1999 between the World Bank and the Government, the latter was exempted from the 10% cash contribution. However, the Government has made a lot of in kind contributions in terms of offices, employees as well as some cash contributions.
- The main interest of the Government is as well as the World Bank to see to it that these funds are properly spent to achieve the objectives for which they were borrowed and or granted.

The Use of Project Funds

- The National Secretariat has done its level best to disburse funds to components implementing Project activities, as efficiently as possible. At the beginning of the Project say up to mid 1998, disbursement was slow but later on it picked up by adapting various measures.
- Funds are disbursed to the Project Components monthly according to Workplans which show activities to be implemented by every component and where.
- Requests for funds are initiated by the Task Leaders and the submitted to the head of an implementing institution – Ministries and or parastatal concerned.
- The request is then submitted to the LVEMP National Secretariat where the funds requested are scrutinized to make sure that they are requested for activities in the wokplans. Sometimes, the National Executive Secretary may adjust funds requested.
- The Project opened two bank accounts at Citibank, Mwanza Branch for faster disbursement of funds to components.
- The Project remits funds to components and to microprojects by telegraphic transfers.
- To-date the Project has spent a total of US$15,917,263.93. There is a balance of about US$2.7m. The difference of US$1,782.736 is the loss arising out of exchange rate between SDR and the US Dollar.

Auditing of Project Accounts

- The Controller and Auditor General was appointed by the Government and accepted by the World Bank as the Project auditor. Thus, since 1997 to date the Controller and Auditor General has carried out four audits – 1996/97, 1997/98, 1998/99, 1999/2000.
- In the last four years, the Project got Clean Certificates of Accounts. In the fiscal year 2000/2001, the Project got a qualified Audit Report. We did not agree with some of the Auditor's comments as explained in our reply.

Management of Project Resources

- The Project has bought a lot of office facilities, equipment of all types, which among others include computers, laboratory equipment, patrol boats, and motor vehicles.
- Procurement of equipment and office facilities has been coordinated by the Secretariat. It has been done in consultation with the World Bank, implementing institutions and either Regional or Central Tender Boards.
- All procurements have been done according to the Government of Tanzania procurement regulations and procedures as stipulated in the Central and Regional Tender Boards' Acts, as well as IDA Guidelines for Procurements (1995) and IDA Guidelines for use of consultants (1981).
- We have been able to procure about 85% of all facilities and equipment re-ended to implement the Project.

Project Personnel

- There are two types of personnel who are implementing the Project
  - Government employees and employees of Government institutions who are on the ground implementing various Project activities in all 15 districts in Kagera, Mara and Mwanza regions.
  - The second category of personnel is that of Regional Secretariat. These are performing advisory and coordinating roles.

- All of them have worked very hard and are very dedicated. The achievements the Project has made would not have been made without them. I thank them and commend them.
- Achievements made since LVEMP inception in 1997 will be explained shortly by individual components.

Lvemp Implementation Arrangement

Implementation arrangements are stipulated in the Appraisal Report agreed between the Government of Tanzania and IDA and GEF represented by the World Bank. The arrangements are as follows:

- Overall policy coordination is done by the Vice President's Office.
- Project Component Coordinators:
  - Agriculture and Food Security, Natural Resources and Tourism and Water;
  - National Environment Management Council (NEMC),
  - Tanzania Fisheries Research Institute (TAFIRI)
  - Zoology and Marine Biology Department of University of Dar es Salaam.

- The Coordinator is a very key person because she/he coordinates and supervises implementation of the activities in the field of the whole component in the three regions.
- She/he approves requests for funds from the Task Leaders.
- Task Leaders re specialists, scientists, engineers, foresters etc. who are coordinating and supervising implementation of the activities of a sub-component in all the three regions.
- The Ministry of Finance is responsible for approving requests for disbursements from LVEMP National Secretariat to World Bank. It is also responsible for approving changes to the Credit Agreement if need be.
- Provides central contact point and information clearing for all components, IDA and GEF.
- The National Secretariat collects/receives information/reports etc. from components.
- Responsible for overall monitoring as well as preparation of progress reports.
- Ensures compliance with IDA & GEF reporting, procurement and disbursement procedures.
- Submits replenishment requests to the World Bank with the approval of the Ministry of Finance.
- Convenes regular meetings of the Technical Committee composed of Project Component Coordinators at which various issues affecting implementation of the Project are discussed.
- It is the Secretariat of the Regional Policy and Steering Committee.

Project Implementation Committee (PIC)

- Is composed of 6 people from the National Secretariat, all Project Component Coordinators, Task Leaders and some Scientists.
- Meets quarterly to discuss implementation of the various issues affecting the Project.

Regional Policy And Steering Committee (RPSC)

- The RPSC consists of nine (9) Permanent Secretaries, three from each country, who are responsible for environment, fisheries, agriculture, water, finance, natural resources etc.
- The RPSC is responsible for policy issues.
- Supervises and guides the implementation of the Project.
- Approves work plans and budget estimates.
- National Water Hyacinth Steering Committee is responsible for overseeing and coordinating the program.

Conclusion

- We have been implementing LVEMP for the last four or so years. Some impressive achievements have been made. However, a lot needs to be done to clean the lake. This will take some time.

- Shortly, we shall be hearing from Components themselves, achievements made so far. They are impressive. I am not therefore going to talk about achievements.
- I wish however to mention here that the Project has strengthened capacity by training Project staff as follows: 6 PhDs, 22 Masters, 5 Diplomas and 130 short courses. All these in a span of about 4½ years.
- The Project has also created awareness on the fate of Lake Victoria and the need to conserve its resources, not only to the Lake Victoria Basin communities but nationally as well.
- The Project has also involved communities in the Lake Victoria Basin, in the implementation for sustainability.
- There are problems. These were encountered at the inception of the Project. Most of them have been overcome but others still persist such as motivation of Government employees implementing the Project.

2.0 THE QUALITY OF THE WATER OF LAKE VICTORIA
(*presented by Hassan Mjengera*)

Sub Components

❖ IN-LAKE WATER QUALITY MONITORING
- Management of Eutrophication
- Sedimentation studies
- Hydraulic Conditions in Lake Victoria
- Lake Victoria Water Quality Model

❖ INDUSTRIAL AND MUNICIPAL WASTE MANAGEMENT
- Management of Industrial and Municipal Effluents
- Integrated Tertiary Industrial Effluent Treatment
- Integrated Tertiary Municipal Effluents Treatment
- Priority Waste Management Investments

❖ MANAGEMENT OF POLLUTION LOADING

Long-Term Vision

The Vision Statement: "A restored Lake Victoria basin ecosystem with clean water that is able to support various uses for sustainable socio-economic development".

Monitorable Indicators

Short-term

- Production by December 2001 of baseline characterization of water quality in the lake and selected tributaries
- The ability to calibrate and verify the preliminary hydrodynamic and water quality models by May 2002.
- Pilot project, pollution loading, management activities successfully reduce nutrient and contaminant loadings near pilot project sites

Medium-term

- Measurable reduction of nutrients and faecal coliform originating from selected areas in urban centres, rivers and industrial discharges.
- Measurable improvements in lake water quality, including
  - Reduced nutrient concentrations, turbidity, algal abundance, area of deoxygenation, coliform counts and contaminants

- Harmonized policies and legislation among the three riparian countries to reduce pollution loading.
- Development and enhancement of public environmental awareness programs
- Application of hydrodynamic/water quality model in determining priority areas for water quality control.

Long-term
- Further improvement in water quality as defined in mid-term indicators 1 and 2 (above), and improvement in biodiversity.
- Continued improvement in public awareness of environmental issues.
- Reduced atmospheric deposition of selected nutrients and contaminants

Objectives
- Elucidating the nature and dynamics of the lake ecosystem by providing detailed information on characteristics of the waters of the lake,
- Improving management of industrial and municipal effluent, and assessing the contribution of urban runoff to lake pollution in order to design alleviation measures.
- Establishing a water quality monitoring network throughout the catchment, estimating the effects of changes in land use planning on pollution loads in the lake, and developing policies and programmes to control non-point source pollution.

Expected Outputs

Eutrophication
- A periodic assessment of physical, chemical and biological characteristics of the lake system.
- Details of limnological changes and model to predict their short and long term consequences,
- Quantitative information on: Nutrient loading and recycling in the lake, sources and mechanics of eutrophication and pollution and their effects on lake productivity
- Lake flora and fauna and their roles etc
- Levels of BOD, heavy metals, pesticide residues and coliform.
- Rates of change of water quality.
- Relationship between rates of change of water quality and observed status of inputs from the catchment.
- Estimate of effects of poor water quality on the economy country
- Basis for a practicable pollution control programme (established)

Sedimentation Studies
- Estimate of sedimentation rates
- Assessment of the rate of release of nutrients from sediments
- Analysis of sediment-biota associations

Hydraulic Conditions
- Patterns of water circulation and interaction
- Improve estimates of hydraulic retention periods in the lake
- Simulation model of dynamics of nutrients and nutrients

Lake Victoria Water Quality Model.
- Lake Victoria Physical Processes and Water Quality Model

Achievements Made During the Project

Eutrophication

An in lake water quality monitoring network has been established. Forming the harmonized lake Victoria water quality-monitoring network designed jointly by Tanzania, Kenya and Uganda

- 11 littoral and 17 pelagic stations the impact station located in the towns of Bukoba (11) and Musoma (12) and the City of Mwanza (12).
- The stations for monitoring of wet and dry deposition located in the islands of Musila, Nabuyongo, Gabalama and Lyamakobe.
- Samples collected from the network are analysed in the in Mwanza, Musoma and Bukoba laboratories.
- Details of limnological changes and model to predict
- A one-year data cycle has been collected from both littoral and pelagic areas is being compared with historical data since 1960s
- The data collected include nutrients, secchi depth, dissolved oxygen, thermal structure, zooplankton, phytoplankton and bacteriological quality of the impact stations.

