

FISHCODE MANAGEMENT

LAKE TANGANYIKA
REGIONAL FISHERIES PROGRAMME (TREFIP)

ENVIRONMENTAL IMPACT ASSESSMENT
REPORT

PREPARED BY

J.E. REYNOLDS AND H. MOLSA



FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

ROME, SEPTEMBER 2000

Lake Tanganyika Regional Fisheries Programme (TREFIP)
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Prepared by:

J.Eric Reynolds
(Development Planner/Socio-Economist, FISHCODE/FAO),
&
Hannu Mölsä
(Deputy Scientific Co-ordinator, LTR)

African Development Bank,
Abidjan

Food and Agriculture Organization
of the United Nations, Rome

September 2000

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

ACKNOWLEDGEMENTS

The present report was drafted in accordance with AfDB Environmental Assessment Guidelines, on behalf of the AfDB and the four Lake Tanganyika littoral States of Burundi, the Democratic Republic of Congo (DRC), Tanzania, and Zambia. Responsibility for its preparation was assigned to the Fisheries Policy and Planning Service (FIPP) of FAO and the University of Kuopio (the Scientific Co-ordination Entity for the Lake Tanganyika Research Project). Funding for the preparation of the report was provided through the FAO FISHCODE Programme (GCP/INT/648/NOR -- Interregional Programme of Assistance to Developing Countries for the Implementation of the Code of Conduct for Responsible Fisheries), and the Government of Finland, through the University of Kuopio.

Lake Tanganyika Regional Fisheries Programme (TREFIP)
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

CONTENTS

| | |
|---|-------------|
| Acknowledgements | iii |
| Currency Equivalents..... | viii |
| Abbreviations | ix |
| Executive Summary | xi |
| 1. INTRODUCTION | 1 |
| 2. PROGRAMME DESCRIPTION | 3 |
| The Lake Tanganyika Research Project (LTR) | 4 |
| Regional Framework Fisheries Management Plan (FFMP) | 4 |
| Tanganyika Regional Fisheries Programme (TREFIP) | 6 |
| 3. THE EXISTING ENVIRONMENT..... | 9 |
| A. PHYSICAL ENVIRONMENT..... | 9 |
| Location and Extent | 9 |
| Geomorphological features..... | 9 |
| Climate and hydrophysics | 10 |
| Infrastructure and services..... | 12 |
| B. BIOLOGICAL ENVIRONMENT..... | 14 |
| The Lacustrine Ecosystem..... | 14 |
| Evolution of the fisheries..... | 18 |
| C. SOCIO-ECONOMIC ENVIRONMENT | 20 |
| Country Overviews | 21 |
| Burundi..... | 21 |
| Democratic Republic of Congo | 22 |
| Tanzania..... | 23 |
| Zambia | 24 |
| Fisheries and Fisherfolk | 24 |
| Distribution of settlements and fishing activities..... | 24 |
| Post-harvest sector | 26 |
| Fisheries, livelihood, gender, and empowerment..... | 26 |
| Increasing regional demand for fish..... | 28 |
| 4. PROGRAMME ALTERNATIVES..... | 37 |
| A. ‘NO PROGRAMME’ (‘DO NOTHING’) OPTION | 37 |
| B. ‘WITH PROGRAMME’ OPTION | 38 |
| 5. ENVIRONMENTAL IMPACTS..... | 39 |
| Output 1 Activities -- Implementation of co-management mechanisms | 39 |
| Output 2 Activities -- Improved Infrastructure and Services..... | 39 |

| | |
|---|-----------|
| Output 3 Activities -- Protection of stocks and biodiversity..... | 41 |
| Output 4 Activities -- Improved fisheries legal regimes and MCS capabilities..... | 42 |
| Output 5 Activities: More effective use of scientific advice for management..... | 43 |
| Output 6 Activities: Establishment of a regional fisheries management entity..... | 43 |
| A. ECOLOGY AND FISH..... | 44 |
| Impacts of Output 1 -- Implementation of co-management mechanisms..... | 44 |
| Impacts of Output 2 -- Improved infrastructure within pilot villages and strategic marketing centres..... | 45 |
| Impacts of Output 3 -- Protection of stocks and biodiversity..... | 46 |
| Impacts of Output 4 -- Improved fisheries legal regimes and MCS capabilities..... | 48 |
| Impacts of Output 5: More effective use of scientific advice for management..... | 48 |
| Impacts of Output 6: Establishment of a regional fisheries management entity..... | 48 |
| Key Issues and Conclusions..... | 49 |
| Beneficial impacts..... | 49 |
| Adverse impacts..... | 49 |
| B. FORESTRY AND LAND USE..... | 50 |
| Impacts of Output 1 -- Implementation of co-management mechanisms..... | 50 |
| Impacts of Output 2 -- Improved infrastructure within pilot villages and strategic marketing centres..... | 50 |
| Impacts of Output 3 -- Protection of stocks and biodiversity..... | 52 |
| Impacts of Output 4 Activities -- Improved fisheries legal regimes and MCS capabilities..... | 52 |
| Impacts of Output 5: More effective use of scientific advice for management..... | 53 |
| Key Issues and Conclusions..... | 53 |
| Beneficial impacts..... | 53 |
| Adverse impacts..... | 54 |
| C. HYDROLOGY, WATER QUALITY, AND SOILS..... | 54 |
| Key Issues and Conclusions..... | 54 |
| D. LANDSCAPE AND VISUAL IMPACTS..... | 55 |
| Impacts of Output 1 -- Implementation of co-management mechanisms..... | 55 |
| Impacts of Output 2 -- Improved infrastructure within pilot villages and strategic marketing centres..... | 55 |
| Impacts of Output 3 -- Protection of stocks and biodiversity..... | 55 |
| Impacts of Output 4 -- Improved fisheries legal regimes and MCS capabilities..... | 55 |
| Impacts of Output 5: More effective use of scientific advice for management..... | 56 |
| Impacts of Output 6: Establishment of a regional fisheries management entity..... | 56 |
| Key Issues and Conclusions..... | 56 |
| Beneficial impacts..... | 56 |
| Adverse impacts..... | 56 |
| E. COMMUNITIES..... | 56 |
| Impacts of Output 1 -- Implementation of co-management mechanisms..... | 56 |
| Impacts of Output 2 -- Improved infrastructure within pilot villages and strategic marketing centres..... | 57 |
| Impacts of Output 3 -- Protection of stocks and biodiversity..... | 59 |
| Impacts of Output 4 Activities -- Improved fisheries legal regimes and MCS capabilities..... | 60 |
| Impacts of Output 5: More effective use of scientific advice for management..... | 60 |
| Impacts of Output 6: Establishment of a regional fisheries management entity..... | 61 |
| Key Issues and Conclusions..... | 61 |
| Beneficial impacts..... | 61 |
| Adverse impacts..... | 62 |
| 6. MITIGATION MEASURES..... | 75 |
| A. IMPACT MITIGATION FOR OUTPUT 1: IMPLEMENTATION OF CO-MANAGEMENT MECHANISMS..... | 75 |
| B. IMPACT MITIGATION FOR OUTPUT 2: IMPROVED INFRASTRUCTURE AND SERVICES..... | 76 |
| C. IMPACT MITIGATION FOR OUTPUT 3: PROTECTION OF STOCKS AND BIODIVERSITY..... | 80 |

