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FISHCODE

MANAGEMENT

LAKE TANGANYIKA REGIONAL FISHERIES PROGRAMME (TREFIP)

PREPARED BY
THE JOINT AfDB/FAO/FISHCODE MISSION

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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LAKE TANGANYIKA REGIONAL FISHERIES PROGRAMME (TREFIP)
A proposal for implementation of the Lake Tanganyika Framework Fisheries Management Plan

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CURRENCIES

All currencies are expressed in US $; the equivalence in local currencies at the date of the Mission was:

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

ABBREVIATIONS AND ACRONYMS

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
CCW	Community Conservation Warden
CFMZ	Community Fisheries Management Zone
CIDA	Canadian International Development Agency
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)
DANIDA	Danish International Development Agency
DAPA	Projet de Développement de l'Aquaculture et de la Pêche Artisanale
DEPP	Direction de l'Environnement, Pêche et Pisciculture (Burundi)
DIFD	Department for International Development (U.K)
DGGM	Direction Générale de la Géologie et des Mines (Burundi)
DOF	Department of Fisheries
DRC	Democratic Republic of Congo
ECZ	Environmental Council of Zambia
EIA	Environmental Impact Assessment
EOP	End of Programme/Project
ERR	Economic Rate of Return
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFMP	(Lake Tanganyika Regional) Framework Fisheries Management Plan
FIDAWOG	Fisheries Data Working Group
FIP	Fisheries Policy and Planning Division/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
IDA	International Development Association
IFIP	Regional Project for Inland Fisheries Planning, Development, and Management for Eastern/Central/Southern Africa
INECN	Institut National de l'Environnement et de la Conservation de la Nature (Burundi).
IOP	Inception of Programme/Project
IRR	Internal Rate of Return
LFC	Local Fisheries Council
LIDAWOG	Limnological Data Working Group
LEGN	Development Law Service
LTBP	Lake Tanganyika Biodiversity Project

LTFMP	Lake Tanganyika Fisheries Monitoring Programme
LTR	Lake Tanganyika Research Project
LVEMP	Lake Victoria Environmental Management Project
LVFO	Lake Victoria Fisheries Organization
LVFRP	Lake Victoria Fisheries Research Project
MCS	Monitoring, Control and Surveillance
M&E	Monitoring and Evaluation
mt	metric tonne
NGO	Non Governmental Organisation
NORAD	Norwegian Agency for Development
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
SCAN	Sustainable Construction Agency for the Needy (Tanzania)
SCIP	Support for Community Initiative Project (Tanzania)
SEC	Socio Economic Survey
SEDAWOG	Socio Economic Data Working Group
SENADEP	Service National pour le Développement des Pêches
SNV	Netherlands Development Organisation
SSP	Scientific Sampling Programme
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
UNV	United Nations Volunteer
WFP	World Food Programme
WWF	World Wildlife Fund
ZESCO	Zambian Electricity Supply Company

EXECUTIVE SUMMARY

1) This report presents results of the joint AfDB/FAO/FISHCODE Mission to Lake Tanganyika, which was carried out between March and July 2000, and involved technical consultations at FAO Headquarters in Rome as well as extensive field visits to the Lake Tanganyika region.

2) Shared by the four countries of Burundi, the Democratic Republic of Congo, Tanzania, and Zambia, Lake Tanganyika covers an area of 32,900 km^2, has a maximum depth of 1,470m, and contains 18,880km^3 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).

3) 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.

4) 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 dependant family and household members, it is estimated that around one million people directly rely on the lake's fisheries for their livelihood.

5) Modern harvest operations primarily exploit six endemic non-cichlid pelagic species. These include the two schooling clupeid 'sardines' *Limnothrissa miodon* and *Stolothrissa tanganicae*, together with their major predators, all centropomids of the genus *Lates* -- viz: *L. stappersii*, *L. angustifrons*, *L. mariae*, and *L. microlepis*.

6) 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).

7) 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.

8) The lake hosts the second largest inland fishery in Africa (after Lake Victoria) and directly or indirectly provides income, food, drinking water, and 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.

9) 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.

10) In recent years, episodes of civil unrest and military conflict have compounded the effects of population growth in challenging food production capabilities, including those of Lake Tanganyika and other major regional fisheries.

11) 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.

12) 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.

13) 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.

14) 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.

15) 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 is due to be 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.

16) 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.

17) 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).

18) 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.

19) 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 for consideration by the fisheries authorities of the respective lacustrine States and also for presentation at a series of community meetings convened around the shoreline.

20) These meetings, completed in late 1998, provided an opportunity to:

- inform lakeshore community residents on the outcomes of major LTR studies;

- demonstrate how these outcomes led to the formulation of the provisional regional management framework; and, simultaneously,
- in keeping with CCRF guidelines, obtain feedback and inputs from local groups in order to strengthen the regional framework.

21) Additional actions undertaken by LTR during this period, 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, and the preparation of a detailed workplan for extension of LTR's monitoring activities as a programme to be implemented in future under national execution.

22) 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.

23) 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.

24) 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).

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

26) 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.

27) This report presents Mission results, in the form of a proposal to the AfDB and other interested donors, for the establishment of a **'Tanganyika Regional Fisheries Programme' (TREFIP)**.

28) The overall objective of TREFIP is to put the FFMP and its underlying processes into full operation, as endorsed by the CIFA Sub- Committee at the 8th Session held in Lusaka in May 1999.

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

30) 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.

31) Six principal and closely interlinked outputs are anticipated.

32) ***Output 1*****, the 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.

33) 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.

34) 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.

35) ***Output 2*****, the creation of improved infrastructure and services**, involves actions both at the pilot village level to improve fish processing and handling equipment and techniques 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.

36) 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.

37) ***Output 3*****, the 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.

38) ***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.

39) ***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.

40) ***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.

41) 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.

42) The Mission has designed TREFIP 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.

43) 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.

44) Although it is difficult to quantify all Programme benefits in strict economic or financial terms, the Mission calculates an ERR of 14 percent for TREFIP benefits related to production savings and extra income for residents of villages within pilot CFMZs.

45) 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.

46) Final determination of Programme costs will depend on recommendations of the TREFIP Environmental Impact Assessment report and negotiations with other donors.

47) The Programme is proposed for execution through FAO, by a team of local and international staff and consultants.

48) 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).

49) 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.

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

51) 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.

52) 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).

53) 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.

54) 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.

55) The 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.

56) In order to ensure the timely implementation of TREFIP the Mission recommends that the following preconditions be met by the four lacustrine States during or before the Preparatory Phase of the Programme.

57) First, legal foundations for CFMZ and LFC arrangements should be elaborated and put in place, as it will otherwise be extremely difficult to implement activities related to proposed co-management measures and the operation of the LFC Micro-Credit Scheme.

58) Secondly, provision should be made to ensure that all national fisheries research and administrative stations/offices around the lakeshore are staffed with sufficient personnel of the appropriate calibre to allow effective participation in TREFIP activities.

59) Finally, representatives of the relevant funding and executing agencies should as soon as possible investigate appropriate modalities of technical and financial co-operation that could be established under a possible Lake Tanganyika Authority (proposed under the draft LTBP/GEF Lake Tanganyika Convention and the Regional Fisheries Management Council to be established under TREFIP.

60) One way to ensure that this co-ordination is effected would be to have one executive agency responsible both for the follow-on actions proposed in connection with the SAP and the Convention, and for TREFIP.

61) With regard to Programme financing, including the Preparatory Phase, the Mission proposes that the AfDB provide 47 percent and the GEF 53 percent of the overall budget. This would be broken down as an AfDB grant of $5.3 million (technical assistance and infrastructure), AfDB loans to individual States totalling $14.8 million (infrastructure), and a GEF grant of $22.4 million (technical assistance, lacustrine parks, and recurrent costs).

PROGRAMME MATRIX

	Intervention logic	Objectively verifiable indicators	Sources of verification	Assumptions
Overall objective	Implementation of FFMP	Stabilised number of fishers; catch level maintained at a sustainable level.	Statistics.	Political stability; maintenance of environmental integrity.
Programme purpose	Improve livelihood of fishing communities.	Fisherfolk income/quality of life measures.	Socio economic reports.	Voluntary participation of stakeholders to improve their living conditions
Results	1. Implementation of co-management.	1. Successful co-management in 200 fishing communities.	Socio economic reports.	Fisherfolk open to co-management.
	2. Improved infrastructure.	2. Infrastructure built.	Observation infrastructure use.	Collaboration with central and local government authorities, local communities.
	3. Protection of biodiversity/lacustrine system productivity.	3. Maintenance of species array and biomass.	Area sampling and field reports.	Collaboration with biodiversity-related research projects.
	4. Improved legal regime.	4. Legislation enacted	Laws promulgated	Political will and collaboration with States.
	5. Facilitate use of scientific advice for management.	5. Availability of technical consultation services.	Reports on monitoring results.	Collaboration with fisheries research agencies; provision adequate Gov't funding.
	6. Establish a regional management entity.	6. Entity officially recognised and operational.	Reports/documentation of activities.	Political will and provision adequate funding.
Activities	1.1 Local Fisheries Council formation	1.1 Number of co-managed fishing villages.	1.1 Socio economic reports.	1.1 Effective outreach programme and motivated staff.
	1.2 Micro credit scheme.	1.2 Number credit allotments.	1.2 Report on credit allotments and outcomes.	1.2 Credit conditions accepted by local users.
	1.3 Introduction of appropriate gear.	1.3 Decreased use of beach seines, small mesh sizes.	1.3 Relative number of beach seines, other gear.	1.3 Acceptance of alternative gear.
	2.1 Installation of facilities/services (at village level).	2.1 New services/facilities in place.	2.1 Inventory of functional services/ facilities; monitoring .	2.1 Collaboration of stakeholders.
	2.2 Installation of facilities/services for strategic marketing channels.	2.2 New facilities/ services in place.	2.2 Inventory of functional services/ facilities; monitoring product quality and environmental benefits.	2.2 Collaboration of stakeholders, including industrial fishing/ processing companies.
	3.1 Creation of lacustrine protected areas.	3.1 Protected areas gazetted and operational.	3.1 Socio-economic reports.	3.1 Acceptance and collaboration by local stakeholders.
	3.2 Environmental education (village workshops, media, videos).	3.2 Increased environmental awareness and conservation practices.	3.2 Socio-economic reports; monitoring of public awareness and environmental benefits.	3.2 Collaboration of stakeholders and government agencies.
	4.1 Draft and facilitate enactment new legislation.	4.1 Legislation enacted.	4.1 Official documentation/gazettes.	4.1 Political will.
	5.1 Assess and strengthen existing capabilities and facilities as needed.	5.1 National execution of improved monitoring programme.	5.1 Reports on in-service training, facility improvements.	5.1 Motivated staff and available funding.
	6.1 Elaborate institutional arrangement.	6.1 Entity officially recognised.	6.1 Official announcement/ documentation.	6.1 Political will and available funding.
	6.2 Set up logistical and financial arrangements.	6.2 Arrangements in place.	6.2 Reports and observation.	6.2 Political will and available funding.
	6.3 Commence operations.	6.3 Entity fully functional.	6.3 Reports and observation.	6.3 Political will and available funding.

1. INTRODUCTION[1]

1.1 Programme Background and History

1) Lake Tanganyika (map, Figure 1) is shared by the four countries of Burundi (8% of surface area), the Democratic Republic of Congo (45%), Tanzania (41%), and Zambia (6%). With an area of 32,900 km^2, a maximum depth of 1,470m, and a volume of 18,880km^3, it qualifies simultaneously as: a) 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; b) the deepest of all African lakes and the second deepest lake in the world; and c) by cubic size, the greatest single reservoir of fresh water on the continent and the second greatest in the world (after Lake Baikal).

2) Tanganyika hosts one of the largest inland fisheries in Africa, second only to Lake Victoria in volume of production (FAO 1995a). It therefore represents a significant source of food and livelihood for millions of people dwelling within and around its basin. Some 45,000 fishers were counted around the lakeshore in the mid-1990s, working out of a total of 786 landing sites. Such figures immediately direct attention to the important socio-economic role played by the fisheries.

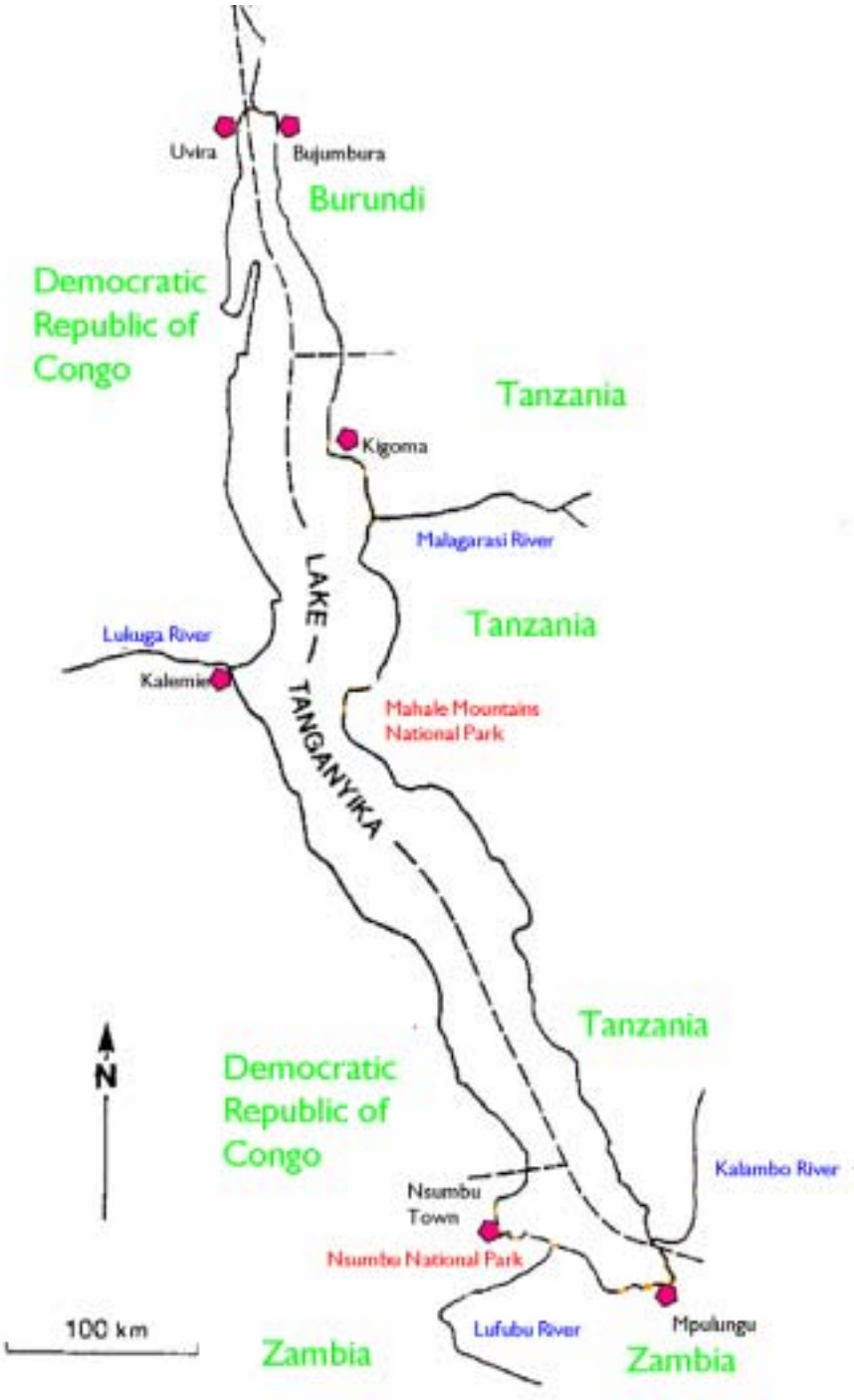
3) In addition to its fisherfolk, the lake directly or indirectly provides income, food, drinking water, and medium a transport and communication for an estimated 10 million inhabitants of its catchment area. Many more millions of people residing within the wider trading orbit of the Tanganyika basin are regular or occasional beneficiaries of its resources as consumers of fishery products.

4) Lake Tanganyika is notable in terms of its fauna composition as well. Owing to its geological history as a deep isolated basin formed by rifting that interrupted an ancient east-west river drainage system, of which the present-day inflowing Malagarasi and outflowing Lukuga rivers probably constituted the major channels, the lake features a high rate of endemism amongst its fish and invertebrate populations.

5) Entrenched within the Western Rift Valley, the lake is cradled between high eastern and western escarpments, and features extensive stretches of unspoilt beaches and rocky promontories, numerous bays, estuaries, and inshore islands. Bordering areas of wetland, forest, and savannah contain a remarkable assemblage of tropical flora, terrestrial fauna, and birdlife. Tourist amenities including lodges and beach resorts already exist at various places around the north-eastern, eastern, and south-western shoreline, and more are gradually being developed. Several of these facilities trade on the attractions of game parks and reserves adjacent to the lake, such as the Ruzizi delta in Burundi, Nsumbu National Park in Zambia, and Mahale and Gombe National Parks in Tanzania. Visitor attractions include diving, angling, and other water sports in addition to game viewing safaris.