Water Quality of the Lake

- The data collected from the pelagic and littoral areas of the lake indicate a deteriorating water quality. The high concentrations of total phosphorus, chlorophyll and low secchi disc, transparency levels in both pelagic and littoral areas of the lake are characteristic of a eutrophic lake.
- The results indicate that the littoral areas particularly those along the Bukoba, Musoma towns and Mwanza city are contaminated with faecal coliform not leaving the shoreline settlements and fish launching sites. Water born diseases like cholera; typhoid and dysentery, which are common in the settlements are associated with the poor water quality in the areas. Bilharzia is also common in most of shoreline villages
- For example a monitoring station 100 metres off the Morongo River month has a concentration of 36,000 coliform counts per 100 mL, Nyarusurya in Musoma 6500 coliform counts per 100 mL and TRC Customs Bukoba 3,800 coliform/100mL

Sedimentation

Analysis of samples and data on sedimentation is in progress is being handled by UDSM-Dept of Zoology and Marine Science

Hydraulic conditions

No out put has been achieved

Water Quality Model

The Lake Victoria Physical Processes and Water Quality Model is in place

MANAGEMENT OF INDUSTRIAL AND MUNICIPAL EFFLUENTS

- Inventories and classifications of all factories and industries in the catchment have been accomplished and a report prepared.
- Assessment of effluent before discharge and its dilution levels in receiving water bodies is on going. The exercise has already revealed that the treatment systems installed by the industries do not produce effluent of the expected quality. The Mirongo River in Mwanza city is an example of the receiving water bodies whose water quality has been badly impaired.
- The effluent monitoring network comprises of industrial effluent monitoring stations: In Mwanza City (11) and Bukoba (4) and Musoma (11) towns.
- Quantification of pollution and nutrient flows from urban runoff. The established urban runoff-monitoring network consists of 20 stations located in Bukoba (11), Musoma (10) and Mwanza (9).

- Formulation of Guidelines and Effluent Standards LVEMP at Regional level has already initiated the process of reviewing the standards
- Training Arrangements for Industrialists and Local Authorities. The results indicated that the industries have appreciated the Cleaner Production Technology have already started implementing the today options. There have been clear changes in attitude and procedures, practice and actions.

Pilot Industrial Effluent Treatment

The process of constructing a pilot constructed wetland to serve as a tertiary treatment system for a portion of effluent from TBL in Mwanza is on going.

Pilot Municipal Effluent Treatment

- A constructed wetland for treatment of municipal effluent from Mwanza City is in place.

Priority Waste Management Investments

- Feasibility study and design of Community based simplified sewerage scheme for Igogo Ward in Mwanza City. Evaluation of technical proposal completed
- Feasibility study of EIA and design of sludge disposal facility for Bukoba town: Evaluation of technical proposal completed

MANAGEMENT OF POLLUTION LOADING

- A Water Quality-monitoring Network Throughout the Catchment (in Tanzania 13 hydrometric stations: Kagera region (3), in Mwanza region (4) and in Mara region (6).
- Four stations for monitoring of atmospheric deposition: Bukoba, Mwanza, Magu District and Musoma
- An automatic weather station located in Musoma
- Twelve rain gauge stations: In Kagera (4), Mwanza (4) and Mara (4) region.
- A portable cableway system for measurement of discharges
- An Estimate of the Effects of Changes in Land use Planning on Pollution Loads in the Lake.
- Suspended sediment loads were quantified for Simiyu and Kagera rivers
- Simiyu sub-catchment is contributing much more total suspended load to lake Victoria than the Kagera sub-catchment
- An assessment of the contribution of agrochemical use in the whole catchment was done Agrochemicals used in the lake zone are insecticides, fungicides and nematodicided and acaricides
- Tri Super Phosphate, Calcium Ammonium Nitrate, Sulphate of Ammonia and Urea. The use of agrochemicals in the lake zone is presently very low.
- An estimate of phosphorus input from atmospheric deposition in the Simiyu Catchment, and Bukoba and Mwanza towns. From the study it has been concluded that the high population density around the lake has a direct influence on increased deposited phosphorus from land use/human activities.
- Training on Lake Victoria Decision Support System at Georgia Institute of Technology (USA).
  Data base development and management, rainfall estimation, watershed response-stream flow, agricultural planning and hydropower scheduling and lake management.

Contribution of the Component Activities to Major National Policies

- ❑ Eutrophication degrades water quality: Degraded water requires treatment for various uses; thus eutrophication is responsible for increased water treatment cost. The management of eutrophication aims to improve the quality, low treatment cost

- Water Borne and Water Related Diseases: The water quality assessments, carried out, and the recommendations made aim to improve the quality of the environment and minimize the incidents of diseases and consequently improve the people's health.

- Component activities: contribute to major policies like the Water, Environment, Forestry Policies and the Policy of Poverty Alleviation etc.

Others Rehabilitation of Water Laboratories

- Water quality laboratories in Mwanza, Musoma and Bukoba were rehabilitated and equipped with laboratory equipment, instruments, glassware and reagents

Constructed Water Quality Data Logger Houses

- Mwanza: Capri Point, At Saa Nane Island,
- Bukoba: Customs Water Supply Intake
- Musoma: Mwisenge Water Supply Intake

Staff Trained Under the Project

Members of staff have attended training courses in country and abroad.

- MSc Programmes (6): In Water Quality Management, Environmental Sciences and Technology Water Resources and Sanitary Engineering.
- Diploma Programmes (6): In Water and Wastewater Engineering
- Short Training Courses (22): In Water Quality Management, Laboratory Procedures, Quality Assurance and Quality Control and an Elementary Computer Courses.
- PhD Programme (1): On Water Quality Modelling

Technical and Scientific Reports/Papers and Other Reports

- Cleaner Production Training and In-plant demonstration programme for industries along the Lake Victoria (Tanzania side) under the programme (10) reports were produced.
- Four annual progress reports were prepared including annual work plans and budgets.
- Consultant of the Integrated Water Quality/Limnology Studies prepared (3) reports on the activities the Consultant has been doing.

The Way Forward

Socio-economic

Experiences of the first phase of LVEMP implementations show that the water quality issues identified are still contributing towards poor health of the people and this is associated with poverty. Investments aiming to improve sanitary conditions should include:-

- ✓ Sludge disposal facility for Musoma town.
- ✓ Construction of shallow wells for drinking water supply
- ✓ Construction public toilets in the permanent shoreline settlements
- ✓ Construction of solid waste disposal facilities for Mwanza, Musoma and Bukoba towns

Environmental

Management of Eutrophication

The Water Quality Monitoring network put in place during LVEMP I is to be strengthened through:-

- ➢ Acquisition of a Research Vessel for in-lake water quality monitoring.
- ➢ Relocation of the Bukoba water laboratory
- ➢ Installation of automatic weather station in Nabuyongo Island

- Carry on with periodic assessment of physical, chemical and biological
- Details of limnological changes, data for the model to predict their short and long term consequences
- Quantitative information on
  Nutrient loading and recycling in the lake
- Levels of BOD, heavy metals, pesticide residues and coliform.
- Rates of change of water quality
- Estimate of effects of poor water quality on the economy of the country
- Basis for a practicable pollution control programme

Management of industrial and municipal effluents

- Inventories and classifications for all factories and industries in the catchment.
- Assessment of effluent before discharge and its dilution and dispersion, levels in receiving water bodies.
- Quantification of pollution and nutrient flows from urban runoff.
- Identification and characterization of pollution "hot spots".
- Formulation of guidelines and effluent discharge standards.
- Training arrangements for industrialists and local authorities.
- Public awareness campaign

Management of pollution loading

- Strengthening the water quality-monitoring network throughout the catchment.
  An estimate of the effects of changes in land use planning on pollution loads in the lake. Policies and programs to control non-point source pollution

Research

Sedimentation

- An estimate and assessment of sedimentation rates at the Simiyu river mouth.
- Analysis of sediment-biota associations.

Hydraulic Conditions

- Patterns of water circulation and interaction between vertical and horizontal circulation
- Improved estimates of hydraulic retention periods in the lake
- Simulation model of dynamics of nutrients and nutrients for predicting the impacts of eutrophication and control programs

Water Quality Modelling

- Development of the physical processes and water quality model frame work through improvement, extension, calibration, validation
- Extension, calibration, validation and implementation of Lake Victoria Model Framework
- Extension of Lake Victoria Model Framework into a comprehensive user friendly Decision Support System

Integrated Tertiary Industrial Effluent Treatment

- Constructed wetland to test tertiary treatment of industrial effluent from TBL in Mwanza City.