Lake Tanganyika Regional Fisheries Programme (TREFIP)
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

| | | |
|-----------------|---|-------------|
| D. | IMPACT MITIGATION FOR OUTPUT 4: IMPROVED FISHERIES LEGAL REGIMES AND MCS CAPABILITIES | 82 |
| E. | IMPACT MITIGATION FOR OUTPUT 5: MORE EFFECTIVE USE OF SCIENTIFIC ADVICE FOR MANAGEMENT | 82 |
| F. | IMPACT MITIGATION FOR OUTPUT 6: ESTABLISHMENT OF A REGIONAL FISHERIES MANAGEMENT ENTITY | 83 |
| 7. | MONITORING..... | 88 |
| A. | MONITORING THE PHYSICAL ENVIRONMENT | 88 |
| B. | MONITORING THE BIOLOGICAL ENVIRONMENT | 89 |
| C. | MONITORING THE SOCIO-ECONOMIC ENVIRONMENT | 89 |
| 8. | CONCLUSIONS AND RECOMMENDATIONS | 91 |
| | Economic diversification | 92 |
| | Community health..... | 93 |
| | Environmental education..... | 93 |
| | Socio-economic empowerment | 94 |
| ANNEX 1. | LAKEWIDE SUMMARY OF LTR 1997 SEC SURVEY FINDINGS | A/1 |
| ANNEX 2. | REFERENCES CITED/CONSULTED | A/17 |

CURRENCY EQUIVALENTS

All currencies are expressed in US \$; the equivalence in local currencies in mid-2000 was as follows:

| | | |
|-------------|-------|---------------------|
| \$ 1 U.S. = | 2,850 | Zambian Kwachas |
| | 791 | Tanzanian Shillings |
| | 823 | Francs Burundais |
| | 30 | Francs Congolais |

ABBREVIATIONS

| | |
|-----------------|---|
| AfDB | African Development Bank |
| AGFUND | Arab Gulf Programme for the United Nations Development Organization |
| APO | Associate Programme Officer |
| CCRF | Code of Conduct for Responsible Fisheries |
| CFMZ | Community Fisheries Management Zone |
| CIFA | Committee for Inland Fisheries of Africa |
| COFI | Committee on Fisheries |
| COMESA | Common Market for Eastern and Southern Africa |
| CPUE | Catch per unit Effort |
| CRH | Centre de Recherches en Hydrologie (DRC) |
| DEPP | Direction de l'Environnement, Pêche et Pisciculture (Burundi) |
| DOF | Department of Fisheries |
| DRC | Democratic Republic of Congo |
| EE | Environmental Education |
| EIA | Environmental Impact Assessment |
| EOP | End of Programme/Project |
| FAO | Food and Agriculture Organization of the United Nations |
| FFMP | (Lake Tanganyika Regional) Framework Fisheries Management Plan |
| FIP | Fisheries Policy and Planning Division/FAO |
| FIPP | Fisheries Planning Service/FAO |
| FS | Frame Survey |
| FINNIDA | Finnish International Development Agency |
| GDP | Gross Domestic Product |
| GEF | Global Environmental Facility |
| HIV/AIDS | Human Immuno-deficiency Virus/Acquired Immuno-deficiency Syndrome |
| IOP | Inception of Programme/Project |
| IUCN | International Conservation Union |
| LFC | Local Fisheries Council |
| LEGN | Development Law Service |
| LTBP | Lake Tanganyika Biodiversity Project |
| LTFMP | Lake Tanganyika Fisheries Monitoring Programme |
| LTR | Lake Tanganyika Research Project |
| MCS | Monitoring, Control and Surveillance |
| M&E | Monitoring and Evaluation |
| mt | metric tonne |
| NGO | Non Governmental Organisation |
| O&M | Operation and Maintenance |
| PA | Protected Area |
| PC | Programme Co-ordinator |
| PIU | Programme/Project Implementation Unit |
| SADC | Southern African Development Community |
| SAP | Strategic Action Plan |
| SEC | Socio Economic(s) |
| SENADEP | Service National pour le Développement des Pêches |
| SSP | Scientific Sampling Programme |

| | |
|---------------|--|
| TACARE | Lake Tanganyika Catchment Reforestation and Education Project (Jane Goodall Institute) |
| TAFIRI | Tanzanian Fisheries Research Institute |
| TCDC | Technical Co-operation Between Developing Countries |
| TCI | Investment Centre Division (FAO Technical Cooperation Department) |
| TREFIP | Tanganyika Regional Fisheries Programme |
| UNDP | United Nations Development Programme |
| UNICEF | United Nations Children's Fund |
| UNHCR | United Nations High Commission for Refugees |
| UNV | United Nations Volunteer |
| USAID | United States International Development Agency |
| WFP | World Food Programme |
| WWF | World Wildlife Fund |