6) The conservation and scenic values of Lake Tanganyika and its littoral zone, and the potential it offers as an 'eco-tourism' destination, are thus also of great significance.

[1] Descriptive material drawn primarily from LTR Technical Documents, as noted in ANNEX 4.



*** Source: Adapted with permission from Lindley (2000).**

7) Amidst growing concerns over the environmental status, endangered biodiversity, and possible over-fishing of this unique lake, efforts have been mounted since 1992 through the FAO-executed Lake Tanganyika Research (LTR) Project (GCP/RAF/271/FIN), 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 (FAO 1992).

8) The LTR project design specified that all aspects of the research programme be conducted in full collaboration with the national fisheries authorities and institutes of the respective lacustrine states, and to this end strong training and other institution-building components were incorporated as part of the workplan. Headquarters were established at the beginning of the project on the compound of the Département des Eaux, Pêches et Pisciculture (DEPP) in Bujumbura (Burundi), and the national research institutes at Uvira (DRC), Kigoma (Tanzania), and Mpulungu (Zambia) have from the outset provided facilities and counterpart staff for the operation of LTR sub-stations around the lake.

9) Core activities of LTR's ecosystem research approach were organised under the scientific sampling programme (SSP), which started in July 1993 (immediately upon completion of the project's preparatory phase) and ran through July 1996.

10) The six major components of the SSP include hydrodynamics, limnology, fish and zooplankton biology, remote sensing, fish genetics, and fisheries statistics. The project's research vessel, *Tanganyika Explorer*, was used extensively as a platform for the conduct of complementary hydroacoustic studies (to develop biomass estimates) and sampling surveys related to various other SSP components.

11) Some aspects of the SSP have been carried out in collaboration with the Lake Tanganyika Biodiversity Project (LTBP). Established in 1995 as a five-year project with funding provided through the UNDP/Global Environmental Facility (GEF), LTBP's remit is to address wider, basin-scale management problems of pollution control, conservation, and the maintenance of biodiversity (LTBP 1998). LTBP has thus complemented LTR's more directly fisheries-related investigations.

12) In 1997, with most of the hydrobiological and fisheries research activities initiated over the first five years of the project either complete or nearing completion, the LTR team embarked on a programme of socio-economic (SEC) investigation that involved a lakewide survey of landing sites, fishers, and trader/processors. Particular efforts were made to collect information on fishery problems and prospects from the viewpoint of local stakeholders.

13) All SSP work along with other LTR activities and research outcomes has been extensively documented through the project's publication series, numbering more than a hundred references. All LTR publications are available for review on the project's website, http://www.fao.org/fi/ltr.

14) 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). The group was established in order to facilitate the process of collating and assessing major results of six years of LTR research on the size

and structure of Lake Tanganyika's resources and the state of their exploitation (hydrodynamics, limnology, fish and zooplankton biology, remote sensing, fish genetics, and fisheries statistics), as well as the socio-economic dimensions and legal-institutional aspects of its fishery.

15) Consistent with overall LTR Project objectives, it was intended 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.

16) The first outcome of the Group's efforts, a draft Framework Fisheries Management Plan (FFMP) for Lake Tanganyika, was presented to and discussed by delegates to the Sixth Meeting of the LTR Co-ordination Committee held in June 1998.

17) In addition to giving their broad endorsement to proposals outlined in the draft framework document, which is based on principles laid out in the FAO *Code of Conduct for Responsible Fisheries*, or CCRF (FAO 1995, 1996a, 1996b, 1997), delegates further agreed to a series of supportive or accompanying measures in order to facilitate management planning co-ordination and implementation between the four lacustrine States.

18) One such measure proposed by the Working Group was the organisation and conduct, later in 1998, of a lake-wide 'Community Referenda' exercise intended to:

- inform lakeshore community residents on the outcomes of major LTR studies;
- demonstrate how these outcomes led to the formulation of the provisional regional management framework; and, simultaneously,
- in keeping with CCRF guidelines, obtain feedback and inputs from local groups in order to strengthen the regional framework.

19) LTR personnel successfully carried out the referenda exercise in October 1998, in collaboration with national field teams in each of the four States.

20) Additional recommendations of the Sixth LTR Co-ordination Committee Meeting called for complementary actions to be taken with respect to further assessment of legal and institutional provisions necessary to facilitate regional management planning and co-ordination, and preparation of a detailed workplan for extension of LTR's monitoring activities as a programme to be implemented in future under national execution.

21) The LTR Fisheries Management Working Group was further requested to elaborate the FFMP into a complete draft for presentation at the Eighth Session of the CIFA Sub-Committee for Lake Tanganyika scheduled for May 1999, and to explore and propose additional measures that would facilitate implementation of the FFMP.

22) Preparation of a work plan for the new Monitoring Programme, including budget details, equipment and material requirements, field team Terms of Reference, data collection and reporting protocols, and administrative/financial procedures was completed in late 1998, on the basis of a field mission to each of LTR's lakeside sub-stations in order to assess staff capabilities and equipment needs.

23) With timely assistance from the FISHCODE Programme (GCP/INT/648/NOR -- Interregional Programme of Assistance to Developing Countries for the Implementation of the Code of Conduct for Responsible Fisheries.), further work was conducted on legal and institutional issues. Beginning in early 1999, a detailed review and appraisal

of existing fisheries legislation and monitoring, control, and surveillance (MCS) capacities within the four lacustrine States was mounted. Possible legal and institutional modalities in support of regional harmonisation of fishery resource management were explored, and a set of recommendations for actions to facilitate implementation of the proposed FFMP was prepared.

24) 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 FISHCODE/LTR technical consultations held at FAO headquarters in Rome in late March 1999.

25) 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.

26) 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), one of whose representatives was present as an observer at the Lusaka meeting.

27) Subsequent discussions with relevant personnel at FAO (FIP and TCI), the AfDB, and the University of Kuopio in order to facilitate the second resulted in an agreement to field a joint AfDB/FAO/FISHCODE feasibility study mission, with the AfDB providing a Team Leader/Economist and a Infrastructure/Marketing Specialist, and FAO (through FISHCODE) a Fisheries Development Planner/Socio-economist. It was also agreed that the University of Kuopio would support the Mission by appointing the LTR Deputy Scientific Co-ordinator to work with the team's Development Planner in the preparation of an environmental impact study for the proposed FFMP Implementation Programme.

28) Mission Terms of Reference (ANNEX 1) broadly call for a reconnaissance exercise in order to establish the feasibility of and accordingly develop a framework for a Lake Tanganyika FFMP Implementation Programme ('Tanganyika Regional Fisheries Programme' or 'TREFIP' for short).

29) In this context, 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.

30) The Mission itinerary (ANNEX 2), covering a period of four months, included technical consultations at FAO Headquarters in Rome, visits to major fishing and

administrative centres around the lakeshore,[2] and interviews with local stakeholders, fisheries administrators and researchers, and senior ministerial officials within each of the lacustrine States (ANNEX 3). Further consultations were held with members of the LTR Scientific Co-ordination team at the University of Kuopio, Finland, in the course of preparing an Environmental Impact Assessment to supplement the present report.

31) In the course of preparing this report the Mission also conducted an extensive literature review covering field reports of previous fisheries projects within the region, technical documents, journal articles, and academic texts (ANNEX 4).

1.2 Performance of Similar Projects in the Region

32) Table 1 summarises major national and regional inland fisheries-related planning, management, and development projects undertaken over the last three decades within Eastern and Southern Africa. Those of particular relevance to the proposed FFMP Implementation Programme are briefly reviewed below.

Lake Tanganyika Biodiversity Project (LTBP)

33) LTBP is a five-year project that began in 1995 with funding from the United Nations Development Programme/Global Environment Facility. It has as its principal objective the creation of a regional basin environmental management plan involving the four lacustrine States, through which pollution can be controlled and the biodiversity of the lake sustained. The five 'Special Study' components of LTBP include those of Biodiversity (investigations of species, species complexes, and habitats to determine which are under threat), Pollution (identification of pollution sources, effects, and possible preventative measures), Sedimentation (monitoring of impact and evaluating possible ways of amelioration), Socio-economics, and Environmental Education. Activities under the latter two components cover subjects including fishing and agricultural practices, appraisal of possible aquatic reserve sites and their local acceptability, and the legal issues that are or will be involved with regionally co-ordinated efforts at sustainable development and conservation of the lake's resources.

34) Project outputs include preparation 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, upon ratification, would commit the four lacustrine States under international law to joint management of the Tanganyika basin, and a collection of technical reports deriving from the Special Studies noted above.

35) LTBP is due to be wound up in July 2000, and plans for follow-up actions are now underway (see Sections 4.2.6 and 5.8 below).

Lake Victoria Environmental Management Project (LVEMP)

36) LVEMP is a Global Environmental Facility (GEF) - and International Development Association (IDA)-funded project involving the three Lake Victoria littoral States of Kenya, Tanzania, and Uganda as joint participants. The project became operational in 1997, and is due to run for five years as the first phase of what has been described as a longer term, comprehensive program 'aimed at the rehabilitation of the lake ecosystem.'

[2] Except in the DRC, owing to the ongoing civil war.

Table 1. Previous fisheries-related projects on L. Tanganyika and in the Great Lakes Region

Project/Programme Title	Duration	Objectives/Remarks
A. National		
A.1 Burundi		
1) Recherche et développement de la pêche (BDI/70/508)	1970- 1974	General fishery survey and development project: evaluation resource potential; field surveys an advisory services for fishery development and a management plan.
2) Fishery Research Project (BDI/73/020)	1973 – 1976	FAO/UNDP resources investigation project.
3) Fisheries Development on Lake Tanganyika, Burundi (BDI/73/007).	1974 – 1976	Development project for the artisanal sector. Rehabilitation and improvement of local fishing and fish processing capacities through supply of fishing equipment and gear (catarmarans and lift-nets), development of fish processing centres and marketing networks, and assistance in establishing the Societé d'Usines de Poissons du Burundi (SUPOBU), with support from the World Bank (supply of fishing gear and credit facilities, boat-building and fish processing factories at main landing sites). SOPOBU was dissolved in 1986 after several years of unprofitable performance.
4) Statistiques et informations pêche (PNUD/FAO/BDI/90/002).	1988 –1991	FAO/UNDP project for improvement of fisheries statistics collection and reporting.
5) Développment de l'Aquaculture et de la Pêche Artisanale (DAPA)	1998 – 2002	Initiated in 1998 by the Government of Burundi and the African Development Bank in May 1998 with a budget of some US$7 million. DAPA's components include: a) aquaculture development; b) fisheries management; and (c) improvement of artisanal fisheries methods.
A.2 D.R.Congo		***No records available.***
A.3 Tanzania		
1) L.Tanganyika Fisheries Research and Development Project (URT/71/012)	1972 – 1978	FAO/UNDP. Broad objectives to expand all aspects fisheries harvest and post-harvest, including through: assessment fish stocks and design permanent monitoring system; research on biological characteristics commercially important species; recommendations on introduction fisheries regulations; improved statistical system; improved fishing methods (industrial and artisanal); improved processing and marketing systems; and provision of advice on investment potential.
2) Fisheries Development Project (IDA)	1976 – ca. 1980	IDA credit to provide technical assistance and facilities for establishing Lake Tanganyika Fishing Centre (joint venture company) and to support associated activities (village fishing programme; lake transport facilities; marketing and pollution studies; training). Fish Receiving Station constructed in Kigoma but never put into operation and is now abandoned.
3) Integrated Technical Assistance and Credit for Artisanal Fisheries (GCP/URT/066/NET).	1983 – 1993	Overall aims of reversing declining trend in fishing production and improving living standards for fishers in Kigoma Region, by means of fishing gear importation and introduction of revolving credit scheme. Project evaluations concluded that most objectives met though adverse operating conditions (poor communications, transport) were major constraints. Long-term intended effects of institution-building and strengthening of extension services reportedly not fully attained.
A.4 Zambia		
1) FAO fishing technology projects	1970s	Three FAO fishing technology projects were carried out during the 1970s from Mpulungu. These include: a) gear technology, catamaran lift-net development, ca. 1975; b) experimental fishing, underwater lights, early 1970s; and midwater trawling trials, early 1970s.

Project/Programme Title	Duration	Objectives/Remarks
B. Regional/Lake Tanganyika		
1) LTR		See text, Section 1.1.
2) Lake Tanganyika Biodiversity Project (LTBP)	1995 – 2000	Established with an initial budget of some US$5 million provided through the UNDP/Global Environmental Facility (GEF), LTBP's remit is to address wider, basin-scale management problems of pollution control, conservation, and the maintenance of biodiversity. See text for details.
C. Regional/Other Inland Fisheries		
1) Regional Project for Inland Fisheries Planning, Development and Management in Eastern/ Central/ Southern Africa (IFIP).	1989 – 1992	A regional FAO/UNDP project with aim of promoting more effective and rational exploitation of fisheries resources in major inland water bodies. Extensive and well documented work related to management and planning for shared water bodies, including lakes Tanganyika and Victoria. Involved number of national sector overviews and field investigations of the state of particular fisheries.
2) EEC Lake Victoria Project	1989 – 2001	Five major components include: 1) institutional strengthening through support of the LVFO committees on fisheries research and management and support for scientific meetings; 2) stock assessment (acoustic, trawl, and gillnet surveys and associated biological and statistical studies; 3) trophic web studies; 4) socio-economic assessments of management strategies through baseline information collection and post-harvest studies, including nutritional and health impacts of the fishery; and 5) development of a participatory process through evaluation of appropriate community structures and pilot community management initiatives.
3) The Lake Victoria Environmental Management Project (LVEMP).	1997 – 2001	Global Environmental Facility (GEF) - and International Development Association (IDA)-funded project involving the three Lake Victoria littoral States of Kenya, Tanzania, and Uganda as joint participants. See text for details.
4) Lake Malawi SADC/GEF	1995 - 1999	A three-country GEF project involving Malawi, Mozambique, and Tanzania, with the aim of developing a unified strategy for the conservation of biodiversity and sustainable use of the lake and its catchments. Funding from the World Bank with inputs from CIDA, DFID, UNDP, FAO, WWF-SA, South African High Commission, and DANIDA. Main scientific aspects of project work involve systematics (taxonomy) and lacustrine ecology and conservation/parks planning. Socio-economic and development aspects include building community awareness, laboratory construction, and preparation of strategy for protected areas. Project closed in July 1999; plans for future follow-up actions unknown.
5) Zambia/Zimbabwe SADC Fisheries Project -- Lake Kariba	1989 – present	See text for details.

37) Overall objectives include: a) maximising the sustainable use of basin benefits (food, employment, income, and safe water supplies, and maintenance of disease free environment); b) conservation of biodiversity and genetic resources; and c) harmonisation of national management programs in order to control and reverse environmental degradation.

38) LVEMP includes a fisheries research component that is to 'provide information on the ecology of the lake and its basin, the biology of its flora and fauna, the impact of environmental factors on the lake system, and socio-economic implications of use of the lake's resources.' (LVEMP Project Document, 1996). The respective national fisheries institutes (Kenya Marine Fisheries Research Institute), Tanzania Fisheries Research Institute, and Fisheries Research Institute (Uganda)) are assigned the primary responsibility for implementing this component.

39) LVEMP aims to facilitate stronger regional co-operation in the management of the Victoria fisheries by providing the principal initial funding for the Lake Victoria Fisheries Organization (LVFO), with headquarters in Jinja, Uganda.

40) LVFO was established through a Convention that was drafted with FAO assistance and signed by the three lacustrine States in 1994. The Organization is presided over by a Council of Ministers responsible for fisheries, and has an Executive Committee made up of Directors of Fisheries Research, a Fisheries Management Committee, a Scientific Committee, and a Permanent Secretariat.

41) LVFO aims at promoting better management of the fisheries through co-ordination of management with conservation and other resource use requirements, collaboration with other public and private agencies and stakeholder groups, co-ordination of fisheries extension and training activities, and dissemination of information on the lake.

42) Although both the LVEMP and the Organization have now been operating for several years, the Mission is not aware of any official evaluation reports on the progress of their respective work programmes. It is known however that in each case considerably more time has been required than originally anticipated for completing basic preparatory tasks, including establishment of office premises, procurement of necessary equipment, and recruitment of personnel.

Lake Victoria Fisheries Research Project (LVFRP)

43) LVFRP is an EEC-funded project with five major components. These include: 1) institutional strengthening through support of the LVFO committees on fisheries research and management and support for scientific meetings; 2) stock assessment (acoustic, trawl, and gillnet surveys and associated biological and statistical studies; 3) trophic web studies; 4) socio-economic assessments of management strategies through baseline information collection and post-harvest studies, including nutritional and health impacts of the fishery; and 5) development of a participatory process through evaluation of appropriate community structures and pilot community management initiatives.