Integrated Municipal Effluent Treatment

Constructed wetland to test tertiary treatment of municipal effluent from Mwanza municipality.

3.0 FISHERIES MANAGEMENT

(presented by Rashid Hoza)

Introduction

Lake Victoria and its basin resources have continued to support millions of stakeholders living within and outside the lake catchment by providing employment, food, income and other socio-economic benefits. The cumulative fish landings from 1997 to the year 2000 were 692,000 metric tons valued at Tshs 212,105 billion of which 139,241 metric tons of fish and fishery products were exported, valued at Tshs 166.4 billion.

Vision statement

"A sustainable integrated fisheries resources management for optimal utilization of the fisheries resources, for the socio- economic benefits of the present and future communities of the riparian partner states "

Objective

The overall objective is to promote, support, guide and ensure proper management and optimum utilization of the fisheries and other resources of the lake and its basin for the benefit of the people of the riparian partner states.

Expected outputs

- Fish quality control and safety assurance improved
- Surveillance against illegal fishing practices carried out
- Co- management introduced in fish landing beaches
- Regional/National Fisheries Regulations harmonized
- A mechanism for sustainable funding for fisheries management and environmental protection activities developed
- Fisheries staff and stakeholders trained
- Public awareness conducted to enhance fisheries management

Achievements

- The microbiological laboratory has been established and is operational. Fish inspectors and other stakeholders were trained on fish quality and safety assurance guidelines. The Government has gazetted the Quality Control and Safety Assurance Regulations, 2000. Nile perch processing plants have adopted the Hazard Analysis and Critical Control Programme.
- These efforts has made Tanzania to be incorporated in category one of the countries exporting fish and fishery products to the EU market.
- Enforcement mechanisms for curbing illegal fishing practices has been strengthened in the last four years. More than 24,000 different illegal gears were confiscated. Fishermen are observing the closure period in fish breeding areas. The use of legal fishing gears has increased from 118,424 gillnets (5" and above) and 675 hooks in 1998 to more than 200,885 gillnets and 2. 2 million hooks in 2000.
- Harmonization of Fisheries legislation has been initiated and areas of harmonization were identified, they include role of fisheries research, environment, fisheries co—management, cross border fishing and trade, etc
- Fisheries Staff were trained in various aspects of fisheries management through short and long courses. Stakeholders were trained on improved fish farming, fishing methods, cooperatives, poverty alleviation, co-management, establishment of credits and saving schemes, etc.
- A mechanism for sustainable funding for lake Victoria has been initiated namely Lake Victoria Environment Fund (LVEF).
- Co-management has been established with 511 BMUs, which are operational. A legal frame work for BMUs has started, a new Bill namely Fisheries Act, 2001 that empowers co-managements units is in

place. The process of providing incentives to BMus has started 10 micro projects identified by the BMUS and other stakeholders are funded by the project and Fisheries Division.

- Public awareness has been carried out through radio programmes, workshops, seminars, meetings at beach, village, district, regional and national levels involving a wide range of stakeholders

Way forward

- Establish a referral accredited Fish Quality Control Laboratory; continue training to fish inspectors and other stakeholders in maintaining fish quality standards
- Improve and strengthen Beach Management Units (BMUS) and Conservation Management Units (CMUs) in fishery resources management by providing working facilities and field equipment and support income generating.
- Facilitate private sector to invest in ice production, transportation, eco-tourism, promotion of trade on value added fish products
- Training to stakeholders on cooperatives, credits and saving schemes and poverty alleviation strategies
- Operationalization of Lake Victoria Environment Fund (LVEF)
- Enhance capacity building in the fisheries sector
- Continuous public sensitisation about sustainable fishery resources management of lake Victoria and its basin.

Acknowledgement

The achievements obtained in the last four years of implementation of LVEMP were made possible due to the positive support and collaboration rendered by the Ministry of Natural Resources and Tourism, Fisheries Division, Regions , Districts, Village and Beach leaders as well as field staff, BMUs and other stakeholders.

4.0 FISHERIES RESEARCH

(presented by E. Katunzi)

Long Term Vision

Data and information on the ecology of the lake and its Catchments, the biology and biodiversity of its fauna and flora, environmental factors and their impact on the lake ecosystem and socio-economic implications arising from utilization of the lake's resources provided. The goal is to ensure sustainable balanced and conserved ecosystem that will provide food, employment and recreation to the communities of the lake.

Component activities operated under four major areas; (Fish Biology and Biodiversity Conservation, Aquaculture, Socio-economics and Information and Database).

Fish Biology and Biodiversity Studies

This was effected through trawl surveys, beach seine operations, gill-net catches, beach landings, electrical fishing and Satellite lakes surveys.

Table 1. Species composition by percentage weight sampled by the three research vessels;R.V. IBIS, R.V. TAFIRI II, R.V. Victoria Explorer

See attachment

Table 2. Species Composition by weight from beach seine Surveys 2001

Table 3. Species Composition by weight from Gillnet Surveys 2000

Table 4. Species composition by weight from different sites by bottom trawling - 2000

Rastrineobola argentea has not been properly represented, because of gear limitations. Work has also been done on other biota, i.e phytoplankton, Zooplankton, macroinvertabrates and macrophytes. Similar species have been found in both the main lake and Satellite lakes.

Aquaculture

Objectives

- Domestication of indigenous species of high nutritional values including restoration of the several endangered and threatened species such as *Tilapia, Labeo* and *Synodontis.*
- Mass rearing of selected species and distributing them to the farmers.
- Mass rearing of endangered and threatened species and releasing them to the lake.
- Mass rearing of aquarium species and introduction of trade link with exporters/buyers
- To visit farmers and assess their progress on the rearing of selected species.

Achievements

Fish Ponds:

- Stocking of selected species by the farmers
- Fish cum-chicken culture" for *O. niloticus* has enabled fingeling distribution to farmers {Kagera (1235), Mara (600) and Mwanza (40)

Hatchery:

The hatchery has enabled the Sub-component to undertake experiments on feeding, stocking and spawning of cultured species.

- Feeding; cotton seed cake Vs Soya beans
- Low stocking density Vs high stocking density
- Artificial induction of spawning for *Clarias* (600,000) fingelings produced
- Survey of aquaculture status has indicated poor pond management, this calls for more extension services to farmers

Socio-economics

The overall goal of the Socio-economics research program on Lake Victoria was to generate data that would be used to formulate policies governing management and utilization of the resources of the lake with greater community participation in formulation and implementation so as to enable them maximize benefits from the fishery.

Studies conducted involved;

- Community involvement in fisheries
- Fisheries contribution to National economy
- Community nutritional status, health and social amenities, results of a pilot/baseline survey carried out in Mwanza region
- Impact of fishing activities on environmental degradation
- Dissemination of research findings

Information and database

The main objective of Information and Database Sub-component is to develop a mechanism that will facilitate timely acquisition and enhanced exchange of information on Lake Victoria, and acts as a central station where this information can be accessed.

Achievements

- Collection of literatures through internet searches and surveys were effected. A total of fourteen journals and forty eight bounded volume of aquaculture reprints
- Production of CD-ROMs has been initiated.
- E-mail and Internet services are in place
- Functional Library
- Desktop publishing facilities are in place

Way Forward

- Need to extend monitoring of the recovering species overtime and advise accordingly
- Inshore rocky and vegetated habitats to be further investigated since they are appropriate sites for breeding and juvenile growth and and also act as refugia for the recovering species
- Conservation Management Units which are considered as repositories for the endangered species will be reinforced and provided with technical and skills for management
- Study on the ration, growth and cost effective pond size of the cultured species need further work. There is still need to supply information
- Role of indigenous knowledge on conservation and management to be reinforced
- An assessment of the socio-economics impact of HIV/AIDS on social- structure of fishing communities need further studies
- Source of financing community level fisheries and utilization of revenue generate to be procured
- Need for enhancement of effective usage of Information Technology (IT) tools by scientists.

5.0 SOIL AND WATER CONSERVATION

(presented by Fares Mahuha)

Introduction

Soil and water conservation composed of two sub-programs namely:

- Integrated soil and water conservation;
- Assessment of agro-chemicals.

World Bank mid-term mission in 1999, recommended to halt as well as scale up (pilot to lakewide focus) some of component's prioritized activities. That resulted into refocusing both the specific objectives and expected outputs, as stipulated in the project document.

Component's Vision

Long term vision of the component (regionally harmonized):

"Increased and sustained land productivity and water quality in the Lake Victoria basin".

Objectives

- Overall objective:
  Improved land use management of the catchment for sustainable utilization of the Lake Victoria basin resources.
- Specific objectives:
  - Enhancing baseline data for follow on programs in the basin in forms of hard and soft copies and thematic maps;
  - deduction from various studies and monitoring activities, appropriate and effective measures on soil and water conservation and agro-chemicals use;
  - acquire a comprehensive plan of action for land use management for medium and long term periods.