EXECUTIVE SUMMARY

INTRODUCTION

- i) *The Tanganyika Regional Fisheries Programme (TREFIP) was prepared in mid-2000 by a joint African Development Bank (AfDB) and Food and Agriculture Organization feasibility study mission*
- ii) *As it was anticipated that the Programme could have both positive and negative environmental consequences, AfDB and FAO mission planners stipulated that an Environmental Impact Assessment (EIA) be carried out immediately after the Feasibility Study Mission had submitted its report.*
- iii) *The present report was drafted in accordance with AfDB Environmental Assessment Guidelines, on behalf of the AfDB and the four Lake Tanganyika littoral States of Burundi, the Democratic Republic of Congo (DRC), Tanzania, and Zambia. Responsibility for its preparation was assigned to the Fisheries Policy and Planning Service (FIPP) of FAO and the University of Kuopio (the Scientific Coordination Entity for the Lake Tanganyika Research Project).*

BACKGROUND

- iv) *Shared by the four countries of Burundi, the Democratic Republic of Congo, Tanzania, and Zambia, Lake Tanganyika covers an area of 32,900 km², has a maximum depth of 1,470m, and contains 18,880km³ of water. By water area, it is the largest of Africa's Great Rift Valley lakes, the second largest of all African lakes (after Lake Victoria), and the fifth largest of the world's lakes. By water volume, it is the second largest lake in the world (after Lake Baikal).*
- v) *Fishing in Lake Tanganyika has intensified considerably over the course of the 20th century in association with the dramatic expansion of human population and settlements around the lake and the introduction of various technological innovations, such as paraffin oil (kerosene) pressure lamps for night-fishing, synthetic netting material, and motorised craft.*
- vi) *Counting operators in both the harvest and post-harvest sectors (fishing unit owners and crew, processors, and traders) and service providers (input suppliers, transporters, boat builders, etc.), as well as their dependants, it is estimated that around one million people directly rely on the lake's fisheries for their livelihood.*
- vii) *Modern harvest operations primarily exploit six endemic non-cichlid pelagic species. These include the two schooling clupeid 'sardines' Limnothrissa miodon and Stolothrissa tanganyicae, together with their major predators, all centropomids of the genus Lates -- viz: L. stappersii, L. angustifrons, L. mariae, and L. microlepis.*
- viii) *Of the Lates species, the latter three have from the mid-1970s been incidental to the catch, reportedly as a result of heavy exploitation pressure. The lake's commercial fishery is now essentially based on the two clupeids (ca. 65% by weight) and L. stappersii (ca. 30% by weight).*

- ix) *Annual harvest levels in recent years have been estimated to vary in the range of 165,000 - 200,000 mt -- volumes that translate into annual earnings amounting to anywhere between 80 to 100 million US dollars.*
- x) *The lake hosts the second largest inland fishery in Africa (after Lake Victoria) and directly or indirectly provides income, food, drinking water, and a medium of transport and communication for an estimated 10 million inhabitants of its catchment area. Many more millions of people residing within the wider trading orbit of the Tanganyika basin are regular or occasional beneficiaries of its resources as consumers of fishery products.*
- xi) *The lake's role in supporting nutritional welfare is therefore critical in a region where fish are estimated to account for up to 40 percent of total protein supply, but where per caput fish supplies are steadily declining because of increasing human populations and continuing high pressure on capture fisheries resources.*
- xii) *Noted for its highly diverse community of fish and other aquatic fauna, outstanding scenery, and near-pristine waters, Lake Tanganyika is also of great significance in terms of conservation values and the potential it offers as an 'eco-tourism' destination.*
- xiii) *Amidst growing concerns over the environmental status, endangered biodiversity, and possible over-fishing of this unique lake, the FAO-executed Lake Tanganyika Research (LTR) Project (GCP/RAF/271/FIN) was established in 1992, with funding primarily from Finland.*
- xiv) *LTR's purpose was to investigate Tanganyika's biological production and fisheries potential, and to devise modalities for the optimal management, on a regional scale, of its fisheries resources to serve present and future human welfare and biological conservation needs.*
- xv) *The major components of the LTR research programme, conducted in full collaboration with the national fisheries authorities and institutes of the respective lacustrine states, included hydrodynamics, limnology, fish and zooplankton biology, remote sensing, fish genetics, fisheries statistics, legal-institutional studies, and socio-economics.*
- xvi) *Some aspects of LTR research were carried out in conjunction with the Lake Tanganyika Biodiversity Project (LTBP), which was established in 1995 as a five-year project with funding from the UNDP/Global Environmental Facility (GEF). LTBP was wound up in July 2000, with the completion of a Strategic Action Plan (SAP) for the Sustainable Management of Lake Tanganyika and a draft 'Convention on the Sustainable Management of Lake Tanganyika,' which now awaits ratification by the four lacustrine States.*
- xvii) *LTBP's remit was to address wider, basin-scale management problems of pollution control, conservation, and the maintenance of biodiversity, thus complementing LTR's more directly fisheries-related investigations.*
- xviii) *The LTR Fisheries Management Working Group, formed in late 1997, brought together a team of LTR advisors, project associates from the respective national counterpart agencies of the four lacustrine countries as well as the University of Kuopio in Finland, and FAO technical officers from the Fisheries Department (FI) and the Development Law Service (LEGN).*
- xix) *The group was established in order to facilitate the process of collating and assessing major results of six years of LTR research and, consistent with LTR objectives, to use the resulting synthesis as a comprehensive set of reference points for developing a regional, lake-wide approach to the optimal management of Tanganyika's fishery resources.*

xx) A draft Framework Fisheries Management Plan (FFMP) for Lake Tanganyika, based on principles laid out in the **FAO Code of Conduct for Responsible Fisheries (CCRF)**, was developed by the group in 1998 for consideration by the fisheries authorities of the respective lacustrine States. A series of 'Community Referenda' meetings was also convened around the shoreline in order to obtain comment and inputs from local fisheries stakeholders.