44) Now in its second phase, the project has carried out its programme of activities in terms of three major working groups. These include: FIDAWOG (Fisheries Data Working Group); SEDAWOG (Socio-Economic Data Working Group); and LIDAWOG (Limnological Data Working Group). A number of results of research and other activities carried out by the respective groups were presented at a major conference entitled 'Lake Victoria 2000: A New Beginning,' which was held at Jinja

during 15 – 20 May 2000 under the auspices of the Lake Victoria Fisheries Organization.

45) Important aspects of the project's work programme have reportedly been subject to considerable delays in implementation owing to problems with equipment deliveries, publishing contracts, rough lake conditions that hamper hydroacoustical surveys, and shortage of national counterpart personnel owing to absences for overseas training.

SADC Lake Kariba project

46) Funding from NORAD and DANIDA for pilot phase late 1980s. Project aims to conduct research and monitoring of the kapenta (clupeid) stocks to determine sustainable yield and devise an appropriate lakewide management plan. A protocol for the joint management of the Lake Kariba kapenta fisheries was signed in November 1999 between Zambia and Zimbabwe. Project components include regional and local training of fisheries staff and facilities upgrades at both the Lake Kariba Fisheries Research Institute (Zimbabwe) and the Sinazongwe Fisheries Training Centre (Zambia), the conduct of a joint research programme, and the establishment of a uniform system of data collection.

47) A related project – Management of the Lake Kariba Inshore Fisheries, Zambia -- is currently underway with the aim of developing community-based fisheries management structures through the establishment of village management committees. (Co-management initiatives are also being carried out in the fisheries of Bengweulu and Mweru Luapula in collaboration with the Dutch development organisation SNV/NDO.)

2. FISHERIES SECTOR[3]

2.1 Generalities

48) Fish has been estimated to account for between 25 to 40 *percent* of total animal protein supply for the populations of the four Lake Tanganyika States (Gréboval *et al*. 1994). Its importance for regional nutritional welfare is therefore critical. However, continued strong population growth within the Tanganyika basin region and across East-Central Africa as a whole (World Bank, 1999) drives an increasing demand for fish products. Thus, the balance between *per caput* supply and overall fish production has been difficult to maintain, despite increases in the latter.

49) The food security situation across the Great Lakes region is subject to the effects of drought and other natural disasters at all times, and so can be regarded as inherently vulnerable. In recent years, though, episodes of civil unrest and military conflict, and the ravages of the HIV/AIDS epidemic in many localities, have compounded the effects of population growth in challenging food production capabilities, including those of Lake Tanganyika and other major regional fisheries.

50) Furthermore, demand for fisheries products can become all the more acute in situations where normal crop and livestock production and marketing activities are severely disrupted by civil conflict and population displacements, as has been witnessed in parts of Rwanda, Burundi, eastern DRC, and western Tanzania.

[3] Descriptive material extracted from FAO Fishery Country Profiles and LTR Technical Documents.

2.1.1 Burundi

51) Burundi's fish catch comes almost entirely from Lake Tanganyika. Smaller inland lakes, the most notable of which are Lake Cohoha and Lake Rweru along the border with Rwanda in the north of Burundi, also host fisheries for tilapia and catfish (gillnets, seines, traps, and longlines), but their contribution to the national catch is very minor. Various rivers, swamps, and floodplains associated with the Ruzizi, Kagera, and Malagarasi drainages likewise provide only negligible catches.

52) The 1995 LTR FS of Lake Tanganyika indicated that there were 642 planked canoes and 46 dugout canoes distributed amongst the 54 landing sites along the Burundi shoreline of Lake Tanganyika. In the last five years, however, the sector has been heavily affected by events of civil unrest and the regional embargo imposed after the 1996 *coup d'état*. Fishing activity has been severely restricted and harvests, boat counts, and general sectoral activity much reduced. From an estimated catch level of around 20,000 mt in 1995, harvests have fallen to an estimated. 9000 mt in 1999.

53) The FAO *Fishery Country Profile* for Burundi reports that the country's geography and hydrology are generally appropriate to the development of fish culture. In the early 1990s it was estimated that there were 2000 to 3000 fish farmers active in the country, and that pond production was in the range of 40t per year. A new project, Développement de l'Aquaculture et de la Pêche Artisanale (DAPA), was initiated in 1998 and is expected to provide a major boost to fish farming development.

54) Fish is a chief source of animal protein in the country, and around the lakeshore and in the major urban centres of Bujumbura, Gitega, and Ngozi, it serves as the most important single source of animal protein. FAO estimates for 1995 put the national *per caput* fish supply at 3.1 kg.

55) Development interventions to improve local processing efficiency and product quality, including establishment of facilities for smoking, salting, drying, and packaging, have been attempted through a variety of projects over the years, though with mixed success.

56) Despite the comparatively good transportation infrastructure that connects the capital Bujumbura to points along the lakeshore and major inland towns, many areas of the interior lack any regular availability of fish. Imports of fish consist mainly of dried product from Tanzania which is generally undeclared and often destined for re-export to the Democratic Republic of Congo and Rwanda. Small amounts of tinned or frozen fish are sold to higher income consumers in the retail markets of Bujumbura.

2.1.2 Democratic Republic of Congo

57) The FAO *Fishery Country Profile* for the DRC issued in 2000 notes that after years of political crisis and economic malaise leading up to the civil war of 1996-97, and the subsequent period of instability, it is difficult to develop a clear view of the DRC fisheries sector. Fisheries administration is tenuous in many areas of the country, and statistical and other information on specific water bodies is either lacking or completely outdated.

58) The DRC has a very limited Atlantic Ocean coastline, and marine production is consequently of a relatively minor order.

59) On the other hand, there are vast freshwater fisheries resources in the country, contained primarily within the major Rift Valley lakes along the eastern borders with

Zambia, Tanzania, Burundi, Rwanda, and Uganda, and in the extensive Congo River basin.

60) There is no recent information on the state of fish farming in the DRC. Annual aquaculture production was estimated at 700 mt in FAO estimates for the late 1980s.

61) Most of the marine catch is marketed as chilled or fresh fish in Kinshasa markets. Inland catches are marketed in cured form, either as smoked, sun-dried, or salt-dried product, except for markets in the immediate vicinity of landing sites where fresh product is available. Waterborne transport plays a critical role in fish distribution and marketing throughout the eastern Rift Valley lakes region and within the Congo River Basin.

62) Fish is a very popular food item in most areas and demand is exceedingly high. However, the isolated location of many of the water bodies and non-existent or extremely disintegrated infrastructure impose severe limitations on distribution and marketing possibilities. FAO estimates for 1997 put the national *per caput* fish supply at 5.7 kg.

63) It is not possible to provide a reliable reading on the present contribution fisheries to the national economy due to the almost complete lack of recent data. It is clear however that both the marine and inland sectors overall have undergone significant decline, consequent upon the highly unstable political and economic circumstances that have prevailed in the country over the past decade.

2.1.3 Tanzania

64) The Indian Ocean coastline of Tanzania extends for some 1,424 km and is characterised by a narrow, sharply falling shelf. Coastal fishing activity is generally concentrated inshore and around the islands of Zanzibar, Pemba, and Mafia. The marine catch is composed of a great diversity of species, including snapper, kingfish, shark, rays, shrimps, lobsters, sardines, and sea cucumbers. It is estimated that by the mid-1990s the shrimp fishery (based primarily around the Rufiji Delta, some 200 km to the south of Dar-es-Salaam, and in areas around Bagamoyo, about 100 km to the north) was producing in the range of 1000 –1300 mt annually, yielding export value of between USD 11 – 14 million. Total annual marine harvests as reported in FAO statistical compilations for 1987 - 1997 ranged from 40,000 to 50,000 mt.

65) Tanzania is extremely well endowed with freshwater fisheries resources: inland waters cover about 6.5 percent of the total land area, and their combined production in recent years has accounted for between 80 to 90 percent of the national total for capture fisheries. The inland fisheries provide direct employment for perhaps 200,000 artisanal and subsistence operators who harvest a wide range of species including Nile perch, tilapias, small pelagic ‘dagaa,’ (clupeids, or ‘sardines’) and catfish. An estimated 25,000 smallcraft, mainly traditional dugouts and planked canoes, make up the national inland fishery fleet.

66) Whilst numerous rivers, minor lakes, swamps, and reservoirs host small but locally important commercial or subsistence fisheries, some 86 percent of Tanzania’s inland waters are contained in the Great Lakes of Victoria, Tanganyika, and Nyasa (Malawi). All three lakes host remarkably diverse assemblies of fish and other aquatic life. Their waters, with the particularly heavy contribution of Lake Victoria, provide the bulk of Tanzania’s inland (and thus indeed total national) fisheries production.

67) Fish is an immensely popular food and most of the national catch is absorbed by the domestic market, although an important export market in frozen fillets and some fresh chilled product has developed with the boom of the Nile perch fishery on Lake Victoria. It is estimated by FAO that about one third of the national catch is consumed in fresh form, and general consumer preference is for fresh fish when it can be obtained. However, sale and consumption of fresh product is mostly restricted to areas within a short commuting distance from the major water bodies, owing to the lack of adequate communications, insulated vehicles, and cold chain facilities.

68) Traditional smoked and dried fish, comprised almost entirely of freshwater species, are consumed over a wide area of the country and very significant but largely unrecorded quantities of locally processed product are also exported to neighbouring countries. The most widespread fish commodity is dried 'dagaa' (i.e. *Rastrineobola argentea* from Lake Victoria or *Limnothrissa miodon* and *Stolothrissa tanganicae* from Lake Tanganyika, and small pelagics generally).

69) Lucrative prospects offered by the Nile perch frozen fillet export market coupled with liberalised Government economic policies have resulted in a surge of private investment in processing plants and marketing facilities. Private companies have also become very active in supplying large quantities of dried dagaa for the production of animal feed.

70) FAO assessments note that good potential exists for aquaculture development in Tanzania, considering the large stretches of the coastal belt that could support brackish-water fish farming, the large number of ponds that have already been constructed, and the existence of hundreds of water storage reservoirs and other small water bodies.

71) Fish farming has been practised for a half century or more in the country, mostly utilising tilapia species, but results generally have not lived up to expectations. FAO statistical reports indicate that aquaculture harvests of tilapia reached a high of 400 mt in 1991, but have since fallen off to the 200 – 250 mt/yr level (1996-97).

72) The fishing industry is Tanzania's largest producer of animal protein. It is estimated that present annual *per caput* supply of fish is around 11 kg.

73) Expansion of fishing capacity and production over the past twenty years has created a situation of full exploitation in most of the major fishing areas. Further development of harvest capacity, therefore, is generally not indicated. Appropriate planning and development initiatives for the future are those, which would help, build aquatic environmental management and protection capabilities, responsible fishing practices, and more efficient performance in the post-harvest sector through improved infrastructure and amelioration of product loss.

2.1.4 Zambia

74) Zambia hosts a remarkable variety of fisheries, exploiting resources mainly provided by several lakes – Tanganyika, Mweru-wa-Ntipa, Mweru Luapula, Bangweulu, and Kariba, the Lukanga swamps, and the upper Zambezi and Kafue rivers. A variety of smaller swamps, flood plains, and streams and some 2,000 fish ponds and 370 water impoundments also contribute to the fishery resource inventory of the country.

75) Small-scale and commercial fish farming has a long history in Zambia, and since the mid-1980s there has been a fifteen-fold increase in production – far more than in most of sub-Saharan Africa. Some larger commercial operations have shown very

encouraging results using intensive and integrated fish culture techniques involving poultry-tilapia and pig-tilapia combinations. Smallholder fish culture has been widely promoted by Government with the assistance of various international agencies, although with mixed outcomes. Major development shortcomings include lack of funding for promotional campaigns over the longer term, inadequate extension support for local farmers, and insufficient maintenance of quality broodstock and seed supply.

76) It is estimated that there are about 4,000 smallholders currently involved in pond culture throughout the country, with most concentrated in the higher rainfall areas of North Western, Copperbelt, and Northern Provinces. Some 10,000 ponds have been established, with a total surface area of about 1,500 ha. Total annual production from aquaculture is currently thought to be in 2,000 mt range, mostly made up of harvests from large scale commercial installations.

77) Fish is sold in various forms on the domestic market: fresh, sun-dried, smoked, and brined. Some fish fillet is produced as well. Most of the national catch reaches markets as sun-dried or smoked product because the main producing areas are very remote from the main consuming areas, and transportation links do not allow for rapid movement of fresh fish.

78) Various surveys in recent years confirm that fish ranks first as a source of animal protein in most parts of the country, with the exception of traditional cattle-keeping areas in Southern and Western Provinces. Considerable volumes of fish products are imported, mostly in the form of dried kapenta from Tanzania. Present annual *per caput* supply of fish within Zambia is estimated at 7.3 kg, down from the 8.5 kg FAO estimate reported in 1990.

2.2 Fisheries Policy and Development Institutions

2.2.1 Burundi

79) Fisheries affairs in Burundi are vested with the Department of Water, Fisheries, and Aquaculture under the Ministry of Agriculture and Livestock. Policy emphasises sustainable exploitation of resources to bolster national food security and generate employment and income.

80) The management authority is severely constrained from fulfilling its monitoring, enforcement, and extension roles by chronic budget shortages. Aside from crippling the Department's normal operational procedures, this problem expresses itself in poor levels of motivation and performance by field staff. Much of the technical assistance provided through external funding in past years, such as for upgrading the fisheries statistics and information systems (FAO/PNUD Project BDI/90/002), has had no lasting impact because national follow-up activities cannot be supported by the weak departmental budget.

81) Fisheries law is based on decrees dating back to the colonial era that establish a broad framework of authority under which specific regulations can be created to govern questions of fishing techniques, gear specification, fishing seasons and areas, licensing, sanctions, etc. A ministerial regulation issued in 1961 specifically deals with Lake Tanganyika, but is in many respects outdated and incomplete. In some cases practices are banned but corresponding sanctions are lacking; in other cases fine levels are obsolete. Furthermore, regulatory provision is lacking entirely for certain kinds of common gear such as longlines, and destructive practices such as beach seining are ignored.

82) It is understood that draft fisheries legislation was developed under an FAO Technical Co-operation Programme project in the early 1990s (TCP/BDI/8954) for submission to Parliament, but that the process was interrupted by the outbreak of political turmoil in 1992. This draft now needs to be re-examined and updated as appropriate, taking into account present fishing practices as well as the need to address environmental issues (pollution, habitat protection, etc.) and fish product quality assurance.

2.2.2 Democratic Republic of Congo

83) It is not yet known just how the fisheries institutional and legal situation will evolve in the Democratic Republic of Congo following the events of civil war that resulted in the establishment of the new national government in 1997.

84) Past fisheries policy in the country has given priority to production in order to meet national food needs. As in Burundi, fisheries legislation rests on colonial era decrees that enable designated authorities to issue regulations covering particular questions such as fishing seasons, licenses, gear specifications, and so on. Various regulations dealing with Lake Tanganyika are on the books but have not been effectively enforced for years and are widely ignored.

85) Overall fisheries management responsibility nominally lies with the National Service for Development of Fisheries (SENADEP -- Service National pour le Développement des Pêches), under the Ministry of Environment, Nature Conservation and Tourism. SENADEP is represented within each of the country's eight regions by a 'regional co-ordinator.' At the sub-regional level there are SENADEP 'heads of office,' and at the lower zone level 'supervisors.' Ordinance No. 274/Agri. of 1945 provides that Governors may create local fisheries committees at the provincial level, each made up of at least four members. Principal committee functions within respective areas of jurisdiction are threefold: advise the competent authority on fisheries regulations; propose creation of fisheries reserves; and assess the state of fisheries. Although this text has not been technically abrogated, it is no longer enforced.

86) Fisheries administration at all levels has for some years been moribund due to civil strife and national economic collapse. Specifically, SENADEP's various offices cannot function due to: isolation between stations and central establishment (remote areas, deteriorated infrastructure, and civil war zones); insufficient or non-existent budget; low staff motivation (poor or non-existent pay); inadequate staffing and training at all levels of administration; lack of basic office and field equipment and facilities; inability to enforce regulations; and absence of reliable data.

87) Draft legislation intended to provide a new legal framework for the national fisheries was prepared in 1985 but never took effect. If the wider political and economic situation improves and fisheries administrative functions begin to be revitalised, comprehensive review of the 1985 draft and earlier regulations, including those specific to Lake Tanganyika would hopefully be treated as a matter of urgent priority.

2.2.3 Tanzania

88) The Fisheries Division of the Ministry of Natural Resources and Tourism, with headquarters in Dar-es-Salaam, oversees fisheries policy, management and development responsibilities in Tanzania. Research responsibilities are vested with the Tanzania Fisheries Research Institute (TAFIRI). TAFIRI has field stations in major

fishery areas, including Kunduchi near Dar-es-Salaam (TAFIRI HQ and marine sector), Nyegezi near Mwanza (Lake Victoria), Kyela (Lake Nyasa/Malawi), and Kigoma (Lake Tanganyika).