Expected Outputs

- *Agro-chemicals Assessment*:
  -Quantitative data on use of fertilizers and pesticides;
  -loss of fertilizers quantified;
  -information packages on efficient use of fertilizers and safe use of pesticides;
  -improved analytical facilities
  -a report assessing the relation btn AC run-off close to the point of application and that experienced by the Lake; and
  -policy and control put in place.

- *Integrated soil and water conservation:*
  - Stakeholder participation;
  - sensitized stakeholders;
  - demonstration units as for comm. participation;
  - soil loss, sediment loads and nutrient transport from a land use types established;
  - extension and training modules for use in other CA
  - suitable SWC measures established.

- Survey and mapping of land use/cover and soil erosion hazard in the whole basin was prioritized during the WB mid-term review to constitute 80% of component expected output. Expected outputs of this activity were:
  - Maps in both hard and soft copies with respect to the whole Lake catchment as well as specified themes;
  - report for detailed descriptions.

Achievements Made

- Assessment of Agro-chemicals:

(i) Carrying out inventories of AC in the basin

- Types and amount of AC from the Lake catchment from 1986 – April, 2000 (fertilizers, pesticides, few herbicides)
- Fertilizers amounted to 18,166,359 tons, while pesticides liquid and powder were 18,816,660 li and 1,648,670 tons resp.
- General stable high profile trend up to mid-90's. Drastic decrease up to late 90's followed stable low profile trend to date, attributed by the removal of subsidy to co-operative societies
- Land productivity is less influenced by the use of AC. Urgency need to sensitize small scale farmers on efficient and safe use.

(ii) Study of AC use, handling and storage

- Conducted in Pilot area of Magu district involving suppliers/ stockists, extensionists and farmers
- Unawareness on the efficient and safe use of AC; most stockists/suppliers are unregistered; but are major advisors on use and guidelines of AC than extension workers
- Need for training stakeholders esp. stockists and emphasize the the use of organic AC and IPM

(iii) Training and extension services

- Seminar on safe use, handling and storage for stockists in 4 Districts conducted involving 24 stakeholders
- 120 farmers received on-field training on scouting technology that led into reduced number of AC spray from 6 to 3 in cotton

- *Senna atomalia* shrubs as pests repellant was introduced in pilot area to promote IPM
- Booklet on use, handling and storage of pesticides for holticultural farming and leaflet on general use and handling of agro-chemicals been typeset and edited, ready for mass production

■ Integrated soil and water conservation

(i) Baseline data acquisition for planning land use

- Using remotely sensed data and GIS technology, maps depicting present land use/cover and soil erosion were enhanced, in respect to whole Lake CA, major rivers CA and districts.
- Maps depicting erosion hazard considered the influence of each factor (land cover, rainfall, slope, soil, farming systems) as well as combination of all factors to give priority areas.
- Also soil losses from various land uses were computed using USLE model, with values ranging 1-14 tons/ha/annual. The data reveals the necessity for field verification and improve data input
- Such information will be useful for follow on program for various stakeholders in the basin to ameliorate land degradation.

(ii) Training and extension services

- Stakeholders were trained on various effective and site specific SWC measure to test the strength of approach and adoption rate
- Adoption rate was excellent with catchment area approach whereby community participation was highly nurtured. Enormous physical work could be done e.g 45,000 m contour bund could be staked and constructed in a two year time
- Whereas crop yield was increased by 50%, soil loss could be reduced for more than 50% in a year time.

(iii) Community participation

- Community participation was given high priority in all stages of activity execution. PRA tool was used from planning session up to implementation and evaluation.
- Project assisted where the community could not excel e.g training them SWC packages. All physical works were done by beneficiaries themselves.
- Community in the pilot area has been adequately sensitized as advantage of SWC measures has now been obvious.

(iv) Information documentation and dissemination

For the sake of sensitizing stakeholders and information sharing, documentation and dissemination was done as follows: 400 Posters, still pictures, seven video cassettes (not edited), 12 radio programmes recorded and five articles written in news media.

(v) Integrated watershed management

The component attained some tangible achievement in the pilot area whereby integrated efforts of four components of the project were to exerted. In a year time, a well planned and organized intervention strategy was put in place in Kwibuse/Kuruya area. That assisted a speedy implementation of physical work as well as evaluation and monitoring processes.

Contribution to Major National Policies

■ **Environmental aspects**

- Great impact on friendly environment attributed by SWC and ACA activities

- Soil erosion was reduced to more than 50% in a year time for any of SWC measure adopted in farms(eg. stop wash lines reclaimed a gully from 1.2 to 0.7m depth in a year time), pollution of water bodies was implicitly reduced.
- Sensitized community in efficient and safe of AC resulted into reduction of unwanted spillage as well as reducing both on and off-point pollution.

■ **Poverty alleviation and economic growth**
- Activities rendered in pilot area had a direct impact to poverty alleviation, hence economic growth.
- Reduction on number of sprays attributed by scouting and the use of IPM had an impact on reduced farm operation expenses and hence saving
- Despite the semi-aridity climate in the pilot area, the issue of crop harvest unreliability was nullified. That resulted into reducing mining cultivation in migration to potential areas
- Crop yields were drastically increased in farms adopted SWC measures as shown on the following table. That has greatly influenced some young energetic boy to have confidence in farming enterprises

Table 6: showing crop production in pilot area
See attachment

■ List of infrastructures:
2 only (Office at Mwanza and raingauge st. at Kale.)
■ List of equipment – Refer the paper
■ List of trained personnel:
4 received short courses ranging 2-4 weeks
■ List of technical and scientific reports:
7 reports and 5 technical papers

The Way Forward
■ **Utilization of enhance baseline information**
- Maps produced to be milestone in prioritizing area of operation
- Stakeholders will be sensitized to use the maps
- Establishment of RS and GIS lab for data update
- Documentation, liaison and collaboration with other programmes

■ **Replication and deduction of prelude works**
- Capacity building
- Adoption of all good practices from pilot area prelude works
- Local Government (district council) to be fully involved
- Other agricultural systems (eg.irrigated farming, IPM, IWM)
- Innovative farmers to be used as extension agents

■ **Research and monitoring**
Collaborative efforts with some interested institutions like ICRAF, UDSM, SUA and ARI in executing activities like field verification for USLE model input data, monitoring the impacts of various SWC measures and conducting other research related activities to be planned

■ **Socio-economic and environmental impacts**
- Integrated soil and water conservation and agro-chemicals assessment have always a direct impact on socio-economic as well as environmental aspects for most agriculturally dependent nations
- Socio-economic and environmental impacts will be magnified and extended to more beneficiaries.

6.0 CONTROLLING AND MANAGING WATER HYACINTH

(presented by Mrs. F. Katagira)

Component Long-Term Vision

Reduced infestation of water hyacinth and other aquatic weeds in Lake Victoria and other water bodies in its catchment to levels that do not cause socio-economic and environmental problems based on sustainable methods.

Objectives:

Sustainable management of water hyacinth through Integrated Pest Management (IPM) strategy by:

- Manual removal at strategic sites such as landing beaches and water source points to make them accessible
- Intensification of biological control in Lake Victoria and its bays and gulfs, rivers Kagera, Mara and satellite lakes/ponds
- Community involvement in both physical (manual) and biocontrol of water hyacinth
- Capacity building at community and national level in aquatic weed control
- Monitoring and evaluation of hyacinth infestation and impact of control measures
- Development and implementation of water hyacinth control quarantine regulations
- Control the inflow of nutrient influx into the Lake Victoria and other water bodies in the lake basin

Expected Outputs

- Mass rearing capacity for biocontrol agents established and operationalized
- Enhanced physical (manual) removal of water hyacinth from strategic sites
- Impact of water hyacinth infestation and its control measures established
- Involvement of Rwanda and Burundi in the management of water hyacinth
- Research on ecological, socio-economic impacts on the weed carried out

Achievements Made

- The IPM (biological and physical) strategy for reduction of water hyacinth proliferation was initiated in 1997. Water hyacinth infestation level has been reduced to 78%.
- **Biological control**
  - ⇨ Two species of *Neochetina* weevils were imported from IITA, Benin and reared at Kibaha National Biological Control Center. Village government provided land for construction of 8 weevil rearing units and fully participated in the construction. Three rearing units were constructed in Government institutions
  - ⇨ Mass rearing of weevils have been carried out at 11 weevil rearing units (5 in Mwanza 3 in Mara and 3 in Kagera region). Weevil multiplication harvesting and releases were done at 90 sites by component staff in collaboration with local communities. Eight weevil-rearing units are 100% managed by local communities
  - ⇨ Approximately 70 million weevils were harvested from various sources such as Kibaha Biological Control Centre, rivers Pangani and Sigi and weevil rearing units, ponds and released in water hyacinth infested areas
  - ⇨ Pure species of parent stocks of *Neochetina* weevils are maintained at Kibaha
  - ⇨ All rearing centers are maintained under optimum condition conducive for weevil multiplication

- **Physical/manual removal**
  - ⇨ The project facilitated local communities, NGO's and CBO's by providing simple tools for weed removal such as wheelbarrows, rakes, manual forks etc. worth 76 million Tshs.