xxi) Additional actions undertaken by LTR during late 1998 and early 1999, with the assistance of the **FAO FISHCODE Programme (GCP/INT/648/NOR -- Interregional Programme of Assistance to Developing Countries for the Implementation of the Code of Conduct for Responsible Fisheries)**, included further assessment of legal and institutional provisions necessary to facilitate regional management planning and co-ordination. In addition, a detailed workplan for extension of LTR's monitoring activities as a programme to be implemented in future under national execution was prepared.

xxii) Results of the Monitoring Programme planning work, the legal-institutional appraisals, and the Community Referenda exercise were taken in account as the FFMP was finalised during technical consultations at **FAO headquarters in Rome** in late March 1999.

xxiii) The updated FFMP and associated reports were presented for deliberation to the **Eighth Session of the CIFA Sub-Committee for Lake Tanganyika** held 18-21 May 1999 in Lusaka, and were adopted as presented.

xxiv) The Sub-Committee further requested **FAO** and the LTR team to continue elaborating ideas for an FFMP Implementation Programme and to explore modalities for its execution with the **African Development Bank (AfDB)**.

xxv) The **AfDB/FAO/FISHCODE Mission to Lake Tanganyika** was subsequently formed and assigned to evaluate earlier proposals drafted under the **FAO/LTR Project** and **FAO/FISHCODE**, and accordingly to develop a comprehensive implementation scheme for the FFMP.

xxvi) The Mission was instructed to evaluate **LTR/FISHCODE Implementation Programme proposals in situ** and elaborate: a) one national project for each participating lacustrine State; and b) one overall project to handle management and co-ordination of all FFMP Implementation Programme activities on a regional level. The Mission was further instructed to pay special attention to:

- the needs for viable alternative technology and approaches to help ameliorate effects of localised over-fishing and the use of destructive fishing techniques, and post-harvest losses associated with poor infrastructure and lack of marketing opportunities;
- the importance of adhering to the participatory management approach and other principles of the **Code of Conduct for Responsible Fisheries**, and the need for complementary environmental education and community outreach activities; and
- the particular circumstances, problems, and prospects that exist within each of the national fisheries.

THE PROGRAMME

xxvii) **TREFIP** is designed for implementation during a five-year period running from 2002 through 2006.

xxviii) In accordance with the **CCRF** principles upon which the FFMP is based, **TREFIP** has strong participatory, developmental, and environmental orientations. Major emphasis is

directed towards building partnerships with local fishing community residents in order first to improve performance and management conditions directly within the fishery industry itself, and secondly, on the village level, to improve facilities and amenities that are generally lacking or insufficient.

xxix) *The overall objective of TREFIP is to put the FFMP into full operation. Towards this end, six closely inter-linked principal outputs are anticipated.*

xxx) **Output 1, implementation of co-management mechanisms**, involves the establishment of pilot Community Fisheries Management Zones (CFMZs) and Local Fisheries Councils (LFCs) through collaboration with NGO agencies involved with village-level outreach programmes related to conservation, agriculture, and community welfare.

xxxii) *These new modalities of stakeholder participation will operate in conjunction with new forms of license and fish levy revenue allocation to both local groups and official fisheries agencies, and in combination with the establishment of micro-credit schemes, to mobilise and disburse locally needed development and operational funds.*

xxxiii) *They will also provide a basis for adapting and putting into effect appropriate measures to control fishing mortality and access to the resource base, and to ensure compliance with these measures.*

xxxiiii) **Output 2, creation of improved infrastructure and services**, involves actions both at the pilot village level to improve fish processing and handling as well as social amenities (schools, health services, water supplies, etc.), and at the level of strategic marketing channels to establish or rehabilitate roads, jetties, public markets, fresh fish collection and handling capabilities, and electricity supplies.

xxxv) *Work will also be carried out in association with this output to construct or upgrade physical plant and technical support facilities at the TREFIP national sub-offices and regional headquarters as necessary to operate the Programme.*

xxxvi) **Output 3, protection of stocks and biodiversity**, involves actions to strengthen and expand fisheries monitoring systems, establish a series of lacustrine protected areas ('no take' reserves), and develop a programme of environmental education in collaboration with local resource users and national fisheries researchers and managers.

xxxvii) **Output 4, improved fisheries legal regimes and monitoring, control, and surveillance capabilities**, involves work to facilitate harmonisation of fisheries legislative frameworks and elaboration of regulatory measures specific to Lake Tanganyika, including provision for new property rights regimes that would allocate control of access to the community level and for enforcement and compliance assurance mechanisms under local responsibility.

xxxviii) **Output 5, more effective use of scientific advice for management**, entails actions to revise and expand existing monitoring activities initiated under LTR, strengthen statistical capabilities within national fisheries agencies, and consolidate regional co-operation in statistical information system management.

xxxix) **Output 6, establishment of a regional fisheries management entity**, will yield a permanent '**Lake Tanganyika Regional Fisheries Council**,' whose secretariat/executive offices, the Lake Tanganyika Fisheries Centre, will be situated at the former headquarters office of the LTR Project in Bujumbura.

xl) *The Regional Council will eventually serve as the successor agency to the CIFA Sub-Committee, as envisaged in the Sub-Committee's Terms of Reference, and would in future co-*

ordinate with the Lake Tanganyika Authority, if and when the latter is established under terms of the yet-to-be ratified the Convention drafted under the auspices of LTBP/GEF.

xl) TREFIP is proposed as a set of four country components and a regional level component that together will involve 200 local communities representing around 20,000 fisherfolk families or around 140,000 - 150, 000 people.

xli) Total Programme costs are estimated at \$42.2 million, including provisions for physical contingencies (10%) and an inflation factor for both foreign and local currencies (2.5% and 5% respectively). Additional costs of some \$350,000 are estimated for the operation of a six-month Preparatory Phase.

xlii) TREFIP would be funded primarily through loans to the four states, financed by the AfDB, and by grants for technical assistance from the AfDB, GEF, and other interested agencies.