89) Sectoral policy aims at the sustainable exploitation of fishery resources to serve national food security purposes and to contribute to domestic employment and income generation, and to provide earnings of foreign exchange.

90) Principal management and development constraints include severe budget limitations affecting both DOF operations (poor field staff support capability, weak extension, statistical collection, and enforcement services) and research activities. The 'in-house' base of information on the state of resources and trends in harvest and trading activity is also deficient. Furthermore, the remote location of most of the main fisheries areas and poor communications and transportation infrastructure, which limit contact with fishing villages, undermine the effectiveness of fisheries administration and research activities, and pose obstacles to the marketing of fish products. There are in addition problems of security and undocumented trade.

91) Fisheries legislation is founded in the Fisheries Act, No. 6 of 1970, which broadly establishes the authority of the Ministry over conservation, development, and regulation of fish, fish products, and aquatic flora. The Fisheries Principal Regulations of 1989 and Fisheries (General Amendment) Regulations of 1994, further elaborate, *inter alia*, conditions and procedures for licensing (vessels, fishers, and fish traders), statistical reporting obligations, export of live fish, prohibited fishing techniques, and pollution liabilities.

2.2.4 Zambia

92) The national fisheries institutional framework is reportedly undergoing substantial revision, including possible changes that will amalgamate individual departments within the Ministry of Food and Agriculture and implementation of other arrangements proposed in recently drafted legislation.

93) At present the Department of Fisheries under the Ministry of Agriculture, Food and Fisheries is headed by a Director, supported by two Assistant Directors for Fisheries and Aquaculture respectively. Departmental sub-divisions include Fisheries Research, Aquaculture Research, Fisheries Management, Aquaculture Extension and Development, and a Training Branch.

94) The Government of Zambia has recently undertaken a major review of policies and objectives in connection with the Agriculture Investment Programme. New policies identified under the Fisheries Development Sub-Programme emphasise sectoral growth consistent with rational management practices.

95) Major policy elements highlight: use of available labour to eliminate rural poverty and increase gainful employment; exploitation of the resource base in a sustainable manner; promotion of conservation of aquatic resources according to sound ecological principles; greater participation of the private sector, traditional institutions, and NGOs in management activities, including creation of an appropriate legal framework; and improved technical capabilities and conditions of service for DOF staff in order to increase operational efficiency.

96) The Fisheries Act, No. 21 of 1974 serves as the principal legal instrument governing development and control of the national fisheries sector. The Act empowers the Minister (and, through the Minister, the Director of DOF) to employ an array of

basic management measures. Country-wide measures that actually have been taken under authority of the Fisheries Act include:

- establishment of 9 commercial fishing areas, viz.: Bangweulu; Kafue; Kariba; Lake Tanganyika; Lukanga Swamp; Lusiwashi; Mweru-Luapula, Mweru Wantipa, and Upper Zambezi;
- prescription of types of licenses required for fishing and registration of fishers;
- prohibition of seine/draw nets and regulation of mesh sizes;
- fishing by means of *kutumpula* (driving fish into a stationary gill nets or monofilament nets);
- declaration of closed areas (in selected commercial fishery areas) and seasons (normally from 1 December to 28 February); and
- prohibition on the use of any pesticides as a means of curing, preserving, processing or storing fish.

2.3 Lake Tanganyika Fisheries

97) 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.

2.3.1 Species Composition and Harvest Levels

98) Modern harvest operations primarily exploit six endemic non-cichlid species. These include the two schooling clupeid 'sardines' (known variously as 'ndagala' (Burundi and DRC), 'dagaa' (Tanzania), or 'kapenta' (Zambia) along different sections of shoreline), *Limnothrissa miodon* and *Stolothrissa tanganicae*, together with their major predators, all centropomids of the genus *Lates* -- viz: *L. stappersii*, *L. angustifrons*, *L. mariae*, and *L. microlepis*.

99) Most fishing is done at night as most methods rely on light attraction. This is why pelagic fishing activities practically cease each month during full moon periods.

100) 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). Annual harvest levels in recent years (up to 1995) 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.

101) The harvest is shared between the littoral States roughly in the order, if not exact proportion, of each State's share of the total lake area. Thus, based on 1995 estimates, fishers in the DRC (45% of lake area) land about 50 percent of the estimated annual pelagic catch, whilst those in Tanzania (41% of lake area) land about 31 percent, in Burundi (8% of lake area) about 12 percent, and in Zambia (6% of lake area) about 7 percent.

102) The lake's present-day fisheries are conventionally classified according to gear kit into 'traditional,' 'artisanal,' and 'industrial' types.

103) The traditional fishery is based on the use of lusenga or scoop nets (in conjunction with fire or lamp light attraction) for the harvest of clupeids, and gillnets, long lines, hand lines, traps, spears, and poisons for the capture of demersal species. It

is strongly if not predominantly a subsistence activity undertaken by simple fishing units comprised of one or two persons operating with dugouts or simple plank canoes propelled by paddles and, in some cases, lateen-rigged sails. Traditional fishing with lusenga nets has undergone substantial decline in recent decades in the face of widespread adoption of more efficient artisanal gear.

104) However, one traditional fishing method that has become increasingly popular in recent years around the Kigoma Region is line jigging for *Lates stappersii*. Jigging is carried out during daylight hours in deeper waters usually within 5 km of the shoreline, in units comprised of one to three persons. Canoes are sailed out to the grounds on the morning offshore wind, and return in the late afternoon with the onshore wind.

105) Recent studies have also demonstrated the inshore demersal fishery, primarily prosecuted with small-sized gillnets, has been vastly under-appreciated in both its size and potentially negative effects (Lindley 2000).

106) Artisanal fishing is primarily carried out for commercial purposes using lift nets, 'chiromila' seines (ring nets), and beach seines. The artisanal fishery has grown immensely from the late 1950s, when the technique of liftnetting from catamaran (two wooden planked canoes lashed together with poles) or, more rarely, trimaran rigs (three hulls lashed together) was first introduced in the northern portion of the lake. Liftnet units are equipped with 4 to 8 pressure lamps and operated by a 4 to 6 person team

107) Industrial fishing units are each comprised of a large (16-20m) steel main vessel, a smaller net-setting vessel, and 3 or more light boats, all requiring a crew of from 20 to 40 persons to operate.

2.3.2 Recent Developments in artisanal and industrial Fishing

108) Within the past decade the introduction of so-called 'Apollo' liftnets has greatly increased the fishing power of artisanal units, to the point where they are almost as effective as the large purse seines deployed by industrial units (see below). The liftnet fisheries primarily target clupeids from the Kipili area northwards, with *S. tanganicae* accounting for the greater proportion of the catch by weight. *L. stappersii* appears to replace clupeids as the dominant target species of the liftnet fishery from Kipili southwards. In the southernmost portion of the lake, however, liftnetting has only developed in a minimal way, reportedly because of the difficulties of operating in wind-exposed offshore waters.

109) Most artisanal operations in Zambian waters are therefore based on the kapenta beach seine, worked at night by shore crews (net haulers) operating in conjunction with net-laying and light attraction boats. Kapenta seining is an inshore fishery that tends to capture juvenile *L. miodon*. The seine codends usually have mesh sizes of <6 mm (stretched), as compared to the 6-8 mm (stretched) mesh sizes that are standard in the lift net fishery. Beach seining is banned in both Tanzania and Burundi.

110) The average efficiency of artisanal units has increased remarkably from 3 mt/yr in the early years up to an overall average of 14 tonnes in the 1990s, with annual peak averages in Burundi and Zambia ranging as high as 30 mt/yr. In recent years artisanal units (mostly liftnets and, beach seines) are contributing an increasingly proportion of total production at the expense of industrial purse seine units. By the mid-1990s the maximum yields within the artisanal sector in Burundi stood at 106 mt/yr for Apollo ('super' liftnet) units, and 41 mt/yr for regular liftnet units. In Zambia they amounted to

62-68 mt/yr for kapenta (beach) seine or chiromila (boat) seine, but only 10 mt/yr for liftnet units.

111) The industrial fishery traces back to the mid-1950s, when Greek nationals introduced the technique in Burundian waters. Purse seine units operated from larger ports throughout the lake in subsequent years, but are now concentrated in the southern portion. This fishery mostly targets *L. stappersii*, which account for about 95percent of the catch in recent years.

112) The drastic decline in industrial fishing in northern waters is reflected in the migration or retirement of many purse seine units. Of the 13 industrial units active in Burundi in 1992, only two were enumerated as active in the 1995 LTR FS and only one is known to be active at present. The remainder have either been decommissioned or have been shifted to Zambia in the south of the lake. The DRC has witnessed a similar decline in purse seining operations based in Kalemie and Moba, though this probably owes more to political instability than to adverse fishing conditions. In Tanzania the industrial fishery never developed to the same extent as elsewhere, but here too purse seining has fallen off in recent years. Of the four operational units enumerated in 1995, none are active at the present time.

113) Over the last 15 years or so there has been a ten-fold growth in purse seining effort in Zambian waters (from 3 to 30 active units since 1983), almost exclusively harvesting *L. stappersii.* The development of the purse seine fishery from the 1950s soon resulted in a substantial reduction in the harvest of other *Lates* species, i.e. *L. mariae, L. microlepis,* and *L. angustifrons*, all of which seem to be particularly vulnerable to localised over-fishing. Today's simple composition of the pelagic stocks, with two clupeids and *L. stappersii*, is one very striking outcome of the selective pressures imposed by the mechanised large-scale fishery.

114) The production of Zambian industrial units has shown a sharp decline within the last few years. Catches have dropped from 3,089 mt in 1997 to 1,988 in 1999. Annual catch per boat was 114 mt in 1997, 84 mt in 1998, and 76 mt in 1999.

115) At the other end of the lake, in the waters shared by Burundi and the DRC, signs excessive exploitation pressures on *L. stappersii* have also been registered. Owing to the cumulative effects of heavy industrial fishing followed by greatly expanded artisanal fishing. *L. stappersii* now make up only around 20percent of the commercial catch in northern waters. Furthermore, most of this proportion is comprised of juveniles.

116) It is notable that *S. tanganyicae* was the dominant target species of the purse seine fishery in the Zambian waters of the lake during the 1980s. Although the *S. tanganyicae* decline coincides with the expansion of purse seining in Zambia, the stock in northern waters, at least until recently, seems to have withstood decades of high fishing pressure in fairly confined areas. This strongly suggests that environmental factors have played a role in hastening the southern stock's decline. A succession of poor recruitment periods brought on by environmental perturbations can rapidly reduce the size of short-lived clupeid stocks.

117) LTR survey results confirm a more uniform lakewide distribution of the *L. miodon* stock in comparison with that observed for *S. tanganicae*. Catch composition observations indicate that *L. miodon* contribute less to the lift net and purse seine harvests than do *S. tanganicae* and *L. stappersii*. At the same time, *L. miodon* dominates catches in the highly unselective beach seine (= kapenta seine) fishery that

operates close inshore over shallow, sandy bottoms, particularly along the southernmost coastlines. Since juvenile *L. miodon* tend to be concentrated within the inshore areas beach seine hauls are mostly comprised of immature fish. The widespread use of very fine mesh covers on the seines further intensifies pressure on the immature stock.

2.3.3 Distribution of Fishing Effort

118) The disposition of fishing effort lakewide and on a country-by-country basis as reflected in the results of the 1995 LTR Frame Survey is summarised in Tables 2 through 4 below. These data, together with updated information collected during Mission field visits in April-May 2000, bring out the following main features of the contemporary distribution of fishing effort around Lake Tanganyika.

Table 2. 1995 Frame Survey summary results: Landing site, fishers, craft, and engine counts by country

Country	LandingSites	Fishers	Lamps	Dugouts [a]	Planked Canoes [a,b]	Catamarans [a,b]	Industrial Units [a]	Transport/Auxiliary Craft [a,c]	Other craft away at time survey	Engines
Burundi	54	2,021	2,444	46	642	630	3	29	56	241
DRC	417	26,308	7,712	2,553	5,471	1,389	22	1,095	877	415
Tanzania	208	12,510	7,635	577	2,836	1,213	4	146	90	494
Zambia	107	4,118	2,588	46	1,490	28	23	--	90	114
Lakewide totals	786	44,957	20,379	3,222	10,439	3,260	52	1,270	1,113	1,264

[a] Figures include limited number of inactive/broken vessels. These latter amount to some 12% of the overall vessel total lakewide. [b] Figures include limited number of metal and fibreglass vessels. [c] Transport/auxiliary craft included with planked canoes in Zambian count.

Table 3. 1995 Frame Survey summary results: Fishing density measures by country

Country	Coast km	Landing Sites/10km	Fishers/ 10km	Lamps/ 10km	Craft/ 10km	Inactive/ broken craft/ 10km	Engines/ 10km
Burundi	159	3.4	127	154	88	21.7	15.2
DRC	795	5.2	331	97	143	9.5	5.2
Tanzania	669	3.1	187	114	73	13.6	7.4
Zambia	205	5.2	201	126	82	12.2	5.6
Lakewide totals	1,828	4.3	246	111	106	12.4	6.9

Table 4. 1995 Frame Survey summary results: Artisanal and traditional gear counts by country

Country	Chiromilla seines	Day beach seines	Night beach seines	Std. lift nets	Apollo lift nets	Lusenga nets	Gill nets	Long lines[a]	Hand lines	Traps
Burundi	0	16	0	438	101	37	196	9	193	0
DRC	0	601	0	1,350	23	8	237	12,630	--	9
Tanzania	0	496	0	1,158	4	271	2,917	410	6,747	0
Zambia	16	30	154	27	0	0	2,950	24	731	4
Lakewide totals	16	1143	154	2,973	128	316	6,300	13,073	7,671	13

[a] Longlines and handlines enumerated together in DRC.

119) The DRC portion of the lake, which contains the largest proportion of the total shoreline (43%), accounts also for the highest proportions and greatest densities (per 10 km of coast) of landing sites, fishers, lamps, and vessels.

120) Burundi, with the smallest proportion of total shoreline (9%), also hosts the smallest proportions of landing sites, fishers, lamps, and vessels. At the same time, it contains the highest densities of lamps and engines per 10 km of shoreline. Although Burundi registers as having the second highest density of vessels, it also ranks first by a wide margin as having the highest density per 10 km of shoreline of inactive/broken craft.

121) Out of the some 17,100 vessels in active service, wooden planked canoes constitute by far the most common (≈60%) type, followed by catamaran and dugout units (19% each). Industrial units make up less than 1percent of the lakewide fleet. Catamarans figure most prominently in the Burundi (48%) and Tanzania (26%) fleets, and dugouts appear to be most popular in the DRC (27%).

122) Of traditional gear, lusenga scoop nets are most commonly encountered in Tanzania, gillnets in Tanzania and Zambia, longlines and handlines in the DRC and Tanzania. Traps appear to be extremely rare according to the 1995 FS returns, although a later survey that focussed more specifically on the inshore fishery showed that they are in fact fairly common (Lindley 2000).

123) Lift nets dominate the artisanal gear kit except in the case of Zambia, where the kapenta or night beach seine rates as the most common. The higher capacity Apollo lift net is mostly limited to Burundi waters, and the chiromilla seine (of Lake Malawi derivation) is restricted to the Zambian portion of the lake. Day beach seines represent about 30 percent of artisanal gear units in both the DRC and Tanzania, but are far less important components of the overall gear kit in Burundi (3%) and Zambia 13%).

124) Almost half of the industrial units enumerated in 1995 were reported as non-operational. At the present time (mid-2000), all active industrial units with the exception of one in Burundi (Rumonge area) are operating in Zambian waters, from bases in Mpulungu and Nsumbu.

2.3.4 Post-harvest Sector

125) Processing, distribution, and marketing patterns associated with the Lake Tanganyika fisheries are not nearly as well documented as the harvest sector. The remote location of most landing sites, the steep escarpments along much of the shoreline, and a general lack of transportation infrastructure impose severe constraints on both processing and marketing possibilities.

126) Roads running parallel to the coast are only found in Burundi and along stretches of shoreline in Uvira and Fizi districts in the DRC. Other major roads link principal towns like Kigoma, Kalemie, Moba, and Mpulungu with their hinterlands but are not effectively served by feeder roads from outlying landing sites.

127) A rail link exists at Kigoma, with service to Tabora (connections to Mwanza and Mpande on the Central Line) and Dar es Salaam. In Kalemie the railway connection to Lubumbashi and the Shaba mining districts no longer operates due to the civil war that has affected large parts of eastern DRC.