- ⇨ 350 landing sites and beaches, water points, ferry lines and recreational sites (Yatch Club of Mwanza) are weed free. Water Hyacinth Management Committees are in place at the 350 landing sites and beaches
- ⇨ Capacity for manual removal has been increased from less than a tone in 1995 to 40 tones per day in 2001

Quarantine regulations of water hyacinth control

- Water hyacinth regulations are in place. Plant protection act of 1997 became operational since July 2001 so is the water hyacinth regulations.

- All districts in the Lake basin infested with water hyacinth were declared under quarantine

- Utilization of water hyacinth is prohibited. No person shall import or use water hyacinth for commercial, socio or any purpose, unless such person first obtains a permit from the Minister.

Involvement and participation of local communities

- Local communities manage 8 weevil rearing units (2 in Kagera, 2 in Mara and 4 in Mwanza). They rear, harvest and release weevils, participate in monitoring and evaluation of weed infestation and control measures e.g. identification of weed infested hotspots.
- They carry out public awareness campaign and manual removal of water hyacinth

Monitoring and evaluation

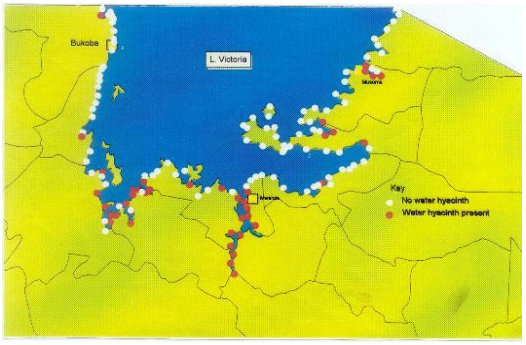
Monitoring involved various methods;

- **Ground surveys**
  - ⇨ A series of ground surveys have been carried out in Lake Victoria to assess the impact of the water hyacinth and its control measures.
  - ⇨ Water hyacinth coverage in lake Victoria was 700 ha in 1995 and increased to 2000 ha in 1998. After the release of *Neochetina* weevils in Lake Victoria in 1997, a general dramatic success in combating the weed has been realized particularly in lake Victoria.

Survey in Lake Victoria

- A ground survey conducted in September 2000 revealed reduction in coverage of 70% and only localized water hyacinth infestation mainly in Mwanza gulf, Emin Pasha and some areas in Musoma.
- Ecological succession became evident in water hyacinth managed sites where by sedges invaded water hyacinth.
- Both *Neochetina eichhorniae* and *N. bruchi* have established very well in the lake Victoria. Weevil population averaged 8 per plant with feeding scars per plant of 17.9 on average.

Fig.1 Distribution of water hyacinth infestation by Sept.2000



- The total water hyacinth currently in lake Victoria is estimated at 440 ha. Of these, 53 ha (12%) are attributed to re-growth (resurgence) and the remaining 387 ha (88%) are the resident plants most of them found growing in association with other aquatic weeds.

- Weevil impact data from stabilized mats have revealed reduction in weed population from 45 to only 7 plants per 0.25 m^2. Indeed in the lake Victoria survey showed plant population of only 8.9/0.25 m^2 on average

Survey of rivers

- The contribution of rivers Kagera and Mara to the water hyacinth infestation in Lake Victoria is enormous.
- A survey of river Kagera revealed that the impact of the weevils was insignificant
- Weevil feed marks averaged only 0.56 per plant
- Approximately 0.2-0.8 ha of water hyacinth are carried down the river Kagera daily.
- About 89% of the river is infested with water hyacinth that are rooted on the riverbank healthy enough to produce a huge reservoir of seeds.
- Water hyacinth is also found in river Mara and a total of 22.055 adult weevils have been released in it and have established very well

Survey of satellite lakes and ponds

- Surveys have been carried out of satellite lakes and ponds in the lake basin and already weevils have been released in the water hyacinth infested ponds

Aerial survey

- Identified infestation hot spots similar to those reported during the ground survey. They included Mwanza gulf, Emin Pasha, Mara and Rubafu bays.

Socio-economic impact assessment

- A socio-economic impact of water hyacinth infestation and the control methods has been done in lake Victoria and the rivers Sigi and Pangani in Tanga region. The information's that has been collected will be useful in the daily management of water hyacinth and future planning of the project. Data analysis is in progress.

Research

- The component has conducted research on the effect of weevils on the water hyacinth. It has been found that the weevils reduce weed population and root length.
- Results of the research have been presented in various scientific forums

National and Regional Water Hyacinth Surveillance System

- Considering the importance of water hyacinth monitoring in the lake Victoria basin, a Water Hyacinth Surveillance system has been developed at National and Regional level
- The system is aimed at providing timely information regarding the location, relative size and rate of changes of water hyacinth mats along the shoreline.

Capacity building

- Since the beginning of the project, a series of training in form of long term, short courses, study visits, workshops and seminars have been conducted to the core staff and the communities.

Public awareness and dissemination

- ⇨ 10 radio programmes produced and broadcasted
- ⇨ 6 TV programmes produced and broadcasted
- ⇨ 2 posters (600 copies) on problems and control of water hyacinth produced and distributed to the public
- ⇨ 2000 water hyacinth caps distributed to the public
- ⇨ Awareness campaign workshop conducted, 400 people participated
- ⇨ 10 articles published in local newsletters

The Way Forward

Environmental aspects

- To continue with multiplication of weevils in rearing units for augmentation purpose
- To carry out regular monitoring of water hyacinth re-growth (resurgence) of hot spots
- Weevil release in identified resurgence sites and to ascertain other potential areas of infestation
- To continue with water hyacinth management in river Kagera using integrated approaches such as intensive weevil release in the river system especially in the upstream areas in Rwanda and Burundi, training of communities, soil and conservation measures and construction of weevil rearing units
- To continue with water hyacinth management in rivers Mara, Kanoni, and Kahororo.
- To monitor succession and its effect to the aquatic environment.
- Investigate/involve alternative control methods for water hyacinth and other aquatic weeds
- To implement surveillance activities both at National and Regional level such as training, data collection, reporting and dissemination.
- Implementation of National Water hyacinth Control Regulation at community level
- Training of local communities, NGOs, CBOs, Leaders, Staff on different aquatic weeds and their management strategies.

Socio-economic aspects

- To implement micro projects in Mwanza, Kagera and Mara on promotion of vegetable and fruit production and introduction of community based small-scale irrigation schemes for women particularly along the lake shoreline
- Construction of cattle dips that will be under the management of elderly people (50 years and above)
- Training of local communities on small scale project management book keeping, public health, environmental sanitation, HIV/AIDS and child care

Research

To carry out research on;

- Water Nutrients in relation to water hyacinth and weevils performance
- Socio-economic impact of water hyacinth and its control measures
- Behaviour of weevils
- Influence of siltation on weevil establishment and performance in rivers Kagera and Mara
- Assessment and management of water hyacinth in satellite lakes and ponds
- Ecology of water hyacinth and other aquatic weeds
- To evaluate the interaction of water hyacinth with other aquatic weeds in the Lake Victoria and its satellite lakes
- Effect of water hyacinth weevils on the rate of water hyacinth coverage in the water bodies of Tanzania

- To investigate on the influence of weevils' age on their effectiveness to suppress water hyacinth
- To assess the effect of water hyacinth growing in rice fields on the growth establishment and yield of rice

7.0 CATCHMENT AFFORESTATION
(presented by Ngatara Kimaro)

Component Long Term Vision:
'Conserved forest/tree cover for sustained environmental and socio -economic benefits in the Lake Victoria ecosystem"

Objectives:

- Improve Management of Existing Forest Reserves.
- Create New Forest Reserves.
- Raise peoples' awareness to promote forest conservation and tree planting.
- Strengthen institutional capacities for effective forestry Extension Services.

Expected Outputs:

- Public awareness in managing natural forests promoted
- Extensive afforestation through establishment of nurseries and tree planting enhanced
- Capacity building improved
- Guidelines and regulations for managing natural forests developed
- Bush burning controlled

Achievements

Creation of New Forest Reserves

- Assessment of unprotected natural forests conducted along Mwanza Gulf and river Mara
- Dialogue meetings held with 64 villages, 29 in Mara 35 in Mwanza
- 36 potential areas for conservation identified.
- Five surveyed, their boundaries demarcated and their maps drawn.
- Simple Management plans prepared
- Legal procedures to establish Village Forest Reserves initiated.

Contents of the Management Plan

- Name of the forest,
- Location
- Forest coordinating committee
- Traditional guards
- By-laws
- Map of the forest
- Principal species found
- Type of destruction inside
- Sustainable use of the forest

Contents of the Prepared Management Plans :

- Free uses (Collection of dead wood, passing through the forest, drawing water from the forest, grazing inside)
- Uses requiring non-payable permission (Collecting stones for house construction, collecting traditional medicine, cutting grass for roofing).
- Uses that required permission with payment (Cutting of poles, logs and making charcoal).
- Totally prohibited uses (Setting fires, building inside, cultivating inside)
- Punishment to offenders (Fines against different offences)
- How to use revenue accrued from the forest
- How traditional guards should be motivated.