xliii) The TREFIP regional component will be based in Bujumbura. Lakeside TREFIP sub-offices within the four countries will be located on the premises of fisheries research institutes and Department of Fisheries stations in Bujumbura (Burundi), Uvira (Democratic Republic of Congo), Kigoma (Tanzania), and Mpulungu (Zambia).

xliv) A regional Programme Implementation Unit (PIU) will be headed by a Co-ordinator responsible for overall operations. The Co-ordinator will be assisted by a Socio-economist, a Civil Engineer, a Fishing Technologist, and a Post-harvest Technologist, and by specialist consultants in fisheries legislation, biodiversity, conservation and ecotourism, statistics, community health, and other technical fields.

xlvi) A provision of 70 person months of consultant services is made in the Programme budget.

xlvi) Local staff will consist of one Programme Assistant recruited from the region, an M&E specialist, a civil engineer, a fisheries technologist, a marketing specialist, and national consultants in other technical fields.

xlvii) A national Deputy Programme Director will head each sub-office, with the assistance of a team of national staff and international associates recruited through the TCDC, UNV, or APO programmes (2 each for DRC, Tanzania, Zambia, and one for Burundi).

xlviii) Co-ordination between the PIU and the sub offices will be maintained through electronic communication, field visits, reporting routines, and annual meetings of Lake Tanganyika National and Regional Fisheries Councils.

xlix) Involvement of local NGOs will be crucial to Programme activities aimed at establishing Community Fisheries Management Zones and Local Fisheries Councils. Contracting NGOs will in particular be responsible for operation of a TREFIP Micro-Credit Scheme within selected villages, and for community outreach and environmental education activities.

l) The TREFIP Feasibility Study Mission recommends that a six-month Preparatory Phase be set up prior to the commencement of full Programme operations, in order to ensure that the legal framework for fisheries co-management arrangements within the four States has been laid, and also to prepare detailed workplans and budgets, recruit local staff and NGO partners, and organise Programme logistics.

RESULTS OF THE EIA

li) In preparing this report, the EIA Team considered two basic futures for Lake Tanganyika. These were a 'No Programme' or 'Do Nothing' scenario, and a 'With Programme' scenario. In accordance with AfDB guidelines, expected environmental impacts associated with proposed interventions under the latter option were then reviewed, and mitigation measures for expected direct and indirect adverse effects identified

'No Programme' Scenario

lii) In the absence of TREFIP, a wide array of adverse trends are likely to ensue. These include the following.

- Growing exploitation rate on pelagic fish stocks due to increased demand for fish and limited control measures;
- Increased risk of destroying sparse populations of *L. mariae*, *L. microlepis*, and *L. angustifrons*;
- Growth and recruitment overfishing of *L. stappersii* and *S. tanganyicae* due to industrial and advanced artisanal operations;
- Heavy damage inflicted on littoral-borne life stages of pelagic species due to uncontrolled beach seining and use of other destructive gear;
- Reduced unit catch and economic return;
- Loss of fish quality and quantity through the post-harvest handling stages (processing, transport, and marketing), including increased risk of disease due to poor hygiene and insufficient facilities; and
- Weakened nutritional and health status amongst children and urban fish consumers.

liii) The 'Do Nothing' option is clearly not advisable given the heavy environmental and socio-economic costs it would entail, and the EIA Team sees no justification for it whatsoever.

'With Programme' Scenario

liv) The Team regards the Programme as essential to the future health and well being of the lacustrine ecosystem and the human populations of some one million lakeshore dwellers and ten million Tanganyika basin inhabitants who depend directly and indirectly on its resources. Programme implementation is therefore strongly recommended. However, evaluation of component activities makes it clear that measures will be required to ameliorate various environmental risks with respect to lacustrine ecology and fish stocks, forestry and land use, hydrology, water quality, and soils, landscape and visual features, and communities.

Main Beneficial Environmental Impacts

Ecology and fish

lv) Substantial positive impacts may be realised through the LFMZ and LFC arrangements. Such partnership arrangements are a necessary condition for the long-term sustainability of the Lake Tanganyika fisheries.

lvi) Component activities in the area of micro-credit and introduction of appropriate gear should help to counter trends of over-exploitation and the use of destructive fishing practices (beach seining).

lvii) Improved product shelf life resulting from upgraded artisanal post-harvest practices would increase fish supplies without concomitant increases in fishing effort.

lviii) *Establishment of PAs will likely contribute towards sustained biodiversity especially amongst littoral dwelling cichlids, and, though the effects will be difficult to measure, a reduction of fishing pressure on juvenile L. miodon stocks.*

lix) *Protection of sustainability within the inshore fisheries has direct consequences for the pelagic sector; depletion of the former could lead to a transfer of fishing effort to the latter, which is already subject to over-exploitation risks.*

lx) *Furthermore, PAs may encourage the growth of ecotourism and thus economic diversification within the Tanganyika basin. This is another benefit for fisheries sustainability.*

lxi) *EE outreach activities developed in partnership with local stakeholders are essential building blocks for responsible fisheries and the protection of lacustrine ecosystem integrity.*

lxii) *Likewise, TREFIP outputs that would provide improved and harmonised regional fisheries legal regimes and MCS capabilities, more effective use of scientific advice for management, and a Tanganyika Fisheries Centre and secretariat for a Regional Fisheries Council are deemed inherently beneficial. All contribute essential tools for realising lacustrine ecosystem and fisheries sustainability in the long-term.*

Forestry and land use

lxiii) *Establishment of the LFMZ and LFC arrangements would have secondary positive effects for forestry and land use practices since they would serve as mechanisms for focusing community attention towards problems of environmental sustainability.*

lxiv) *More direct benefits would be forthcoming from improved fish processing operations encouraged by the micro-credit scheme and provision of technical support. Reduced demand for fuelwood supplies would result from declining reliance on smoke curing of fish.*

lxv) *Improved roads, jetty construction, provision of electricity supplies, and more efficient fresh fish collection, handling, and marketing networks would all yield potentially favourable impacts in terms of reduced pressure on forest resources for the supply of wood to fuel fish smoking operations.*

lxvi) *PAs could encourage the growth of ecotourism and thus economic diversification within the Tanganyika basin, possibly leading to reduction in activities like woodcutting, charcoal burning, and brick production that exploit large quantities of forest and land resources.*

lxvii) *Greater awareness of environmental problems and ecosystem-based management approaches, nurtured through educational partnerships between local community residents and TREFIP government and NGO agency associates, would potentially have far-reaching positive effects in promoting sustainable forestry and land use practices.*

lxviii) *Improved fisheries legal regimes and MCS capabilities, an expanded LTFMP, and a Tanganyika Fisheries Centre and Regional Fisheries Council would all be complementary to planning and management efforts in support of sustainable resource use within the wider Tanganyika basin environment.*