128) Furthermore, electricity supplies and other amenities needed to support energy-intensive techniques of fish handling and processing (chilling or freezing) only exist in the largest towns. The most developed facilities are to be found in Mpulungu, where nine companies are currently running freezing operations. Two other Zambian-based fishing companies have facilities in Nsumbu (one in operation, one dormant). Industrial processing facilities also exist at Kalemie, but they are reportedly not in operation at the present time due to the civil war.

129) Generally speaking opportunities for trade in fresh fish are limited to localities in the immediate vicinity of landing sites except for places situated close or within easy road access of major population centres. Thus most fish caught in Burundi waters is sold fresh in the Bujumbura market. The bulk of the catch landed at most sites, however, must be processed in some fashion in order to extend its shelf life for marketing purpose.

130) Simple sundrying on the beach or ground is easily managed under local conditions, as it requires few inputs other than labour. The use of elevated racks, which provide a cleaner product, is not widespread. Sundrying is the most common method of processing clupeids and small *L. stappersii*. Smoke curing is commonly used for processing larger *L stappersii* and cichlids, but demands large quantities of fuelwood. Deforestation is consequently a significant problem around major fish landings.

131) For residents of the vast majority of landing sites along the lakeshore non-existent or poor and irregular overland transport links are historical conditions that have tended to maintain reliance on the lake itself as the main 'highway' of travel and commerce. A substantial tonnage of dried and smoked fish moves up and down the Tanzanian shoreline between Burundi in the north and Mpulungu (Zambia) in the south. Most of this traffic is carried aboard the two passenger/cargo vessels operated by the Marine Services Company Ltd. of Tanzania (formerly the marine branch of the Tanzania Railway Corporation), the *MV Liemba* and *MV Mwongozo*. Large motorised transport dhows or 'water taxis' also carry smoked and dried fish, mainly from Tongwe (60 km south of Kigoma) in Tanzania to Rumonge (70 km south of Bujumbura) in Burundi, and Uvira in the DRC.

132) Although reliable statistics are lacking on the volume of product flow along the various marketing channels that reach beyond the lake basin, the major outlets for dried and smoked fish are long established and well known. According to statistical returns obtained by the Mission from the Marine Services Company Ltd. in Kigoma and the Mpulungu Harbour Corporation Ltd, it can estimated that from 1 to 2 thousand mt of dried sardines and *L. Stappersii* are shipped north along the Tanzanian shoreline every year, whilst from 2 to 7 thousand mt of mainly sardines (from both Lake Victoria and Lake Tanganyika) along with some *L. stappersii* are shipped south along the same route. In addition to the mining districts of Shaba Province in the DRC and the Zambian Copperbelt supplies reach the Dar es Salaam market through the railway connection from Kigoma. North of the lake Bukavu and Goma in the DRC and towns in Rwanda have in the recent years become very important market destinations.

133) Hundreds of fishmongers are involved in the trade of dried and smoked fish at different scales of operation. The largest operators have the financial capability to buy up multi-tonne consignments of fish at low prices and to transport them to distant points in the Copperbelt and Shaba mining districts where they can be sold at very substantial profit. Smaller traders operate more locally, buying modest consignments at

various landing sites and selling them in nearby markets or to other traders destined for town or urban centres of demand.

3. PROGRAMME AREA

3.1 Location and Physical Setting

134) The surface of Lake Tanganyika lies at an altitude of 773m and stretches in a generally north to south orientation between the narrow confines of the steep eastern and western escarpments of the Rift from 03°20'30"S to 08°48'30"S latitude. The lake averages almost 50 km in width and runs to a total length of 673 km. The lake's shoreline substrate has been classified as: rock (43%), sand (31%), mixed rock/sand (21%), and marsh (5%).

135) Lake Tanganyika has a mean depth of 570m. Maximum depths are found in the 'deeps' of the major northern and southern basins (1,310m and 1,470 respectively), which may in turn be divided into the several sub-basins listed in Table 5. As noted by Coulter and Spigel (1991:49), 'Despite high water temperatures (23.25 - 27.25°C), thermal stratification is well marked and varies seasonally above an apparently permanent anoxic hypolimnion. The lake can be classified as meromictic.' Table 6 summarises additional data on the allocation of surface area and shoreline frontage between each of the lacustrine states.

Table 5. Lake Tanganyika: Geomorphological features

Major Basin*	Latitude Range	Sub-basin	Length	Width	Max. Depth
North-Tanganyika Trough	03°20' - 05°40' S	Bujumbura	70 km	25 km	350 m
		Rumonge (Karonda area)	80 km	35 km	1150 m
		Kigoma	170 km	80 km	1310 m
South-Tanganyika Trough	06°50'S – 09°S	Kalemie	130 km	40 km	800 m
		Moba	70 km	50 km	600 m
		East-Marangu (Kipili area)	120 km	30 km	1470 m
		Mpulungu	100 km	25 km	800 m

* Adapted from Mannini (1998), after Tiercelin and Mondeguer (1991).

Table 6. Lake Tanganyika: Division of national waters and shorelines

Country	Latitude Range	Lake Area (km^2)	Lake Area (%)	Shoreline (km)	Shoreline (%)
Burundi	03°20'30"S - 04°26'40"S	2,600 km^2	8%	159km	9%
DRC	03°21'00"S - 08°13'40"S	14,800 km^2	45%	795km	43%
Tanzania	04°26'00"S - 08°36'00"S	13,500 km^2	41%	669km	36%
Zambia	08°13'40"S - 08°48'30"S (West shore)	2,000 km^2	6%	215km	12%
Lakewide totals	03°20'30"S - 08°48'30"S	32,900 km^2	100%	1,838km	100%

136) The lake region features two main seasons. The wet season runs from October/November to May, and is characterised by weak winds, high humidity, heavy rainfall and frequent thunderstorms. The dry season lasts from June to September/October and is characterised by moderate precipitation as well as strong and regular southern winds.

137) These major climatic patterns and particularly the winds, regulate the seasonal thermal regime of the lake, evaporation, water flows and the vertical mixing and transport of water masses. Hydrophysical phenomena are primary regulators of the spatial and temporal patterns of biological productivity.

3.2 Socio-Economic Setting[4]

138) The tens of thousands of boat and equipment owners/operators and crew active in the harvest sector represent a first tier of fisheries employment and income generation. Secondary fisheries-generated employment has also to be taken into account. Local processors and traders, long-distant transporters and marketeers, and various others who provide services and support at landing sites and throughout the distribution chains are reckoned to number in the hundreds of thousands. And if the individuals tied to the families and households of all of these operators and service providers are considered as well, it can be reckoned that some one million people living around Lake Tanganyika – about one-tenth of the estimated population of the entire lake basin -- are directly dependent on the fisheries for their livelihoods.

139) LTR Project SEC survey findings confirm that lakeshore communities are generally characterised by conditions of weak and deteriorated physical infrastructure, and of a critical scarcity in basic social services and amenities. The communities bordering Lake Tanganyika clearly share in the conditions that, on the basis of various 'quality of life' indices, have ranked East-Central African countries amongst the world's most poverty-stricken and underdeveloped.

3.2.1 Burundi

140) Burundi is a small (27,834 km^2) landlocked country with relatively few natural resources and one of the highest population densities (230 persons per km^2) on the continent. The national population, estimated at 6.6 million in 1997, grows at an average of 2.6 percent per year, a rate that will almost double the number of people within the next 25 years. Pressure on the country's very limited land base thus continues to mount. Estimated GDP per capita for 1997 was $180, amongst the lowest of all African countries.

141) About 94 percent of the population lives in rural areas and the economy depends almost entirely on agriculture. Until the recent period of conflict, the country was self sufficient in food and could export within the region. Coffee provides around 90 percent of foreign exchange revenue from exports.

142) Economic sanctions imposed after the 1996 *coup d'état* further worsened the situation, creating hardship for the bulk of the population. Deterioration in quality of

[4] Data on regional and national socio-economic conditions described in this section are derived primarily from World Bank country reports and LTR Technical Documents.

life is apparent through a variety of socio-economic indicators. Immunisation coverage and rates of primary school employment for children have declined sharply. There have been dramatic increases in malnutrition (wasting amongst children under five), reported cases of endemic diseases, and HIV prevalence. Poverty has worsened sharply: the World Bank estimates that rural poverty has increased by 80 percent in recent years, and that the incidence of urban poverty has doubled. Poverty depth is thought to be amongst the greatest in sub-Saharan Africa.

143) The conflict and the embargo have affected agriculture through looting and destruction of households goods and livestock, displacement of populations and collapse of distribution channels for agriculture inputs. Fisheries activities also suffer from the current situation. The military authorities have from 1996 imposed various restrictions on the scale and location of fishing operations. Fishing was stopped altogether from 26 September 1999 to 9 February 2000. Since then, only four landing sites have been opened. Before 1996, over fifty landing sites of various sizes were in operation.

144) In urban areas many unskilled workers have been laid off from formal private sector enterprises, in response to a drop in industrial GDP of almost 60 percent since 1992. The urban informal sector has also suffered, as enterprises have closed due to difficulties in the supply of materials from abroad and from the interior of the country.

145) The national economic situation has shown some limited signs of improvement in some areas in the last few years. There have been modest gains in industrial production, and the average inflation rate has dropped from 31.1 percent in 1997 to 12.6 percent in 1998 and 7.5 percent in 1999.

146) Fisheries in Burundi contribute only an estimated 1 percent to the country's agricultural GDP and 0.5 percent to its global GDP. Although these figures suggest that fisheries play but a minor role in the national economy, their significance as a source of food and, particularly along the Tanganyika lakeshore, as a source of employment, is very substantial. Fish represents close to 30 percent of the total animal protein available in the national food supply, and in many areas it is of vital significance for the nourishment and indeed survival of local inhabitants.

3.2.2 Democratic Republic of Congo

147) The DRC is a vast country of 2 364 200 km^2 extending across the Congo River basin from the Rift Valley lake region in the east to the Atlantic Ocean in the west. It has the second largest land area and the third largest population (some 48 million estimated in 1997) in sub-Saharan Africa. From 1991 through 1997 the estimated average annual rate of population growth was a relatively high 3.1 percent. At its current rate of growth the national population will more than double (to about 103 million inhabitants) over the next 25 years.

148) The country is richly endowed with forests, good agricultural land, rainfall, and a variety of mineral resources. Mineral and petroleum extraction have been principal sources of export revenues in the past, and formerly contributed about one quarter of the country's GDP. However, the formal economy has hardly functioned in recent decades owing to prolonged mismanagement, maladministration, and civil strife. Estimated GDP per capita for 1997 was a mere $131.

149) The overthrow of the previous regime in 1997 and the coming to power of the Kabila government brought a period of some positive developments in the form of

currency stabilisation measures, regularisation of revenue collections, and other reconstruction measures.

150) But a new outbreak of hostilities in the eastern regions of the country from late 1998, involving national factions supported by intervening forces from various regional states, has again raised questions about when the country will attain a state of good governance and socio-economic health.

151) World Bank assessments call for a far-reaching programme of assistance in support of reconstruction and development in the DRC, including financial and monetary reform, rehabilitation of infrastructure and social sectors, provision of credit lines and import financing to help 'jump-start' the economy, capacity building, return of expatriate Congolese, political and judicial reform, and the general restoration of civil society. Such measures will be difficult to organise and implement, however, until an enduring resolution of current hostilities is achieved.

152) The poor economic climate has led to physical deterioration of the fishing fleet due to lack of maintenance, spares, fuel supplies, etc. Yields from the inland fisheries are thought to be substantially depressed from previous levels due to shortage of essential inputs and marketing difficulties related to infrastructure breakdowns.

3.2.3 Tanzania

153) Tanzania currently (1997 estimate) hosts a population of 31.3 million inhabitants, and has an average annual population growth rate of 2.9 percent. At its current rate of growth the national population will more than double over the next 25 years. The country is very large, having an area of 945 087 km^2 (942 626 km^2 mainland; 2 461 km^2 for the islands of Zanzibar and Pemba combined). Estimated GDP per capita (1997 figure) is US$ 214.

154) The overall economic performance of the country was good in 1999: GDP grew by 4 percent, compared to 3.3 the year before. The inflation rate, which declined steadily since 1998, reached 8.9 percent in April 1999 and was close to 7.5 percent at the end of the year.

155) Available economic indicators show that the sectors, which recorded the highest GDP growth, were mining (27.4%) followed by tourism (13.7%) and construction (12%).

156) Agriculture, which represents 49.1 percent of GDP, recorded a 2 percent increase, compared with 2.5 percent in 1998. Despite some negative effects brought on by the el Nino phenomenon, weather conditions have generally been favourable for agricultural production during recent years.

157) Nevertheless, the continuing weak performance of the sector overall suggests wider problems of productivity. The fall in the real producer price of tradable crops of between 25-70 percent during the period 1993-1998, coupled with the negative impact of structural reforms on production input supplies, marketing and credit, have had a disincentive effect on farmers.

158) Main agricultural products are maize, sugar cane, coffee, tea, and cotton. Natural resources also make an important contribution to the national economy, and the forestry, fisheries, bee keeping and game/wildlife sectors all recorded moderate achievement in 1998-1999.

159) However, the fisheries sector suffered following the European ban on importation of fish products from the East African countries imposed on March 1999. As a result, export from Lake Victoria decreased more than 50 percent (from 80 to 36 tons per day). Fish processing industries cut their workforce by 40 percent, and 20 percent of the fisher population left the trade.

3.2.4 Zambia

160) Zambia is a very large and landlocked country comprising an area of 740 720 km^2 and hosting a population of some 9.4 million people. Annual population growth is 2.7 per cent. At its current rate of growth the national population will nearly double (to 18.3 million inhabitants) over the next 25 years. GDP per capita is estimated (1997 figure) at US$ 404.

161) The economy historically is based on mining of copper and other metals, which together account for around 75 percent of export earnings. In the early 1970s, however, a combination of factors including a collapse of the international copper market, sharp spikes in the price of oil, statist economic policies, and declining agricultural production brought on a long period of economic reversal that has been crippling in its effects. Between 1974 and 1990, per capita income fell at an annual rate of almost 5 percent.

162) Despite moves by Government in recent years to introduce a series of market-oriented reforms (e.g. reduction of state ownership or control in key productive sectors, price deregulation and elimination of subsidies, removal of exchange controls, and liberalisation of import restrictions and procedures), the country still has a long way to go in recovering from this protracted economic decline.

163) Fishing is of major economic importance to Zambia, representing the third largest occupational sector after farming and mining. Available figures indicate that some 40,000 small-scale fishers are active throughout the country, and that some 70 commercial fishing companies are operating on the Kariba reservoir or on Lake Tanganyika. It is estimated that as many as 300,000 Zambians are involved in fisheries-related employment. Fishing is the single most important source of food and employment for all those living near major water bodies, including rivers, swamps, and floodplains. At the national level, fish provides the most important source of animal protein, and is of particular importance as a high quality food for lower income groups.

164) After several decades of expanding fishing activity, there appears to be little room for further development of Zambia's capture fisheries. Particular concerns have been raised with reference to the traditionally rich fisheries of the northern regions. It is apparent that national fisheries planning and management policy now needs to concentrate more on efforts towards rehabilitation, environmental protection, and adoption of responsible fishing practices. Improvement of processing, distribution, and marketing procedures, including transportation infrastructure, would ensure more efficient performance in the post-harvest sector through supply of greater volumes of high quality product to the consumer.

3.3 Gender Issues

165) Results of the 1997 LTR SEC sample survey of artisanal and traditional fishers (N = 923) and post-harvest operators (N = 431) at 66 landing sites around the lake indicate that local fishers of all categories (artisanal or traditional, unit owner or crew member) are almost exclusively men.

166) Women are much more active in the fisheries post-harvest sector around the lake, and even appear to constitute a majority of the small-scale processor/trader population in Zambia and parts of the DRC. Survey data indicate that post-harvest operators, in comparison to their harvest sector counterparts, tend to be younger and to have a lower overall level of education -- particularly amongst women. As with the fisher population, post-harvest operators are usually involved in the fish business as a main occupation, though are typically engaged in secondary jobs either in some other fishing-related activity (e.g. gear owner) or in farming.

167) The 1997 SEC survey data show that earnings amongst artisanal operators are substantially higher in most places than those of either traditional fishing operators or processors/traders, and that artisanal unit owners earn substantially more than their crew members and helpers. Post-harvest income levels appear to be generally lower than those of the harvest sector, especially in comparison with levels found in the artisanal fishery.

168) Based on LTR survey data and World Bank figures, it is estimated that average income for women in some cases runs well below national per capita averages. For the Kigoma Region post-harvest sector, for instance, a strong gender-related discrepancy is apparent. Income estimates showed that a majority of male processors/traders were earning some US$ 340 per year (similar to artisanal crew earnings), but that a majority of their female counterparts were earning about US$140 per year (less than half of the estimated national working age average; estimates based on World Bank figures).