Long-Term Monitoring (Kigambabitare Forest)

- Location: Kwibuse and Kuruya villages in Tarime
- 60 Permanent Sample Plots (PSP) established
- 65 control PSPs established in un-conserved forest.
- Aim: To Assess woody-biomass, growth and biodiversity.

Baseline data

- Data on Forest regeneration, forest growth and Tree species diversity were found
- Forest inventory data will be collected at three years interval.
- 3 surface run-off plots wereinstalled in Kigambabitare and 3 control plots established in public land
- Aim: Assessing surface run off, Soil erosion, Suspended solids draining into the lake and rainfall.

Tree Nursery Establishment

- Promoted central-, commercial- and individual-nurseries.
- 9 Central, 5 commercial and 31 individual nurseries established.
- Have raised over 3 million seedlings. Majority of households in pilot villages had low-income, they couldn't afford buying enough seedlings.
- Raised seedlings were distributed free

Commercial nurseries

- Initiated in 1999 Under contract between nursery groups selected and accepted by village councils and LVEMP
- 5 groups formed (Kuruya, Kwibuse Bukabwa, Masurura and Ryamisanga)
- The village councils are Overseer of the groups.
- Members: Kwibuse (22) Masurura (10) Bukabwa (25) Ryamisanga (21) and Kuruya (20).
- Each group prepared a constitution,
- Agreement made:
- Project - Pay Tshs. 100 per seedling, provides nursery materials, equipment, transport and training
- The groups - contribute labour force, plough back part of income gained for subsequent seasons,

Seedlings produced under commercial Nurseries

- 1999/2000 - 231,000 seedlings
- 2000/2001 - 630,000 Seedlings
- Total - 861,000 Seedlings

- Amount of support is reduced with time and the groups encouraged to find their own market.

Nursery Cost assessment

- Aim: To find most viable option of tree-seedlings production.
- Individual nurseries cost Tshs 8.60/seedling
- Central nurseries Tshs 89.90/seedling
- Commercial nurseries Tshs 118.75 per seedling.
- This showed that individual nurseries were the most cost effective.
- However Central nurseries - proved strong in large-scale seedlings production & were the best for trying new species.
- Commercial nurseries were directly benefiting community-based groups income wise
- Individual nurseries were managed by family labour and had advantage of knowledge transmission from parents to children.

Tree Planting

- Trees have been planted by contact farmers, NGOs, Community based organizations and Institutions in the districts of Tarime, Musoma, Bunda, Mwanza, Misungwi and Sengerema).
- A total of 2.3 million trees (1,370 Ha) have been planted in the pilot villages
- Average survival rate was 60%.
- Seedlings planted outside the pilot areas could not be followed up.
- Most of the planted trees have not reached usable size.
- Communities are still depending on natural forests for wood products.
- The fast growing species like Eucalypts and Acrocarpus are expected to be ready for fuel wood in 2003/2004 (after 4-5 Years) and poles in 2005/2006 (after ≥7 years)

Strengthening Forest Extension Services

- Two study tours have been conducted. One involving 9 foresters and 13 farmers from Mwanza and Mara regions. Visited Mgori forest in Singida, Duru-Haitemba and Ufyome forests in Babati and Mpanga forest in Tanga to learn experiences on community involvement in forest conservation.
- Experiences learned helped to refine the management plans of conserved village forests
- Another Study tour involved 3 foresters who went to Uganda to learn experiences on monitoring surface run off and soil erosion done by Land use Component.
- From what was learned the component has managed to establish six run off plots in Kuruya – Kwibuse integrated management pilot area.
- Two MScs on Conservation and Natural Resource Management at Sokoine University & 11 short courses of which 9 were basic computer courses were conducted

Linkages

- Institutional linkages and co-ordination has been established with Institute of Resource Assessment (IRA) of UDSM on data analysis from Permanent Sample Plots, with TAFORI for tree species identification and National Tree Seed Programme for obtaining quality seeds.

Raising Awareness

- Inception workshop (Awareness raising workshop was conducted to district leaders, technicians and politicians of 15 districts in which LVEMP is operating).

- This was done in collaboration with the other LVEMP components to make the stakeholders aware of the project and therefore become custodians of the project during implementation

Field Training

83 farmers have been trained on nursery establishment techniques in Tarime district (Kwibuse and Kuruya villages) and in Musoma rural District (Masurura, Bukabwa and Ryamisanga villages)

Nursery manual

The component has prepared a manual showing different steps involved in nursery establishment and tree growing. The manual is used to train stakeholders on nursery establishment and tree planting techniques

Newsletters & Brochures

- Newsletters have been produced and disseminated by the Secretariat in collaboration with components
- Brochures showing project activities have been produced and disseminated by the Secretariat in collaboration with components

Contribution to Major National Policies

Poverty alleviation and Economic Growth:

- Under Commercial nursery establishment of tree nurseries is taken as income generating micro project.
- Under this system Masurura group has managed to buy a milling machine, Kuruya group a water pump and established vegetable gardens.
- In Kwibuse they have started petit business of shops and restaurants.
- Almost all members from each group have started building improved houses.
- This strategy is used to trickle down resources to benefit target groups

Environment

- The major activities of the component, include forest conservation and tree planting. These are geared towards environmental protection. Conservation of village forests has reduced the number of annual fires inside Kigambabitare Village forest from six when we started to nil at present.

Gender

- In formation of commercial nursery group members the general criteria used in selecting, is to have a mixture of men and women and to ensure women are part of leadership.
- Kwibuse, Kuruya and Ryamisanga commercial nursery groups have slightly more women than men.
- The first chairperson of Kwibuse group was a woman.

Community Involvement:

- Communities do most of the activities of the Component. The Component plays a facilitating role by providing technical support, working facilities and funding.
- When Village forest reserves were surveyed elderly villagers were involved in tree species identification and youngsters cleared the way and dug directional trenches for boundary demarcation
- Village youths are involved in data collection from surface run off plots.

Technical and Scientific Reports

- Cost Effective Nursery Establishment - A Comparative Analysis Of Central-, Commercial- and Individual-Nurseries in LVEMP
- An Assessment of standing volume, stocking density and biodiversity of tree species in Community Managed Kigambabitare Forest

- Nursery Establishment and Tree planting Manual

Way Forward

General Observations

- The problem of deforestation in the eastern side of lake Victoria is very critical. Most of the hills and cultivated areas are bare.
- Much of lake Victoria Pollutants are from outside the lake. Seriousness to save the lake needs more weight been put in the lake Catchment.
- In the first phase, most of the Catchment Afforestation management issues were thought nationally. There is a need of thinking more regionally. To Have more harmonisation of activities
- There was a wrong perception of Linkages with NGOs. Some NGOs thought linkage is LVEMP giving money to them, i.e. LVEMP was another small donor. When they realized that LVEMP was not funding they shied away. Realistic linkages have to be thought of in follow on phase
- The project has planted 2.3 million trees. This is equivalent to 1370 hectares i.e 1680 trees per Ha. These efforts are very little compared to the size of the problem.
- There is a need of intensive afforestation and conservation of natural forests will be promoted in 15 districts surrounding lake Victoria, starting with areas with high deforestation rate and those prone to soil erosion through people's invo lvement.

The major activities will include:

- Forest conservation by communities
- Nursery operations
- Tree planting
- Capacity building
- Regional harmonisation of activities
- Collection of data for impact assessment.

Socio-economic Specific Areas

⇨ Afforestation in form of agroforestry will be integrated with agricultural crops to diversify farmland products.

Provision of Health Services

⇨ The trees planted will also involve medicinal plants as a way of promoting health services

Promotion of Employment & Income

⇨ The component will continue promoting commercial nurseries whereby the income gained will be diversified to other income generating micro projects.

Special Concern for Women and the Elderly

- The component will organise women groups to construct and sell improved stoves as a way of conserving forests and generation of income.
- Elderly people will be facilitated to carry out beekeeping activities inside protected village forests to produce honey that can be sold to ain income for their livelihood.

Awareness Raising & Capacity Building

- The component will continue to raise people's awareness in conserving forests and planting trees
- The component will strengthen short and long-term training, study tours and workshops to build capacity of staff in pursuing different forestry activities.

Environment

- Forests contribute highly in cleaning the lake water through infiltration processes that results to formation of streams and rivers that enter the lake. These highly reduce the pollutants that enter the lake and therefore improve production of lake water resources. This operation will be expanded
- Joint Forest Management will also be promoted in a few selected government forest reserves in the most deforested areas.

Research

- The component will continue with already started data collection activity in Permanent Sample Plots and Surface Run Off Structures to monitor the level of success and impact of conservation to the improvement of water quality of lake Victoria.
- More plots will be established in newly conserved potential forests.

8.0 ACHIEVEMENTS OF MICROPROJECTS UNDER LVEMP

(presented by S.B. MBWANA)

Objectives of micro-projects

To improve the standard of living of the local communities through environmentally sound self-help projects. The purpose being to ensure the full participation of the local communities in the lake basin in all LVEMP activities.

Component long term vision

To promote participatory and collaborative planning and implementation of small scale investments through community partnership with District Councils, line agencies, NGOs and the private sector to improve the management of resources in the lake and its catchment.

Study Area

Table 6: Twelve administrative districts bordering Lake Victoria.