Hydrology, water quality, and soils

lxix) Land-based Programme activities related to upgrading of post-harvest operations and improved infrastructure within pilot villages are expected to have indirect positive effects through altered patterns of land use and raised awareness for environmental problems and their remedies. In particular, they should help to reduce the loss of trees and other protective vegetation, which in consequence will reduce water run-off, soil erosion, and sedimentation of adjacent rivers, streams, and the littoral zone.

Landscape and visual features

lxx) Activity components of Output 3, fisheries monitoring, establishment of PAs, and EE, are likely to generate strong positive landscape and visual impact effects. Community awareness for and commitment to the value of preserving natural landscapes will be an especially useful contribution from EE activities.

Communities

lxxi) Participation in the pilot CFMZ/LFC programme will foster a strong sense of solidarity and civic purpose amongst those who elect to participate. Such qualities would be conducive to the development of community self-help initiatives in areas beyond the affairs of fishing.

lxxii) Operation of the LFC Micro-credit Scheme will enable local fisherfolk to upgrade or modify their productive equipment and techniques in ways that will foster fisheries sustainability, and may result in higher market values for fresh and processed fish as well.

lxxiii) Activities directed towards improving local post-harvest practices would benefit fish processors and traders by extending product shelf life. Wholesale and retail product prices are also likely to improve. Fish consumers will benefit from availability of cleaner and healthier dried clupeid products, and from a greater supply of fish because of reduced wastage.

lxxiv) Construction or rehabilitation of social facilities and services in pilot villages will yield substantial benefits in the form of better educational opportunities, and reduced rates of illness and mortality because of better preventive, reproductive, and clinical health care, sanitation practices, and access to safe drinking water.

lxxv) Construction or rehabilitation of roads, jetties, central market facilities, and electricity supplies will all generate short-term income benefits to project communities to the extent that Programme contractors employ local labour.

lxxvi) Possible benefits from improved marketing systems include increased incomes for local fisherfolk and the availability of greater quantities of fresh fish to national populations.

lxxvii) Development of ecotourism in association with lacustrine PAs would stimulate much-needed economic diversification along the Tanganyika shoreline, creating jobs and raising income for adjacent communities.

lxxviii) Environmental education will build local awareness of the problems brought on by over-population and over-exploitation of the natural environment, and possibilities for their amelioration through reproductive health and ecosystem-based management measures.

lxxix) Activities aimed at the improvement of regional fisheries legal regimes, use of scientific advice for management, and lakewide management co-ordination through creation of a permanent regional fisheries entity are inherently beneficial. They would all establish

instruments through which community interests can be represented, understood, and meaningfully incorporated within a responsible fisheries management process.

Main Adverse Environmental Impacts

Ecology and fish

lxxx) Road rehabilitation, jetty construction, and activities aimed at improving fresh fish collection, handling, and marketing facilities and practices each carry the risk of indirectly promoting unsustainable increases in fishing and fish trading activities. The advantages they confer might attract new 'economic migrant' entrants to the fishery sector. Established operators would clearly find it more convenient to evacuate fish and fish products. End results might thus include increases in harvest activities, demand for raw product, and/or the frequency of marketing trips.

Forestry and land use

lxxxi) Road rehabilitation, jetty construction, electrification, and improved trade in fresh fish, carry possible adverse effects for forest and land resources within and around target communities. These include increased commercial activity, influxes of immigrants in search of employment opportunities, and the opening of easier marketing routes for timber and other natural resources. Such developments would be associated with further clearing of indigenous forest and bush areas for timber and fuelwood supplies, further agriculture encroachment, and further erosion and land degradation.

Hydrology, water quality, and soils

lxxxii) Risks of indirect adverse effects are essentially those identified for forestry and land use impacts.

Landscape and visual features

lxxxiii) Adverse impacts are foreseen to varying degrees in relation to the installation and operation of new or rehabilitated strategic marketing centre infrastructure. Concerns are raised especially in the case of jetties, central markets, electricity supplies, and fresh fish marketing systems.

Communities

lxxxiv) Possible adverse effects of the CFMZ/LFC programme include the exclusion of women and low-income fish workers from full participation. Implementation of the co-management mechanisms proposed under TREFIP would in this eventuality run counter to responsible fisheries goals of socio-economic equity.

lxxxv) Input acquisitions and fleet restructuring for more efficient fish collection financed through micro-credit facilities might have the effect of raising fishing pressure on stocks that in some sectors of the lake are already overexploited.

lxxxvi) A further possible adverse effect would arise in the event that women and low-income fish workers and processors/traders were to be excluded or not adequately represented amongst groups of micro-credit assistance recipients.

lxxxvii) Road, jetty, and electrification projects, as well as improvements to fresh fish marketing systems, all carry the potential for creating conditions that would draw 'economic migrants' into target localities, leading to further unsustainable pressure on the ecosystem and available social infrastructure.