169) The gender dimension of socio-economic inequality in local communities can be seen not only in terms of educational attainment and estimated income measures, but in terms of civic participation as well. Although they have a very high profile in the Tanganyika and other regional fisheries as workers, processors, traders, and even occasionally as boat and gear owners, women do not seem to play a concomitant role when it comes to participation in local public decision-making processes. As a class they appear to be subject to some of the same disadvantages as those who serve as crew and helpers (but not boat and gear owners) in the harvest sector—namely, subordinate social status and poor pay.

170) Initiatives to improve the welfare and earning of women by means of co-operative activities including micro-credit schemes are being taken in many localities throughout the region and around the Tanganyika lakeshore, often involving partnerships between international and national NGOs and local community groups. The Mission noted in particular the activity of a local NGO in Kigoma known as the Kibilizi Women Development Trust, which is working with a local group to dry and market small pelagic dagaa. Drying racks have been constructed with the aim of obtaining a cleaner and better quality product with a higher market value.

4. THE PROGRAMME

4.1 Objectives

171) The overall objective of the Tanganyika Regional Fisheries Programme (TREFIP) is implementation of the Framework Fisheries Management Plan (FFMP), as endorsed by the CIFA Sub-Committee for the Management and Development of the Fisheries of Lake Tanganyika, at the Eighth Session of the Sub-Committee held in Lusaka, Zambia, in May 1999.

172) Previous studies conducted under the research programme of the LTR project have shown that areas of localised overexploitation are developing in the lake, especially in the extreme southern and extreme northern portions. Latest assessments of the situation point to a worrisome decline in production, which is particularly noticeable in the industrial sector.

173) Moreover, existing conditions of free access to the resource base perpetuates the risk of still greater increases in fishing effort, as new fishers recruit themselves to the estimated 45,000 (1995 figures) population of artisanal and traditional gear operators. In the absence of clear and definite measures, fishing activity may become non-profitable and untenable over much of the lake within the very near future, depriving thousands of households of their main source of income.

174) Implementation of the FFMP would reverse present trends by encouraging sustainable fisheries development, protection of the aquatic environment, and the maintenance of a diverse ecosystem. It would thus secure Lake Tanganyika's continuing role as a major pillar of regional food security now and for the sake of future generations.

175) In accordance with the CCRF principles upon which the FFMP is based, realisation of the overall objective will require a combination of normative orientations and practical measures featuring:

- adaptive or interactive management practices that allow for adjustments in fishing pressure;
- multi-disciplinary monitoring capability for measurement of continuity and change across a range of bio-physical and socio-economic parameters, as appropriate to the complexities of ecosystem – human system interactions;
- partnerships with local stakeholder groups in management decision-making and in fashioning modalities of enforcement and compliance;
- allocation of access and fishing rights to local communities; and
- use of integrated development strategies and coastal area management models in order to accommodate interplay and possible conflicts between fishing and non-fishing activities and to reduce pressure on the fishery resource base through economic diversification.

176) Major emphasis will be directed towards improving living conditions of fishing communities around the lakeshore. This will involve partnerships with local residents to undertake actions first to improve performance and management conditions directly within the industry itself, and secondly, on the village level, to improve facilities and amenities that are generally lacking or insufficient.

4.2 Programme outputs

177) The Programme aims at reaching six major outputs, as follows.

- Output 1: implementation of co-management mechanisms;
- Output 2: improved infrastructure within pilot villages and strategic marketing centres;
- Output 3: protection of stocks and biodiversity;
- Output 4: improved fisheries legal regimes and MCS capabilities;
- Output 5: more effective use of scientific advise for management; and
- Output 6: establishment of a regional fisheries management entity.

4.2.1 Co-Management System

178) The FFMP stipulates that long-term sustainability of the Lake Tanganyika fisheries will require establishment of partnership mechanisms so that local resource stakeholder groups develop a sense of direct interest in and exercise responsibility for management decision making and compliance. As distinct from the 'top-down' orientation of conventional fisheries management regimes, where a high degree of state intervention and control is involved, approaches that emphasise 'co-management' (also labelled 'management in partnership,' 'participatory management,' or 'community-based management') are more likely to increase the efficiency and implementability of management measures because local interested parties have had a hand in crafting them.

179) A further advantage realised with the co-management approach is its potential for reducing enforcement costs for regional fisheries administrations, all of which labour under severe financial and operational constraints. From a fisheries management standpoint, to the extent that local stakeholders are able to assume responsibility for MCS and enforcement tasks, more would be accomplished at cheaper cost – and accomplished with greater effectiveness.

180) As is clear from LTR socio-economic investigations, the scope and pace with which co-management partnership arrangements can be implemented around Lake Tanganyika will depend on specific circumstances. For one thing, local views on co-management possibilities differ to some extent between countries and localities within countries. Differences also exist in fisheries and environmental circumstances from place to place, and in terms of attitudes various communities have towards possible combinations of regulatory measures (e.g., licensing, gear, and space-time restrictions) to be implemented.

181) The Programme will therefore initiate actions to establish co-management mechanisms in a gradual rather than wholesale fashion, by working through a series of undertakings at selected landing sites within pilot 'Community Fisheries Management Zones' and establishing the feasibility and replicability of specific mechanisms before encouraging their adoption on a lakewide basis. Pilot co-management zones will be identified by a Programme task force working in consultation with local community representatives and in collaboration with national district and regional Government and NGO officials involved with services related to natural resources (fisheries, forestry, tourism and wildlife), agriculture (crops, livestock), and community welfare (health, water, education, commerce, and security).

182) Pilot zones will be identified on the basis of several considerations, including logistical feasibility (possibility of regular access for outreach and monitoring activities) and the typical fisheries-related conditions and problems that need to be addressed. These latter include, for example, high effort density, indications of overexploitation/ use of destructive gear, proximity to lakeshore/aquatic reserve areas or areas suitable for designation as such, and low levels of infrastructure/service development. Findings generated from the 1997 LTR lakewide SEC survey will be useful for the pilot zone identification exercise.

183) It is foreseen that pilot co-management arrangements involving the formation of 'Local Fisheries Councils' will initially be implemented in some 20 or about 2 - 3 percent of the total number of landing site villages lakewide, as enumerated during the LTR FS in 1995. Based on experiences and lessons learned during the first year of

operation, the pilot co-management activity would then be expanded in stages over the next four years, so that by End of Programme (EOP) about 200 or 25 percent of landing sites lakewide would be included in the programme.

184) Co-management arrangements at each site will involve several interrelated components. In addition to facilitating the community education and outreach activities needed to build levels of environmental consciousness and receptivity to measures for the regulation of resource access and exploitation, the Programme will also facilitate direct partnership actions in support of responsible fishing practices and improvement of local welfare. Within an agreed national and regional framework of policy and policy instrumentation (see Section 4.2.4 below), these actions will include:

- initiation of new forms of license and fish levy revenue allocation to both local groups and official fisheries agencies in combination with the establishment of micro-credit schemes to mobilise and disburse locally needed development and operational funds.
- adaptation and introduction of appropriate measures to control fishing mortality and control access within community-based fishing zones, and of the compliance mechanisms needed to ensure the effectiveness of these measures;
- adaptation and introduction of appropriate capture gear in conjunction with the phasing out of destructive fishing practices;
- adaptation and introduction of processing equipment for production of better fish products; and
- operation of social service amenities such as schools, health centres/dispensaries, potable water supplies, latrines, etc., rehabilitated or constructed under the Programme workplan (see below).

4.2.2 Improved Infrastructure and Services

Local post-harvest sector facilities and services

185) In most cases around the lakeshore small pelagic clupeids are spread out on sand or gravel to dry in the sun. This practice tends to result in a product loaded with grit and other contaminants. Partly as a result of the work of earlier fisheries projects and partly due to spontaneous undertakings by some local processors, drying tables and concrete slabs are found in several places around the shoreline and are used to make a cleaner, grit-free product sometimes known as ‘dagaa safi’ (Kiswahili for ‘clean sardines’)

186) In some instances also the clupeids are lightly brined and/or smoked before drying. Salting, with or without smoking, has the effects of:

- reducing drying time;
- increasing shelf life;
- cutting loss from product breakage and fragmentation (fish stays firmer); and
- creating a brighter, more appealing product appearance.

187) At least at some marketing points, these cleaner products command a better price than conventional sundried clupeids. It has also been observed in such places ‘dagaa safi’ they have a considerably higher market turnover rate, i.e. are bought up much quicker than the conventional product.

188) Training and extension services will be provided under the regional programme to encourage the wider use of these processing techniques, and to build consumer preference for the improved products they yield.

189) By EOP, it is expected that the quantity of Lake Tanganyika 'dagaa safi' being sold at the major retailing outlets of Uvira, Bujumbura, Kigoma, Dar es Salaam, the Copperbelt, Lubumbashi, and Mbujimayi will have increased by a substantial margin.

190) It is estimated by the Mission that this product now accounts for less than one percent of the total amount of dried clupeids delivered at these major marketing centres. It is anticipated that this figure will have risen to a range of from 10 to 20 percent by EOP.

Pilot village infrastructure and services

191) Socio economic surveys carried out in recent years under the auspices of the LTR project included an inventory of basic commercial, social, and technical services and facilities. Although conditions vary between countries, surveys revealed a generally weak array of amenities and infrastructure in all national sectors.

192) Schools, medical facilities, retailing establishments, input suppliers and servicing agents, protected water supplies, electricity, telephone/radio links, post offices, banks, fisheries extension staff, and local fisher organisations were most poorly represented in Zambia, followed by Rukwa Region (Tanzania), Kigoma Region (Tanzania), and the DRC and Burundi sites. Protected water supplies, electricity, telephone/radio links, post offices, and banks are absent at nearly all sites in all countries.

193) When respondents were asked to talk about their most pressing community development needs during the 1997 LTR survey interviews and the 1998 LTR Community Referenda exercise, schools, health centres, and potable water supply systems were most frequently cited.

194) The Programme through each of its national projects will, in partnership with pilot village residents, construct or rehabilitate the physical infrastructure needed for these and similar services, to be operated and maintained through local participation.

195) By EOP it is expected that in every pilot village at least one major facility will be completed and functional.

Strategic marketing centre infrastructure and services

a) Roads

196) Most transport of fisheries products from lakeshore landings to major marketing centres is by boat or road, with the exception of the railway line linking Kigoma to Dar-es-Salaam. With the notable exception of Burundi, which is served by a tarmac road along almost the full length of its Lake Tanganyika shoreline, feeder road links around the lake are poorly developed and the roads that do exist generally suffer from a marked lack of maintenance.

197) This state of affairs increases delivery times and affects the quality and hence the value of highly perishable fishery products. Rough conditions also imply high vehicle operation and repair costs for transport operators.[5]

[5] In Tanzania, for example, it was estimated at a recent transportation conference held in Dar-es-Salaam that 65% of the national road network is in poor shape, resulting in lost economic opportunities and increased vehicle operating costs amounting to TShs. 365 billion per year (speech by President Mkapa reported in *Daily News*, Dar-es-Salaam, 1 June 2000).

198) Furthermore, inadequate roads force those in remote landing sites to dry or smoke fish in order to preserve it long enough to reach potential buyers. This not only detracts from the value of the catch and increases handling costs, but, in the case of smoke cured products, results in heavy consumption of fuelwood and thus in deforestation around the lakeshore.

199) In order to ameliorate these conditions, the Programme will undertake to rehabilitate selected feeder roads, totalling some 70 kms, between key fisheries production centres and marketing centres within the four countries. Whilst these routes have been tentatively identified by the Mission (see Section 4.3.2 below), detailed design and cost estimates will be carried out during the initial stages of TREFIP implementation after further review of ongoing and/or planned road construction projects in the respective countries.

b) Jetties

200) The lake provides a critically important medium of transport for passengers and cargo, including fish, linking principal towns and transit points along the shoreline, including Uvira, Kalemie, and Moba (DRC), Bujumbura and Rumonge (Burundi), Kigoma, Tongwe, Kipili, and Kasanga (Tanzania), and Mpulungu and Nsumbu (Zambia).

201) Lake cargo is carried by a fleet of some dozen small to medium sized steel ships under both state and private company ownership, barges pulled by small tugboats, and locally constructed wooden dhow-type craft equipped with outboard engines.

202) At present the ports of Bujumbura (Burundi), Kigoma (Tanzania), Mpulungu (Zambia), and Kalemie and Uvira (DRC) are the only places with fully equipped berthing and cargo handling facilities, although some of these are not adequately maintained. The recently announced COMESA proposal for a Great Lakes Regional Railway will presumably lead to substantial improvements for the ports of Mpulungu and Bujumbura, since their rehabilitation is programmed as a first phase activity of the project.[6]

203) The only other cargo vessel facilities found on the lake are rudimentary jetty installations at Kasanga (Tanzania) and Nsumbu (Zambia). The former installation is used by *M/V Liemba* and *M/V Mwongozo*, medium sized mixed passenger/cargo ships of Marine Services Co. Ltd. of Tanzania, one or the other of which plies the eastern shoreline route along which the company runs a weekly service between Kigoma and Mpulungu. Nsumbu is not at present served by any regularly scheduled shipping service.

204) In view of the importance of traffic (including fisheries products) all over the lake, and the lack of road connections between the lakeshore and the hinterland, TREFIP includes a provision to build or renovate jetties at several strategic marketing/transit points.

205) The Mission has identified a number of sites where commercial potential warrants jetty development and where factors of access, shelter from prevailing winds, and water depth appear to offer suitable conditions for such development. Pending detailed engineering study and costing to be carried out in the preliminary stages of the

[6] The COMESA Kasama-Mpulungu-Bujumbura railway line proposal was announced after project meetings were held in Lusaka in the latter half of May 2000. Member states of the project include Zambia, Burundi, Rwanda, and the DRC. Initial upgrading of Mpulungu and Bujumbura ports as a first phase activity is projected to cost US$ 101 million (*Daily News* (Dar-es-Salaam, Tanzania), 22 May 2000.

programme, the Mission proposes that jetty construction initially be carried out at three sites in Tanzania and one in Zambia. The budget also makes provision for two jetties in the DRC and two in Burundi (see Section 4.3.2 below).

206) In addition to facilitating loading and off-loading of fish and agricultural products, these installations will substantially reduce the number of accidents and fatalities that regularly occur during transfers between ships and small canoes ferrying passengers to and from local landing sites.

207) Furthermore, and bearing in mind the importance of diversifying local employment and income opportunities, they are expected to enhance the traffic of tourists seeking to visit national parks and safari lodges in such places as Nsumbu (Zambia) and the Mahale Mountains (Tanzania).

c) Marketing facilities

208) Public market structures and services at major marketing centres around the lake are in dire need of upgrading. In some cases facilities are in a state of extreme disrepair, are completely congested with roughly constructed kiosks and sheds erected with no reference whatsoever to safety and fire prevention standards (yet apparently built under permission/licensing by local authorities), are ridden with filth and pests, and, with their poor drainage and pools of stagnant water, are perfect sites for the transmission of malaria and other water-borne diseases.

209) Aside from the obvious safety and health hazards these markets pose, their conditions make it impossible to maintain fish product quality and thus maximum product value.

210) Construction of new markets and the rehabilitation existing ones will substantially improve the quantity, quality and value of fish products sold, especially with regard to fresh product. It will furthermore provide far better working conditions for fish wholesalers and retailers, as well as acceptable safety, health, and product quality standards for consumers.

211) Major market improvement works are foreseen at twelve key centres around the lake (see Section 4.3.2 below). Facilities will be built or rehabilitated according to internationally accepted standards, and will insofar as local circumstances allow be designed along similar lines. Detailed design and engineering studies and cost assessments will be conducted after Inception of Programme (IOP).

212) Public market properties around the lakeshore are currently owned and operated by local authorities. It is foreseen that improvement works will only be undertaken with a strict and legally binding agreement that, once the newly constructed or renovated facilities reopen, they will be operated by private franchise holders who will pay the local authorities a fixed percentage (to be negotiated) of their stall rental and/or other fee collections. Revenue generated in this way will allow local authorities to fulfil their obligations in other public service sectors, including provision of market safety, hygiene, and health inspection services.

213) In order to further encourage the distribution, and marketing of fresh product, particularly for more remote fishing areas where keeping and transport facilities are presently inadequate, it is foreseen that the Programme will assist one or more private commercial firms to develop fresh fish collection services and infrastructure.

214) This will be managed by means of investment credits and will entail the redeployment of some industrial fishing boats out of the harvest sector to serve as fish

collection vessels, as well as acquisition and/or modification of necessary equipment (ice making machines, cold storage units, insulated transport boxes and refrigerated/insulated trucks/vans, etc.).

d) Electricity supplies

215) Fresh fish collection, storage, and onward distribution through marketing channels is severely constrained in some key localities by a lack of electricity needed to operate ice machines, maintain chill room temperatures, or produce and keep frozen product.

216) In some cases existing electricity supply grids are unreliable and/or under required capacity; in other cases there is no electricity supply at all.

217) TREFIP will, therefore, facilitate the installation of standby power units (medium capacity auxiliary generating sets) at appropriate sites, and will furthermore facilitate the installation of new township-level generating capacity where fish marketing has high commercial potential (see Section 4.3.2 below).