Mwanza	Kagera	Mara
Misungwi	Bukoba	Musoma
Mwanza	Biharamulo	Bunda
Magu	Muleba	Tarime
Ukerewe		
Geita		
Sengerema		

Expected Outputs

- Component operational manual produced
- A swahili edition of procurement and financial accounting manual produced
- Basic wide implementation mechanism created
- Training of District coordinators and Chairpersons on the application of the manual carried out.
- Educational facilities improved
- Health facilities provided to fishing communities
- Fish handling facilities improved
- Defforestation abated

Achievements

- Operational manual was prepared and is now in use
- Procurement and financial accounting manual is in place
- Basin wide implementation mechanism has been established
- Training on the application of the manual was carried out
- Based on the above, a total of 65 micro projects have been initiated out of which 39 have been completed.

Table 7: Regional Distribution of Community Projects

Region	Health	Water & Sanitation	Education	Access Road	Fishing	Tree planting	Total
Mwanza	8	5	5	1	3	-	22
Kagera	3	-	10	2	2	-	17
Mara	2	4	6	-	2	6	20

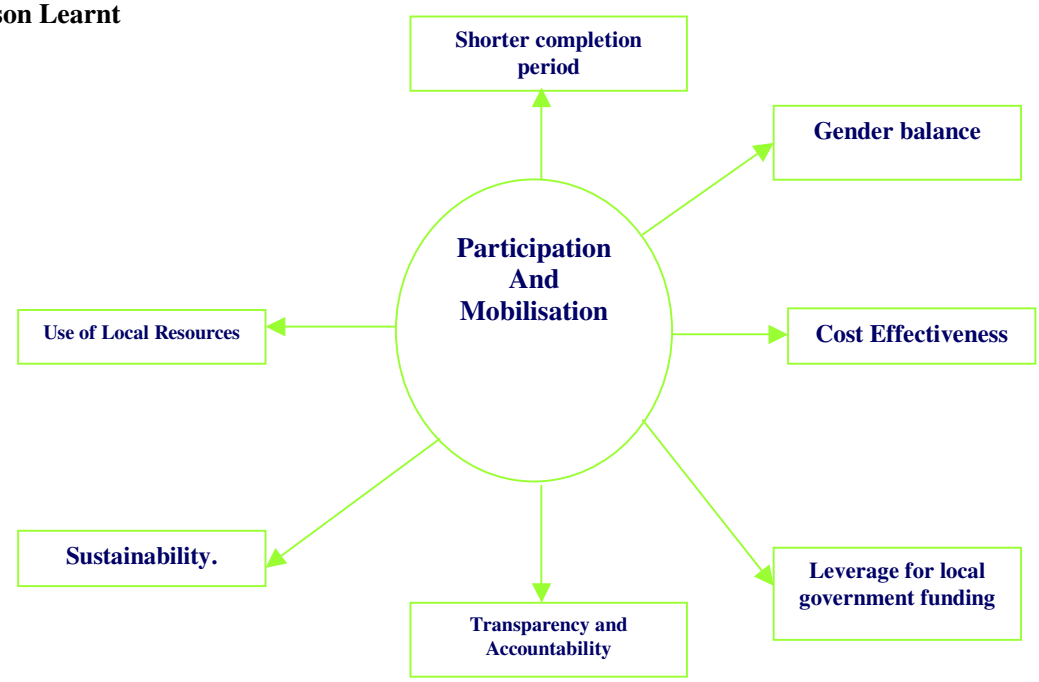
Table 8: Comparative Costs

District	Project	Actual costs (Tshs 000)	Valuation cost by District works engineer (Tshs 000)
Bukoba	Kishanje dispensary	12,000	19,800
	Kahororo Dispensary – 9 rooms and toilet	10,000	13,700
	Mafumba Primary School (2 classrooms)	9,000	11,800
	Buyekela Primary School (5 classrooms & 1 office)	8,000	12,000
	Kemondo Primary School (5 classrooms & 1 library)	12,000	29,100
Musoma	Majita Dispensary (11 rooms)	13,000	24,621
	Suguti Primary School (5 classrooms & 1 office)	11,500	28,000
	4 Fero cement tanks 23m^3 capacity each at Bweri ward	8,000	10,500

Distribution of the Component to Major National Policies

- Environment
- Poverty
- Gender
- Local Government Reform

Lesson Learnt



Problems

- Frequent transfer of DCs and Coordinators
- Delays in accounting for funds
- Urban and peri-urban communities

Difficult

- Politics

Pending Activities

- Impact assessment of micro-project
- Completion of ongoing and recently approved project for Misungwi, Sengerema and Tarime
- Basin wide tour for District Commissioners, Coordinators and village implementation committees

Way Forward

- Extend micro-projects to cover economic areas
- Geographical extension
- Gradual transfer of the administration of micro-projects to districts

COMMUNITY PARTICIPATION

(presented by Mrs. A. Nanai)

Introduction

Community Participation caters across all project components of LVEMP. It is a strategy to ensure long-term ownership, efficiency and sustainability of Lake Victoria Environmental Management Project. Briefly, community participation is designed to enhance awareness and knowledge on sustainable management of Lake Victoria basin resources.

Long Term Vision

The long-term vision statement of community participation in LVEMP is:

"a responsible and inspired community with skills, interests, capacity and commitment towards judicious utilization of resources and sustainable management of the Lake Victoria basin ecosystem".

Objective

The objective of community participation is:"to develop a community that is knowledgeable, capable and committed to sustainably manage resources of Lake Victoria basin".

Expected Outputs

Community participation in the LVEMP is expected to involve communities in order to ensure:

•Mechanism for community participation established
•Project ownership by the communities
•Sustainability of activities initiated by the project
•There is provision for fiscal continuance
•Empowered communities

Achievement Made

- Communities have been involved through awareness creation meetings, workshops and seminars. Awareness seminars on LVEMP were conducted in twelve districts involving all government departments at district level, NGOs and religious leaders. Issues facing the lake and need to conserve lake resources, roles of the community in LVEMP implementation were discussed.
- Non Governmental Organizations (NGOs) and Community Based Organizations (CBOs) have participated in the project reviews and regional workshops.
- In the process of involving communities films were developed on: *Mradi wa hifadhi ya Mazingira ya Ziwa Victoria* (Lake Victoria Environmental Management Project); *Gugumaji* (Water hyacinth) and

Uvuvi bora (Improved Fishing). The produced films were shown to a total of 65 lakeshore villages in the 14 districts councils where the project is implemented.

- Awareness workshop on LVEMP was conducted at BOT Training Institute Conference hall on 10th January 2001 involving District Education, Cultural, and Community Development officers from the 14 project district councils to discuss awareness creation on Lake Victoria Environmental Management Project through Primary School Competitions. The criteria to select 5 primary schools from each district to participate in the competitions and the criteria to select winners were agreed upon.
- A total of 74 primary schools in the three riparian regions participated in awareness creation on LVEMP through competitions at district, region and zonal level in songs, poetry and poetry drama. Seven primary schools that won the competitions were awarded on condition that the money awarded should be used in implementing environmentally friendly projects. The proposed projects from the primary schools were funded and implementation is in progress.

In the process of creating awareness, a film and a choir cassette on "Mashindano ya Sanaa Shule za Msingi Kanda ya Ziwa Victoria" (Theatre Arts Competitions for Primary Schools in Lake Victoria Zone) were produced.

The LVEMP-Tanzania 2001 Scientific Conference was held between 6th-10th August, 2001. The objective of this conference was sharing of knowledge and experiences. A total of 33 scientific papers from project components were presented.

Through involvement of communities project components have been able to achieve the following:

Fisheries management

- 511 Beach Management Units (BMUs) formed.· 53 Fish Landing Sites identified for gaze ting. 400 fish farmers trained on fishponds construction.· 141 Closed Fishing Areas identified for gaze ting.· 40 Fish farmers trained on aquaculture practices.· 72 fishermen trained on improved fishing methods.· 600 fisher folks trained on fish quality and safety assurance standards.
- 79 people from 8 landing beaches out of 53 selected landing beaches have been trained on data collection on length and weight of *Oreochromis niloticus* (Sato) and *Lates niloticus* (Sangara).Communities provided vital information in a study on Fish Levy Trust which later became known as Lake Victoria Environment Fund (LVEF). LVEF is intended to carter for environmental protection in the lake basin.

Fisheries research

- 100 fish farmers in Mara Kagera and Mwanza were provided with fingerlings.
- 20 Conservation Management Units (CMUs) for satellite lakes have been formed.

Water quality and ecosystem management

- 300 shoreline settlements have been involved in inventory of water quality and sanitary around the lake.
- 12 institutions are involved in rain data collection for pollution loading monitoring.

Wetlands management

- 1000 farmers in Kwibuse are involved in the integrated wetland management covering Soil and Water Conservation, Catchment Afforestation and Water Quality and Ecosystem Management components.
- Villagers around Simiyu and Rubana wetlands have been involved in preparing the Wetland Management Plan.