Proposed Mitigation Measures

Implementation of co-management mechanisms

lxxxviii) *TREFIP and contracting NGO personnel, working in close co-operation with each LFC executive committee/leadership group, should ensure that candidate loan recipients are fully eligible to participate in the **Micro-credit Scheme**. For each pilot village, basic eligibility criteria should include local residence, history of involvement in the local fishery harvest or post-harvest sector, and possession of a fishing or processing/trading license issued through the LFC.*

lxxxix) *Care should be taken to ensure that **each LFC** is formed in an inclusive way – that is, to be as fully representative as possible. The TREFIP Socio-economist, working in close co-operation with the respective national project socio-economists and contracting NGO teams, should assume overall responsibility for this measure.*

Improved infrastructure and services

xc) *For **all construction/rehabilitation works**, (roads, jetties, central markets electricity supplies), building sites and local material borrow sites (murrum, rock, sand, roofing and scaffolding poles, etc.) should be subject to site-specific environmental appraisals before construction begins. After construction or material removal operations are complete at any site, disturbed areas should be restored as appropriate. For land-based sites, restoration should include filling and contouring excavations with spoils and stored topsoil, and seeding with native vegetation from adjacent areas.*

xcii) *These tasks should be supervised by a suitably experienced environmental specialist, who would chart out any areas requiring special attention because of potential problems with habitat destruction, pollution, erosion, or aesthetic impact, and recommend particular mitigating measures or more benign alternative approaches.*

xciii) *For **roads**, all upgrading should use murrum to provide an all weather surface. Proper camber and drainage on both up-slope and down-slope sides should be ensured. Murrum borrow pits should be as visually unobtrusive as possible.*

xciv) *In the event that it proves necessary to widen any existing road, new earthworks should be constructed in a way that minimises erosion. On steep slopes, soil should be stabilised through planting of native vegetation and, if required, the use of a geo-textile overlay.*

xcv) *For **jetties**, all rock fill material borrow pits should be located at sites that are as visually unobtrusive as possible, i.e. out of sight of roads and viewpoints. The shoreline and underwater substrate areas at proposed jetty sites should be charted out to determine any potential problems with habitat destruction, pollution, erosion, or aesthetic impact requiring special attention.*

xci) *For **central market construction/rehabilitation**, design of new or upgraded facilities should pay particular heed to problems posed by large concentrations of traders and market users. Significant amounts of liquid and solid wastes are generated under such circumstances and special arrangements will be required to deal with them in a sanitary and environmentally friendly fashion. Environmental appraisals specific to each construction site should be prepared and should detail appropriate waste runoff and disposal arrangements.*

xcvi) *This task should be the joint responsibility of a suitably experienced environmental specialist, the TREFIP Fish Technologist, and the Community Health Advisor, who would collaborate in examining specific market sites, identifying real or potential sanitation, health, pollution, or aesthetic impact problems, and recommend mitigating measures or more benign alternative approaches.*

xcvii) *Common risks associated with **all activities related to facility and service improvement** are the indirect effects stemming from increases in commercial activities and attraction and settlement of 'economic migrants' in and around project villages (unsustainable pressure on natural resources and social infrastructure).*

xcviii) *Mitigation of these long-term problems will be a complex undertaking and will require close partnership with local communities. It will demand protracted and comprehensive initiatives on several fronts, especially in the key areas of community health, economic diversification, and environmental education. Although the original TREFIP proposal has made provision for consultant-supported interventions in these areas, the EIA Team strongly believes that extra personnel and operational resources are called for.*

xcix) *For **community health activities**, the TREFIP workplan and budget should be revised to accommodate a full-time three-year post of 'Community Health Advisor' stationed at the regional PIU.*

c) *The staff establishment for each of the four national projects should be strengthened with the addition of a 'Community Health Assistant.' These staff would work closely with the Programme Community Health Advisor and Socio-economist, and the Socio-economist Assistants and TCD/UNV/APO Socio-economists posted to the respective national projects, in order to implement health-related infrastructure and services improvement activities within pilot villages.*

ci) *A detailed work plan for these activities should be finalised by the TREFIP Co-ordinator, Community Health Advisor, and Socio-economist with the assistance of other PIU and national project personnel immediately after Programme inception. Planning for these activities should begin during the TREFIP Preparatory Phase.*

cii) *The community health work plan should anticipate extensive involvement in family planning and mother and child welfare outreach activities. These would be undertaken in close collaboration with and in ways that would complement and strengthen any existing reproductive health, disease prevention, nutrition, and similar outreach programmes being operated by government services or NGO or international donor agencies. The role of Community Health Advisor should be to serve as primary link between TREFIP and these services and agencies, in order to ensure close mutuality.*

Protection of stocks and biodiversity

ciii) *Although no significant adverse impacts are foreseen for any of the Output 3-related activities – viz. fisheries monitoring, establishment of lacustrine PAs, and environmental education, failure to implement them effectively will seriously undermine the effectiveness of the Programme as a whole. Failure with respect to PAs and EE would be particularly worrisome, as they are primary means for mobilising and building community partnerships to meet the tasks of stock and biodiversity protection.*

civ) *The lack of alternative income-earning opportunities within lakeshore communities poses a severe risk to fisheries sustainability and general environmental integrity throughout the Tanganyika littoral, and is thus not only a potential problem for successful PA operations.*

cv) *EE activities would build awareness amongst local resource users not only for the role and importance of fish refugia. They would also foster appreciation for the adverse effects of unconstrained population increase, invasive agricultural practices, and fish smoking and deforestation on lacustrine and terrestrial resource bases and human welfare.*

cvi) *For both **economic diversification and environmental education** Programme components, the TREFIP workplan and budget should be revised to accommodate more vigorous and far-reaching community development and outreach activities related to ecotourism and other income-generating opportunities, sustainable use of resources, and community conservation initiatives.*

cvi) *The Team further notes that additional environmental specialist personnel will be required if mitigation measures to address various adverse impacts catalogued in this report are to be adequately addressed.*

cvi) *Provision should be made for a full-time three-year post of 'Community Conservation Advisor,' based at the regional PIU. The staff establishment for each of the four national projects should be strengthened with the addition of 'Community Conservation Assistants.' These staff would work closely with the Programme Conservation Advisor and Socio-economist, and the Socio-economist Assistants and TCD/UNV/APO Socio-economists posted to the respective national projects, in order to implement activities related to the establishment and operation of PAs, development of ecotourism and other possible non-resource extractive/sustainable employment alternatives to fishing, and environmental education.*

cix) *Provision should also be made for enhancing the use of village video presentations as an EE tool, in light of reports from some NGO agencies operating programmes in the region that they have proved particularly effective for the delivery of conservation messages.*

cx) *A detailed work plan for these expanded community conservation/environmental education activities should be finalised by the TREFIP Co-ordinator, Community Conservation Advisor, and Socio-economist, with the assistance of other PIU and national project personnel, immediately after Programme inception. Planning for these activities should begin during the TREFIP Preparatory Phase.*

cx) *The community conservation work plan should anticipate extensive involvement in reforestation activities. These would be undertaken in close collaboration with and in ways that would complement and strengthen any existing outreach programmes being operated by government services or NGO agencies.*