218) The Mission notes that provision of reliable electricity supplies will not only yield benefits directly to the fisheries sector in terms of gains to local fishers (improved prices for catch), local traders (improved storage and handling facilities), and local and distant consumers of Lake Tanganyika fish (greater availability and improved quality of fresh product). It will also help strengthen and diversify local employment and income opportunities in adjacent sectors, such as the food and beverage trade (supply of ice, availability of chilled storage, expanded business) and the tourist trade (improved and expanded lodge facilities, more clients).

e) Office and technical support facilities

219) The four national fisheries research stations are in need of various rehabilitation works and upgrades in order to function more effectively as providers of technical advice for regional resource managers. (More details are provided in Sections 4.2.5 and 4.3.5, which bear on Output 3 relating to 'more effective use of scientific advice for management.')

220) Building works are also envisioned at Bujumbura in order to expand the former headquarters of the LTR Project to serve as the TREFIP administration and co-ordination office, and eventually as the office of the proposed Lake Tanganyika Regional Fisheries Centre. (More details are provided in Sections 4.2.6 and 4.3.6, which bear on Output 6 relating to 'establishment of a regional fisheries management entity.'

4.2.3 Protection of stocks and biodiversity

221) Like the other great African lakes of Victoria and Malawi, Tanganyika features extremely high rates of endemism amongst the population of aquatic invertebrates and for both cichlid and non-cichlid fishes. (Indeed, the lake is famous in the international ornamental fish trade as a source of prized aquarium stock.)

222) Rates of endemism for cichlids (98%) as well as non-cichlids (57%) are similar to those from lakes Victoria and Malawi, both of which are like Lake Tanganyika in having a long history of geo-biological isolation (Beadle 1981; Lowe-McConnell 1969).

223) Tanganyika is unique however in that it is older and has been isolated for a longer period. These conditions have given rise to a wider divergence in the speciation of non-cichlid fishes, represented in eight endemic genera as compared to only one in Lake Victoria and none at all in any of the other African Great Lakes.

224) Scientific observers have noted that in addition to its wider array of cichlid genera (40 as compared to the 20 produced in Lake Malawi and the 4 present in Lake Victoria), Lake Tanganyika is also distinctive because of the diversity of aquatic fauna other than fish. Most invertebrate groups are represented by several endemic species, and in some cases entire genera as well (Beadle 1981:281).

225) As has been well documented through LTR and LTBP studies, the concerns that have long been expressed about threats to Lake Tanganyika's unique ecosystem are well founded. Direct threats to the integrity of the lacustrine system – i.e. to its ability to maintain biomass productivity and diversity – exist in the form of industrial and urban pollution (particularly in the vicinity of major ports), and overexploitation of the fisheries (particularly in the most northerly and most southerly portions of the lake).

226) Risks of overexploitation in some localities have been documented through fisheries-derived data, biological observations, and fishing practices studies (Section 2.3 refers). Evidence is available in the form of statistical series and field reports that demonstrate declining CPUE trends, increased juvenile content of catch over time, extensive deployment of small-meshed nets, and use of destructive fishing techniques.

227) Other more indirect but nevertheless potent threats to lacustrine system integrity and the viability of the fisheries are terrestrial in origin. Deforestation and cultivation of steep hillsides are constantly on the increase within the lake basin as ever growing numbers of people seek to meet their needs for fuelwood, charcoal, and cleared land for agriculture and settlement. These practices inevitably cause further erosion of soil in the Tanganyika watershed and silt deposition in the lake, with long-term detrimental effects for the fisheries.

228) Such basin-scale environmental degradation affects fisheries in another way as well. The loss of sustainability within forest and agricultural resource systems eventually leads to socio-economic displacements within the communities that have been exploiting them. Livelihood strategies that depend on alternative subsistence and income earning opportunities to fishing are thereby lost. This is precisely the opposite of what is needed as far as the sustainability of the Lake Tanganyika fisheries is concerned.

229) Ultimately, of course, it is the sheer pressure of population growth within the region – the loading of human biomass – that underlies processes of environmental degradation within the basin in general and threats to lacustrine ecosystem integrity in particular.

230) In order to help reverse trends towards overfishing of the lake and environmental degradation across the wider Tanganyika basin, i.e. to achieve the Output 3 requirement of maintaining a viable commercial fishery and protecting lacustrine biodiversity, TREFIP will facilitate action in three major areas.

231) First, existing monitoring procedures initiated under the LTR project will be strengthened and expanded to include more comprehensive coverage of catch levels and socio-economic parameters as well as a biodiversity component. These activities are also associated with Output 5, relating to 'more effective use of scientific advice for management'), and are more fully detailed in Section 4.3.5 below.

232) Secondly, working in close partnership with local stakeholders and fisheries, natural resources, and other relevant government officials, a series of lacustrine protected areas ('no take' reserves) will be established. Whilst the Mission has provisionally identified ten sites as candidate PAs on the basis of existing status (already within national park/ reserve boundaries) or probable importance as breeding and stock recruitment zones, final decisions as to location and extent of individual sites must obviously await detailed surveys and stakeholder consultation to be undertaken after IOP within the respective States (see Section 4.3.3 below).

233) Thirdly, a programme of environmental education will be developed and implemented in close collaboration with local resource users and national fisheries researchers and managers. The programme will rely heavily on video as well as posters, pamphlets, community workshops and other conventional formats for community outreach and awareness building. Programme content will be developed in local language versions insofar as possible (see Section 4.3.3 below).

4.2.4 Improved fisheries legal regimes and MCS capabilities at national and regional levels

234) Inventories of major fisheries legal frameworks within the four lacustrine States reveal that existing legislation, in some cases dating back to the colonial era, is in many respects outmoded or obsolete. Comprehensive overhaul is needed in order to relate it both to current realities of territorial and administrative organisation, and contemporary management imperatives.

235) Also, umbrella-type legislation that establishes broad regulatory powers for state authorities to exercise on a national basis needs to be supplemented with specific regulations to fit the particular circumstances of Lake Tanganyika.

236) The lake's ecosystem, including its pelagic stocks, exists and must be understood and managed as a unitary whole: it makes little sense to devise management approaches purely on a piecemeal, national jurisdiction-by-jurisdiction basis. Imposition of mesh size restrictions or the banning of beach seining, for example, will be of limited utility both in biological and social equity terms if the fishers or gear suppliers of an adjacent country are not subject to the same regulations.

237) Despite their involvement in the CIFA Sub-Committee structure, no provision exists in the current legislation of the respective lacustrine States for participation in regional efforts to guide resource use and conservation on an internationally shared basis.

238) Enforcement and compliance assurance are other major areas of legal deficiency. Fisheries regulations in all four lake States are widely ignored in practice, either because they are insufficiently enforced or because they are simply not enforced at all. The problem arises in part from the impossibility, under conditions of chronic financial constraints, for regional fisheries authorities to muster adequate numbers of enforcement agents in the field.

239) But even with substantially enhanced numbers of such agents, policing of the fisheries cannot be effective unless local stakeholders are inherently willing to co-operate. Genuine resolution of the enforcement and compliance problem, therefore, calls for full participation of local stakeholders in management decision-making and in MCS follow-up actions to ensure regulatory compliance.

240) By EOP, TREFIP will have facilitated harmonisation of fisheries legislative frameworks and elaboration of specific regulatory measures for Lake Tanganyika, and the upgrading of MCS competencies along mutually agreed lines, through provision of technical assistance at both national and regional levels (see Section 4.3.4 below).

4.2.5 Improved use of scientific advice for management

241) At the beginning of the LTR project it was apparent that fisheries monitoring and information processing capabilities at some of the lakeshore stations were extremely weak. Extensive collaborative work with national administrators and researchers was conducted in order to strengthen these capabilities and to assemble the sort of information base that is a first requirement of fisheries planning and management.

242) The LTBP also initiated monitoring activities covering biodiversity and sediment discharge at various sites within each country. For biodiversity monitoring, four sites per country were established, including one relatively pristine control site and three others known to be subject to one or more threats to biodiversity from pollution, sedimentation, and over-fishing. For sedimentation monitoring, hydrometric stations were set up on major rivers and river mouth sites.

243) After the completion of the main LTR hydrobiological and socio-economic research programme in 1998, plans were put in place to carry on with an extended monitoring programme under national agency execution. The Lake Tanganyika Fisheries Monitoring Programme (LTFMP), as it came to be known, seeks to collect and collate basic data through weekly sampling trips mounted from the former LTR sub-stations at Bujumbura (combined operations with personnel from the Uvira station in the DRC), Kigoma, and Mpulungu.

244) The objective is to continue studying a limited set of abiotic and biotic ecosystem parameters that are key indicators of the lake productivity. Thus, basic meteorological and limnological variables are routinely measured to provide indications of long term trends in primary productivity. Density and distribution patterns in the meso- and macro-zooplankton communities are monitored because they correlate with local fish abundance, and CPUE and fish biology data for main target species are collected in order to track changes in exploitation levels and patterns.

245) The Mission notes however that the LTFMP remains too limited in scope. It cannot as presently constituted provide the range of coverage, particularly in regard to comprehensive catch assessment and socio-economic parameters, to meet the long term information needs of a regional management process for Lake Tanganyika.

246) Furthermore, donor funding is only available to support LTFMP activities through the year 2001, and it appears highly doubtful if the respective national fisheries research and administrative authorities will, given their severe budget shortages, be able fully to provide for the activity in the immediate future.

247) It is also noted that continuation of monitoring activities initiated under the LTBP appears to be in doubt.

248) Since planning and management processes for Lake Tanganyika fisheries will be impossible to pursue in future unless a regular lakewide monitoring programme is kept in place, TREFIP intends, through provision of technical assistance, training, and facility upgrades (see Section 4.3.5 below), a) to build on the monitoring activities initiated under LTR and LTBP by b) further strengthening statistical capabilities within the respective national fisheries agencies responsible for Lake Tanganyika, and c)

consolidating an institutionalised basis for co-operation between the respective agencies.

4.2.6 Establish a regional management entity

249) LTR assessments confirm that the fisheries authorities of Burundi, DRC, Tanzania, and Zambia are all strong advocates of enhanced regional co-operation for the management of Lake Tanganyika fisheries.

250) Past commitment to regional co-operation has been demonstrated through the participation of all four States in the CIFA Sub-Committee for Lake Tanganyika, which was established under FAO auspices in 1978. The Sub-Committee has provided an important forum for technical discussions on many aspects of the Tanganyika fisheries, and through its recommendations was instrumental in launching the LTR project as one of the most ambitious, comprehensive research efforts ever undertaken on the lake.

251) The principal outcome of the LTR work programme, the Lake Tanganyika FFMP (adopted by the Sub-Committee meeting in its Eighth Session -- Section 1.1 refers), recommended a set of accompanying measures (also endorsed by the Sub-Committee). These latter included significant expansion of regional co-operation in fisheries management through the establishment of a 'Lake Tanganyika regional fishery body with enhanced capabilities to undertake increased responsibilities for fisheries management and conservation measures.'

252) In endorsing this particular accompanying measure for the FFMP, the Sub-Committee was fulfilling one of the functions laid out in its Terms of Reference. Under TOR 'j' the Sub-Committee is supposed to 'Continue to explore ways and means of establishing an autonomous intergovernmental organization or arrangement....'

253) TREFIP will seek to implement the above FFMP recommendation through a series of activities that, by EOP, will culminate in the establishment of a 'Lake Tanganyika Fisheries Centre' (see Sections 4.3.6 and 5.1.1 below). The Centre will be constituted with a remit to:

- serve as a secretariat/executive arm for a Lake Tanganyika Regional Fisheries Council;
- facilitate technical investigations and discussions for all fisheries-related matters, including coastal zone management, and environment and water quality;
- promote exchange and dissemination of fisheries information, including operation of a Regional Fisheries Documentation Centre (ex-LTR Documentation Centre);
- develop, recommend, and facilitate implementation of conservation and management measures;
- in consultation with fisheries stakeholder groups, facilitate periodic review and revision as appropriate of the FFMP, taking into account the experiences and recommendations of TREFIP; and
- facilitate continued harmonisation of national policies and policy instruments pertaining to the sustainable utilisation of the living resources of the Lake, in accordance with the CCRF principals endorsed by the FFMP.

254) The Mission notes that initiatives have been underway through LTBP/GEF to establish a Lake Tanganyika Authority, under provisions of the 'Convention on the Sustainable Management of Lake Tanganyika.' The draft Convention now awaits

ratification by the four States (the Convention comes into effect when two of the States have ratified it), and it is not at the moment clear how long this process will take.

255) The Convention is very ambitious in scope, in that it addresses a wide spectrum of environmental and resource issues across the whole of the lake basin. Its basic objective is to ensure the protection and conservation of the biological diversity and sustainable use of the natural resources of the lake and its environment by Contracting States on the basis of integrated and co-operative management.

256) As progress towards the establishment of a Lake Tanganyika Authority continues, TREFIP will work closely with all concerned parties to ensure that formal technical consultation linkages and, as appropriate, other modalities of organisational integration, are established between the Authority and the Lake Tanganyika Fisheries Centre/Regional Fisheries Council.

4.3 Detailed description of activities and components

4.3.1 Implementation of co-management mechanisms (Output 1)

257) TREFIP will establish a pilot co-management system in partnership with 'Local Fisheries Councils' (LFCs) located in designated 'Community Fisheries Management Zones' (CFMZs) in each of the States. This will involve a series of preparatory activities followed by a five year staged implementation process.

258) In the first stage, 'Pilot One' communities will be identified and system components will be developed, feasibility tested, and revised as appropriate through an initial one-year period. The second year stage will involve replication of the resulting co-management package to a wider number of 'Pilot Two' communities in year two, with further monitoring of system performance. This process will then be repeated through years three, four, and five.

Activity 1.1: Establish Community Management Zones and Local Fisheries Councils

259) Preparations for co-management implementation will be carried out by elaborating a detailed programme of work for each country in consultation with local and regional Government and NGO officials involved with services related to natural resources (fisheries, forestry, tourism and wildlife), agriculture (crops, livestock), and community welfare (health, water, education, commerce, and security).

260) Where necessary, technical assistance will be provided to ensure that legal and administrative arrangements for the declaration and operation of pilot CFMZs are in place. In this connection, the Zambian experience of establishing 'Village Management Councils' on Lake Kariba will be useful to draw upon.

261) Legal and administrative foundations for the CFMZ system will include provision for overhaul of existing licensing and other fisheries-related fee and levy collection arrangements to allow revenues to be shared between LFCs and appropriate national, regional, and local authorities.

262) Suitable NGOs will be selected to collaborate in the execution of the LFC programme within each of the four countries. Selection shall be on the basis of a proven track record in community development within the lake basin region, with particular regard to experience in group mobilisation, fisheries-related activities, micro-credit, and construction of facilities at village level. The Mission held meetings with

representatives of various NGOs in the course of its visits around the lakeshore, and is confident that several organisations have the appropriate capabilities.

263) Under the supervision and with the close collaboration of TREFIP personnel, contracting NGOs within each country will:

- review and finalise criteria for selecting candidate village sites located within declared CFMZs to participate in the LFC programme;
- select suitable candidate villages and organise and convene public meetings in each of them in order to brief residents on the programme and its terms of local participation;
- on the basis of follow-up meetings to be held within two weeks of the initial series of meetings, evaluate public response to co-management proposals and, on this basis, invite the five most suitable communities to participate as 'Pilot One' villages in the LFCP programme.

264) Once agreements with the 'Pilot One' villages have been secured, the contracting NGOs within each country will further, under the supervision and in close collaboration with TREFIP personnel and in partnership with each of the new LFCs:

- Ensure that Council membership rolls are compiled, constitutions or articles of association drawn up, officials elected, and other relevant formalities for registration of the LFC as a legally recognised entity are met.
- Organise and convene a national workshop for officials of the respective LFCs in order to review LFC aims and procedures and agree on a timetable for action;
- As allowed within the framework of national fisheries legislation and regulations (see Section 4.2.4 above and 4.3.4 below), devise appropriate standardised measures for control of access within declared CFMZs, as well as mechanisms to ensure compliance with these measures; and then proceed to
- initiate and carry out community training and outreach components of the LFC programme detailed in Sections 4.3.2 and 4.3.3 below.

265) Contracting NGOs under the supervision and in close collaboration with TREFIP personnel will devise a monitoring and reporting system to allow continuous evaluation of the LFC programme and effect adjustment of its elements as appropriate.

266) In year two and for subsequent years, the above sequence of activities will be followed for the successive establishment of 'Pilot Two' through 'Pilot Five' LFCs within each of the four countries, according to the schedule laid out in Table 7.