Soil and water conservation

- 408 farmers are involved in integrated soil and water conservation in Simiyu catchment

Catchment afforestation

- 372 Ha and 626 Ha of natural forests are now owned by village communities in Sengerema and Tarime districts respectively. Management Plan for Kigambabitare natural forest reserve (Mara Region) prepared by communities. Thirteen farmers have attended training on community involvemnt in natural forest conservation.
- 350 contact farmers;14 primary schools; 3 church organizations; district councils of Musoma (R), Bunda, Mwanza, Misungwi and Sengerema are involved in tree planting activities. Communities in collaboration with the component staff have initiated tree planting.
- 5 CBOs (3 in Musoma rural and 2 in Tarime districts) are involved in seedling production.

Water hyacinth control

- 500 villagers have taken part in mass rearing and release of water hyacinth weevils around the lake.Communities, CBOs and NGOs have kept a total of 280 Landing beaches, 70 water points and recreational areas weed free by manually removing water hyacinth. Village communities manage 8 out of 11 water hyacinth weevil rearing centers.

Support to riparian university

The University of Dar-es-Salaam has strengthened its human resource capacity. The institution is in a good position to facilitate human resource development in Tanzania with regard to environmental issues.

Micro projects

- 14 District Steering Committees (DSC) have been established.
- Under the facilitation of DSCs, communities have been able to identify, plan and implement 39 completed micro-projects and 26 micro-projects are in progress.

Problems

Lack of staff (CPO) during the first three years of the project.

Contribution of Community Participation to Major National Policies.

Involvement of communities in the implementation of LVEMP has cultivated self- confidence and empowerment to communities in situation analysis, problem identification, problem prioritization, decision-making, planning, implementing, monitoring, and evaluation of their own development. This is in line with the Local Government Reform, Environment, Poverty alleviation, economic growth and gender policies of Tanzania.

List of Technical and Scientific Reports

1. Report on "**The Status of Communities' Participation in Implementing Lake Victoria Environmental Management Project: The Case of Tanzania**".
2. Proceedings of a Workshop on Awareness Creation on LVEMP through Primary School Competitions Held in Mwanza, 10th January, 2001.
3. Report on "**Awareness Creation on Lake Victoria Environmental Management Project Through Primary School Competitions**".

4. Paper on "**Community Participation and Sustainability of LVEMP Activities**" presented at the LVEMP-Tanzania 2001 Scientific Conference.
5. A paper on "**Community Participation**" which was prepared jointly by Community Participation Officers of Kenya, Uganda and Tanzania was presented in the 2nd Regional Workshop held in Uganda – Kampala from 6th – 10th November, 2000.
6. Report on "**The Level of Awareness and Perception on LVEMP in Kagera, Mara, Mwanza regions of Tanzania**".

Way Forward

- Create awareness on LVEMP to the communities at all levels.
- Strengthen information dissemination from research to communities and facilitate communities to plan and implement interventions to restore a healthy ecosystem of Lake Victoria basin.
- Impart Community Participation skills to all LVEMP staff, extension teams at district, ward, village levels and the communities.
- Capacity building at village community in planning and execution of community based projects.
- Define the role of Local Authorities, CBOs, NGOs and other stakeholders in implementation of LVEMP.
- Strengthen community monitoring and evaluation of LVEMP and recommend measures to enhance LVEMP implementation
- Provide districts with transport to facilitate movement to the project implementation areas

LVEMP's Project Coverage Area

District Councils	**Number of Divisions**	Number of Wards	**Number of Villages**
Bukoba (U)	1	3	8
Bukoba (R)	6	41	164
Muleba	5	31	116
Biharamulo	5	22	84
Geita	7	33	787
Sengerema	5	25	124
Misungwi	4	20	78
Mwanza City	2	20	17
Magu	6	27	1125
Ukerewe	4	24	84
Bunda	3	20	93
Musoma (R)	3	27	106
Musoma (U)	1	13	47
Tarime	8	40	153
TOTAL	**60**	**346**	**1976**

10.0 SUPPORT TO UNIVERSITY OF DAR-ES-SALAAM
(presented by Dr. J. Machiwa)

Component's long term vision

Self sustaining centre of excellence in teaching , research and outreach in aquatic sciences

Objectives

- Availling the Department with additional scientific equipment and repairing the existing equipment

- training of staff and assisting them with funds for attending national and regional workshops
- supplying chemicals and reagents
- assisting with road and water transport
- providing office equipment and computers
- providing books and journals

Expected outputs

- Strenghtened capacity of the Department
- Instilled continuity in the work of LVEMP
- Department enabled to run upgrading and refresher courses
- Staff assisted in solving local environmental problems in the lake basin through postgraduate research projects.
- LVEMP eased of the high investiment cost of training staff overseas by offering similar courses locally.

Achievements made during the project period

- Three PhD and one MSc candidates are in progress through the support to the component. These graduate students are involved in aspects of water quality, parasitology and fisheries biology research on Lake Victoria.
- Teaching and laboratory materials as well as the Department' s capacity to conduct field research have been improved.
- Road and water transport was provided, this enabled the Department to conduct field trips on land and in the water efficiently.
- The component also trained M.Sc. students from Fisheries Research component (TAFIRI). Equipment and facilities acquired through LVEMP support became very instrumental in the training of these M.Sc. students.
- The Kunduchi aquatic science laboratory was partly rehabilitated during phase 1 of the project.
- Because of these investments, the Department is well prepared to sustain the supply of technical and professional capacity that will be required during phase II of LVEMP

Way Forward
Training

- Continued building of the capacity of the Department in terms of long term training and supply of equipment
- Continued support to staff to attend workshops, refresher courses and short courses
- Facilitation of field trips

Research

- Baseline studies as well as multidisciplinary research for better management of the lake basin are still needed
- For efficient, cost effective and productive implementation of research and training activities, the University of Dar es Salaam should have a modern FIELD STATION in Mwanza.

11.0 WAY FORWARD FOR LVEMP

(presented by Christopher M. Nyirabu)

Introduction

- The LVEMP implementation started in July, 1997. It is now in its fifth and final year of operations.

- As we have heard from presentations that in these four or so years, a lot of work in the form of information/data collection, capacity building, strengthening and improving fisheries management and research, among others, have been done. This is because this First Phase was intended to provide the necessary information to improve management of the lake ecosystem.

- It was not expected that in these 5 years the LVEMP was going to save Lake Victoria from problems which took decades to become apparent. It will also take a long time to solve these problems.

The Need for LVEMP Phase II

In spite of the achievements explained by the various presenters, a lot still needs to be done to rehabilitate the lake. A lot of basic data still needs to be acquired on:

- The quantity and quality of the waters entering the lake from rivers and the atmosphere.
- Lake wide concentration of nutrients.
- Internal circulation of waters and the exchange of nutrients between different water layers and across the water.
- Factors limiting algal growth.
- Relative importance of different human activities causing these changes.
- The LVEMP in Tanzania, has invested heavily and strengthened the capacity of implementing institutions to implement and manage the lake and the basin's resources. These will be wasted unless they are put to use.
- Across all components there are activities which have not been completed. These need to be done.
- Some new investments will be needed to address problem areas identified such as pollution hot spots.

The Way Forward for LVEMP

- The major objectives of LVEMP Phase I was on the environmental concerns of Lake Victoria and its basin. It is intended that the strategic focus of LVEMP II should focus on both socio-economic, ecological as well as environmental concerns**.**
- The following are recommended regarding Phase Two of LVEMP:
  - Focus on socio-economic development. Investments in infrastructures, industries, tourism, agriculture etc. in order to generate employment, and income for the lake basin communities and other Tanzanians.
  - Focus on poverty eradication which is crucial to the sustainability of the Lake Victoria basin resources and environmental conservation.
  - Deal with the health and diseases (HIC/AIDS as well as waterborne and education).
  - Investment in fisheries research facilities, construction of barges and landing sites.
  - More awareness creation to the lake communities on the need to manage the lake properly as well as conserve the lake basin resources.

Sustainable Funding Mechanism

Phase Two needs a funding mechanism which will sustain environmental conservation as well as generate employment and income through private and public investment as well as through grants, since the lake is an international water body.

The following funding mechanism are therefore recommended:

- The establishment of a Trust Levy Fund for the development of the lake basin
- There has been a study on the establishment of this kind of fund. The Report is with the Ministry of Natural Resources and Tourism. If the fund is established, it will go a long way in improving fishing and other activities in the Lake Victoria Basin.
- Private investments in establishing industries and tourism to create employment and generate income to the communities within the Lake Victoria basin.

- Public investment in infrastructures such as feeder/access roads, hospitals, schools etc. not very attractive to private investment.

- It is also recommended that sectors like water, forestry, mining and agriculture should contribute to the fund.

- The Government should also get a Credit/loan to bridge the gap.

Implementation Mechanism

- It is not easy to recommend an implementation mechanism now. This will be determined after a study. However, it should involve more district and urban authorities where these activities are implemented.

    - There must also be coordinating institution to be determined after the study.

Expectations from Phase Two of LVEMP

The following are expected during Phase Two:

- Employment generated
- Income of the people improved
- Health and life of the people improved
- Poverty reduction
- Environment of the Lake Victoria Basin and the lake ecosystem well managed and sustained
- Revenue to the local and central governments increased.