Improved fisheries legal regimes and MCS capabilities

cxii) *Potential major risks linked to fisheries legal framework revisions and MCS capabilities would be in the form of indirect impacts on forestry and land resources, and communities. The EIA Team believes that such risks can best be minimised through concerted efforts to widen the employment base for lakeshore dwellers, as already recommended.*

More effective use of scientific advice for management

cxiii) *It will be extremely important for the expanded LTFMP to function in the way intended. If critical information on changes in fishing and post-harvest activities and their effects on the wider lacustrine and terrestrial environment go unremarked or unreported, the success or otherwise of impact mitigation actions will be impossible to gauge. Risk mitigation here should take the form of strict activity quality assurance and monitoring reports and follow-up.*

Establishment of a regional fisheries management entity

cxiv) *No significant adverse impacts are anticipated for activities related to regional fisheries organisation. As in the case of the use of scientific advice, though, there are inherent risks of omission. If the proposed Regional Fisheries Management Council and its secretariat/executive arm, the Lake Tanganyika Fisheries Centre, do not function in prescribed ways, it will not be possible to track the effects of mitigation measures or to co-ordinate their application on a lakewide basis. Again, risk mitigation should take the form of strict activity quality assurance and monitoring reports and follow-up.*

MONITORING

cxv) *Programme monitoring functions have already been provided for in the TREFIP proposal. A combination of two different mechanisms will be used. First, a major TREFIP activity component is establishment and operation of an expanded LTFMP, which originated under the LTR Project. The expanded LTFMP will focus on indicators for physical, biological, and socio-economic dimensions of the Tanganyika basin environment.*

cxvi) *Secondly, a Monitoring and Evaluation (M&E) routine will operate within the PIU in order to track and assess progress within the different TREFIP activity areas. The Socio-Economist will prepare in an electronic spreadsheet format a data base system capable of being updated on a quarterly basis by each of the Programme sub-offices.*

cxvii) *TREFIP sub-offices will provide such quarterly updates for each of the activities programmed within their respective national sectors, e.g.: formation of Local Fisheries Councils, establishment and operation of fund raising for micro-credit schemes, data on fish production, construction of village facilities or marketing/distribution infrastructure, and EE sessions.*

cxviii) *Using these updates, the PIU will issue quarterly M&E reports detailing the percentage of physical and financial realisation of Programme outputs compared to the goals set in the annual work plans. Main issues and bottlenecks will be identified and steps will be taken to resolve any difficulties and adjust the programme accordingly.*

cxix) *The PIU quarterly reports will then be transmitted to the Bank, the Directors of Fisheries, and the National Fisheries Councils. They will also be tabled at the annual meeting of the Regional Fisheries Council for deliberation and appropriate follow-up action.*

SUMMARY OF RECOMMENDATIONS

cxx) *As the net effect of expected beneficial impacts would be likely to far outweigh potential risks of adverse effects, the EIA Team endorses the Feasibility Study Mission report and recommends that **Programme content and budgetary provisions should be implemented largely as proposed.***

cxxi) *The Team nevertheless recognises that Programme activities may in some cases directly or indirectly induce potentially serious environmental problems, or exacerbate problems that already exist within the lake and its littoral districts.*

cxxii) *The EIA team therefore strongly believes that **certain Programme components should be significantly expanded, and that work plans and budget lines should be modified accordingly, in order to minimise anticipated risks.** These changes relate primarily to*

mitigation of impacts affecting lacustrine ecology and fish stocks, forestry and land use patterns, and the socio-economic environment.

cxxiii) **Additional Programme costs implied by these recommended expansions amount to an estimated US\$ 1.65 million.**

cxxiv) Successful mitigation will depend on outcomes of partnership initiatives between TREFIP and local communities in **four key areas** – viz. **economic diversification, health, environmental education, and social empowerment.**

cxxv) **Substantial enhancement of Programme activities relating to encouragement of community health, economic diversification, and environmental education is strongly recommended.** Additional resources required to effect these enhancements are mainly in the form of personnel, including creation of two new three-year posts – namely, Community Health Advisor and Community Conservation Advisor. Each of the four national project components would also require the addition of one **Community Health Assistant** post and one **Community Conservation Assistant** post. Their incumbents would help implement expanded work programmes in village facilities and services improvement, development of ecotourism and other alternative employment, and EE. Planning for these expanded work programmes should begin during the TREFIP Preparatory Phase, and be completed to coincide with the inception of other activity components within the first set of Programme pilot villages.

cxxvi) Particular emphasis should be placed on **the use of village video presentations as a major tool for promoting EE and a ‘dialogue of sustainability’** within local communities. Revision of the TREFIP workplan and budget should be carried out in order to accommodate this emphasis. A permanent **EE Task Group**, based at Programme Headquarters and equipped with basic screening equipment, should be set up to work with contracting NGOs and local communities in order to identify and develop a video series curriculum.

cxxvii) With regard to **social empowerment**, as new institutional structures and development interventions are facilitated under Programme auspices, **particular care needs to be exercised to ensure that equal opportunity for participation is accorded to all segments of the stakeholder population.**

cxxviii) This would not necessarily entail the addition of any new Programme staff or elements. **It is more a question of cultivating community consensus during the early stages of component activity implementation, and of comprehensive monitoring and follow-up through later stages.** The TREFIP Socio-economist, working in close co-operation with the respective national project socio-economists and contracting NGO teams, should assume the lead role in securing ‘equal opportunity compliance.’