Table 7. Schedule of proposed pilot co-management activity

Country	Tot. Landing Sites	Year 1	Year 2	Year 3	Year 4	Year 5	% Co-managed Sites
Burundi	54	5	10	15	15	15	28
DRC	417	5	15	30	60	95	23
Tanzania	208	5	15	25	40	60	29
Zambia	107	5	15	25	30	30	28
TOTAL	786	20	55	95	145	200	25

Activity 1.2: Micro credit scheme

267) Access to credit will be an essential means for individual fishers to upgrade their fishing tools, and in particular to replace undersized mesh nets and beach seine kits with gear that is less destructive to commercial fish stocks. Local post-harvest operators

would benefit from credit in that it would allow them to invest in improved drying facilities, such as elevated racks (tables) and concrete slabs.

268) Commercial banks have in the past generally treated the artisanal fisheries sector as a low priority and their participation in fisheries credit operations has been negligible. The TREFIP Micro-Credit Scheme will therefore be established by contracting NGOs. The Scheme will operate within each pilot village and will be managed in partnership with local community members.

269) As many fisherfolk have poor knowledge of credit mechanisms and as past credit programmes within the region have experienced some problems with repayment performance, special attention will be given to the need for building understanding of TREFIP Micro-Credit Scheme lending procedures, including application and documentation, technical and financial appraisal of applications, and conditions of loan disbursement and recovery.

270) Revenue to build LFC common pool credit funds will be generated from four sources, viz.: licensing, landing levies, TREFIP matching grants, and interest from loans.

271) ***Licensing.*** TREFIP will work during its preparatory phase with appropriate national authorities within each of the four States to facilitate necessary revision of legislative and/or regulatory measures in order to establish a standardised licensing fee schedule covering all territorial waters of the lake.[7] It is expected that once appropriate legal and administrative arrangements have been put in place, LFCs will manage at least 50 percent of the fishing license fees and landing levies collected within their areas of jurisdiction.

272) ***Landing levies*** (catch levies). In the same way, a standardised schedule of landing levies will be facilitated.[8] Since it is necessary to have accurate records, each LFC shall elect an official to weigh and record catches, receive payments, and issue receipts.

273) ***Matching grants***. As soon as any LFC fund has reached a specified level, TREFIP will offer to double-match it through a grant in aid. The minimum level for the local component of any common pool credit fund is recommended to be US$ 5,000, which is an amount that could be achieved within less than a year's time according to Mission calculations based on assumptions of typical landing site fleet size and catch returns (see Micro-Credit Scheme details in ANNEX 7). If in each case the US$5,000 is double-matched by a grant of US$10,000, by LFCP Year 5 TREFIP will have made a commitment of US$ 2,000,000 to the LFCP Micro-Credit Scheme.

274) It is proposed that an annual interest rate of 15 percent be charged on the loans awarded to acquire new gear and/or processing equipment (drying tables). The rate may vary somewhat between countries but will remain fixed within any one country. (Mission calculations for budgeting purposes are based on the 15 percent figure.)

[7] Whilst exact fee amounts will have to deliberated and agreed upon between the respective authorities, the Mission's preliminary suggestion, based on the average of annual license fees that are now in force in Burundi, Tanzania, and Zambia, is that US$ 20 per year be charged to each catamaran, Apollo and chiromila unit, and that US$ 5$ per year per unit be charged for units operating all other types of gear.

[8] Again based on an average of levies currently charged, a preliminary amount for standard levies on catch at landing is suggested as US$ 0.50 per 80 kgs (equivalent to 2 boxes of sardines).

275) Credit to individual LFC members could start during the second year of programme implementation. In order to get a loan, each applicant would be expected to provide 25 percent of the investment. Repayment should commence after a short grace period (1-2 months), with instalments made at fairly short intervals (every week or fortnight).

276) As most of the local fisherfolk have few assets in real or moveable property, a non-collateral based lending approach is required, in which the ability of the borrower to utilise the loan properly and repay it in due time is regarded as paramount. The credit scheme would operate as a revolving fund, with old loans having to be repaid before new loans are offered. In this way group pressure within each LFC encourages borrowers to act responsibly, lest they cause delays for other council members – friends, neighbours, and fellow fishers and processors – to receive their own loans.

Activity 1.3: Introduction of appropriate gear and fleet restructuring

277) The provision of loan assistance through the LFC Micro-Credit Scheme will be used in combination with credit facilities to large commercial firms (see following section), environmental education (see Section 4.3.3 below), and new techniques of fresh fish collection and preservation to encourage:

- replacement and retirement of destructive gear and fishing methods;
- the use of improved fish handling and processing methods to ensure better fish quality and hence the possibility of obtaining higher market values for fresh and cured products; and
- redeployment of some industrial fishing units to serve as collection vessels in order to reduce fishing pressure in southern waters.

278) With respect to fishing technique introductions, the Programme will particularly concentrate on the need to provide viable alternatives to beach seining along some stretches of shoreline, although attention will also be given to the need to discourage the use of other destructive practices (e.g., use of fine-mesh gillnets, actively driving fish into net lines, and fishing in breeding areas).

279) Specifically, the TREFIP Fishing Technologist and Socio-Economist will work intensively with the respective national project teams to:

- Determine improved design requirements for safe and efficient liftnet and chiromila units that could serve as suitable alternatives to the beach seine, particularly under the rougher wind and sea conditions that prevail in the southern waters of the lake.
- Fabricate and test of prototypes of the above units.
- Verify socio-economic impacts and financial performance/feasibility attendant upon a transfer away from beach seining to the use of alternative techniques.
- Ensure that, once the feasibility of prototype units has been proven, gear and equipment packages are available for purchase and use through the LFC Micro-Credit Scheme.

280) With respect to post-harvest activities, the Programme will particularly concentrate on improved fish drying facilities in the form of elevated racks (tables) for the processing of ‘dagaa safi,’ and on improved fish handling practices for fresh product.

281) Specifically, the TREFIP Post Harvest Technologist and Socio-Economist will work intensively with the respective national project teams to:

- Determine improved design requirements for drying racks that are fabricated with maximum local material content.
- Fabricate and test of prototypes of the above units.
- Verify socio-economic impacts and financial performance/feasibility attendant upon a transfer away from existing curing techniques (ground drying) the use of alternative techniques.
- Ensure that, once the feasibility of prototype units has been proven, adoption of new equipment packages is encouraged through the LFC Micro-Credit Scheme.
- Encourage partnerships between local fishing communities and private commercial firms for the development of improved fresh fish collection, handling, and marketing systems using ice as a means of product preservation.

282) The introduction of appropriate gear and improved post-harvest practices will be undertaken in conjunction with activities directed towards improved strategic marketing centre infrastructure and services (see following section).

4.3.2 Improved infrastructure within pilot villages and strategic marketing centres (Output 2)

Activity 2.1: Installation of facilities and services in pilot villages

283) TREFIP will provide grants-in-aid, subject to local co-payment or contribution in kind, for the construction or rehabilitation/upgrading of pilot village facilities e.g schools, health centres/dispensaries, domestic water supplies and distribution networks, and latrines.

284) Details of which facilities will be established where and in what numbers will be determined in consultation with village stakeholders themselves. When such decisions have been made, and agreement established as to the scale and nature of local contributions to specific construction/rehabilitation projects, final design and cost estimate details along with contractor selection will be facilitated by Programme personnel.

285) It is foreseen that construction or rehabilitation work will be 70 percent financed by the Programme and 30 percent, either in cash or in kind, by pilot village residents. In case of local contributions in kind, TREFIP personnel will estimate the value of contributions according to a standard scale (person hours worked, number of bricks supplied, etc.).

286) Responsibility for consultation with pilot village residents for project identification and subsequent design, contractor selection, and construction supervision will be shared between the TREFIP Socio-economist, the Civil Engineer, and Community Health Consultant.

287) For villages where infrastructure development work is already underway through assistance provided by NGOs or through programmes such as the Tanzanian Parks and Wildlife Service's Support Committee for Initiative Project (SCIP), TREFIP assistance shall be co-ordinated with existing efforts in such a way as to complement rather than duplicate or otherwise conflict with them.

288) It is expected that in many instances TREFIP aid will best be provided in the form of augmented supplies and services rather than civil works, as in the case of health centre/dispensary operations, for instance. In these cases and again after consultation with LFC members, regional and district officials in the appropriate Government ministries will be consulted as particular assistance packages are organised. It can be foreseen, for instance, that the level of supplies and teaching materials needed to run successful family planning and family health extension services in selected local health centres could be substantially augmented through TREFIP assistance.

289) When operational, new or rehabilitated facilities and services would be managed with a maximum degree of community participation and responsibility, under the supervision of executive committees specially constituted for the purpose. Where relevant, operating and maintenance costs would be met through the collection of modest user fees.

Activity 2.2: Installation, operation of strategic marketing centre infrastructure and services

290) TREFIP will improve links between important fisheries production centres and market places and upgrade marketing facilities through works to be tendered out to reliable private or NGO contractors, and in some instances through provision of credits to larger commercial companies.

291) In all cases involving works on publicly owned facilities, the TREFIP Civil Engineer, in consultation as appropriate with the Post Harvest Technologist, Socio-Economist, and Community Health Consultant, under the supervision of the Programme Co-ordinator and in consultation with relevant national and local authorities, will be responsible for finalising details of siting, design, contract preparation and tendering, contract award, construction monitoring, and project hand-over.

Activity 2.2a: Road construction/upgrades

292) TREFIP will upgrade an estimated of 70 kms of Lake Tanganyika feeder roads in the four countries, according to the breakdowns given in the following table.

Table 8. Proposed road improvement programme

Country	Road link	Kms	Tot. kms	Tot. estimated cost (US$)
Burundi	To be determined	10	10	1.2 million
DRC	To be determined	20	20	2.4 million
Tanzania	Kigoma-Katunga	4.0		
	Kipili-Kirando junction	6.5		
	To be determined	9.5	20	2.4 million
Zambia	Mpulungu town	1.0		
	To be determined	19	20	2.4 million

293) Detailed design and costing work will be carried out during Programme implementation, taking into account further technical consultations with relevant authorities and ongoing road construction programmes within the respective countries.

294) Further information on specific road improvements is provided in the respective Country Project Annexes (see ANNEX 8.2 through ANNEX 8.5).

Activity 2.2b: Jetty construction

295) TREFIP will construct or rehabilitate jetty facilities at the following sites around the lakeshore, subject to further field survey work and consultation with relevant authorities and local communities. Detailed costing and engineering studies will therefore be completed after IOP.

Table 9. Proposed jetty construction programme

Country	Jetty location	Remarks	Tot. estimated cost (US$)
Burundi	To be determined.	Provision for 2 jetties	0.2 million
DRC	To be determined.	Provision for 4 jetties	2.0 million
Tanzania	Kipili	Rehabilitation of old jetty.	
	Buhingu (Lagosa)	New jetty.	
	Kibwesa	New jetty.	2.0 million
Zambia	Nsumbu	Rehabilitation of old jetty.	0.5 million

296) Further information on jetty construction is provided in the respective Country Project Annexes (see ANNEX 8.2 through ANNEX 8.5).

Activity 2.2c: Construction/upgrade of marketing facilities

297) TREFIP will undertake construction of new marketing facilities and upgrading of existing facilities at the following key centres around the lakeshore.

Table 10. Proposed key marketing facilities improvement programme

Country	Marketing facility location	Remarks	Tot. estimated cost (US$)
Burundi	Bujumbura Central Mkt.	Rehabilitation	0.2 million
DRC	Uvira	Rehabilitation 2 markets	
	Baraka	Rehabilitation 1 market	
	Kalemie	Rehabilitation 2 markets	
	Moba	Rehabilitation 2 markets	0.7 million
Tanzania	Kigoma Central Mkt.	Construction of new facility	
	Kigoma Mwanga Mkt.	Rehabilitation	0.4 million
Zambia	Mpulungu	Construction of new facility	
	Mpulungu Central Mkt.	Rehabilitation	0.35 million

298) Further details of existing facilities and proposed improvements are given in the respective Country Project Annexes (see (see ANNEX 8.2 through ANNEX 8.5).

Activity 2.2d: Installation/upgrades of electricity supplies

299) TREFIP will install or upgrade electricity supplies service according to the programme proposed in the following table.

Table 11. Proposed electricity supply installation/upgrade programme

Country	Supply site	Remarks	Tot. estimated cost (US$)
Burundi	To be determined.	Auxiliary generators for ice plants.	See Activity 2.2e.
DRC	To be determined.	Auxiliary generators for ice plants.	See Activity 2.2e.
Tanzania	To be determined.	Auxiliary generators for ice plants.	See Activity 2.2e.
Zambia	Nsumbu	Installation of generator and distribution lines for township	0.5 million

300) Further details are given in the respective Country Project Annexes (see ANNEX 8.2 through ANNEX 8.5).

Activity 2.2e: Credits for establishment of fresh fish collection, handling, and marketing systems

301) In each country TREFIP will provide a credit facility of up to $300,000 to encourage larger commercial firms to establish improved collection, handling, and marketing systems for fresh fish.

302) In Zambia, where marked overcapacity has developed in the industrial fishing sector, it is envisioned that this credit facility will be used to establish fresh fish collection operations using re-fitted purse seiners as transport vessels in combination with ice production units, chilled storage facilities, and new product evacuation channels.

303) In the other countries, opportunity exists for the development of fresh fish collection and marketing systems through construction of small flake ice plants and chilled storage units.

4.3.3 Protection of stocks and biodiversity (Output 3)

304) Activities associated with this output include improvement of fisheries monitoring procedures, establishment of lacustrine protected areas (PAs), and environmental education.

Activity 3.1: Strengthen and expand fisheries monitoring capabilities

305) Adequate monitoring capacity is fundamental to the protection of commercial stocks and lacustrine biodiversity as events of stability and change will otherwise be impossible to track on a regular basis.

306) Monitoring system improvement is also a primary activity to be undertaken in support of Output 5, and is thus reviewed under Section 4.3.5 below.

Activity 3.2: Establish lacustrine Protected Areas (PAs)

307) TREFIP will, in partnership with lakeshore communities participating in the pilot village co-management initiative as well as official and NGO agencies involved with fisheries and natural resources policy, planning and management issues, facilitate establishment of lacustrine PAs.

308) Working under the supervision of the TREFIP Co-ordinator and in close consultation with the Socio-economist, Legal Advisor, and other programme personnel, the Community Conservation/Ecotourism Advisor will conduct a detailed feasibility assessment of potential sites and, on this basis, devise and implement a workplan for the establishment and operation of a series of PAs around the lake.

309) In the context of extensive consultation with stakeholder communities and agencies, potential sites will be identified on the basis of existing status (already within national park/ reserve boundaries), and/or probable importance as breeding and stock recruitment zones, and, with regard to such features as scenic setting, aquatic habitat and faunal diversity (as determined through benthic surveys), accessibility, and their likelihood of offering significant attraction as ecotourism destinations.

310) Other factors that will be taken into account include the following:

- **Delimitation of boundaries.** It is foreseen that once identified and officially gazetted, the boundaries of PAs will need to be delimited by sets of permanent buoys, fixed in place by chains and anchors; PAs thus generally need to be located in areas of shallow water (depths of greater than 30 m make the task of physical delimitation very difficult and costly).
- **Enforcement capabilities.** Fisher groups (LFCs) will have to ensure that the new delimited areas are protected against poaching; villages in closest proximity to PAs will have to organise regular surveillance of the same, and be properly equipped to do so.

311) Development of particular sites will be carried out insofar as possible using locally available human and material resources, and with the understanding that local people will be the primary beneficiaries of such development either directly as site owners and operators or as recipients of fees or commissions collected from visitors and commercial tourist service providers.

312) The feasibility assessment exercise will focus first on the following sites provisionally identified by the Mission as candidate PAs.

Table 12. Provisional candidate PA sites

Country	PA site	Remarks	Est. Cost for establishment (US$)
Burundi	Ruzizi River Delta area.	Strengthen existing protected status and expand reserve boundaries.	50,000
	To be determined.		50,000
DRC	To be determined.	3 sites to be identified	150, 000 (total)
Tanzania	Mahale National Park	Gazette aquatic protected area offshore of national park.	50,000
	Malagarasi River Delta area.	Gazette aquatic protected area.	50,000
	Gombe Stream National Park.	Gazette aquatic protected area offshore of national park.	50,000
Zambia	Kalambo River Delta.	Gazette aquatic protected area offshore of national park.	50,000
	Nsumbu National Park.	Gazette aquatic protected area offshore of national park.	50,000

313) Further details are given in the respective Country Project Annexes.

Activity 3.3: Environmental education

314) An environmental education and outreach programme will be developed and implemented through TREFIP collaboration with LFCs, national fisheries researchers and managers, and NGO agencies involved with natural resource conservation and community welfare projects around the Lake Tanganyika littoral. Programme development will be under the co-ordination of the TREFIP socio-economist working in close consultation with the Bio-diversity/Conservation Advisor, Fishing Technologist, Post-harvest Advisor, and Community Health Advisor.

315) The programme will rely heavily on video presentations as well as posters, pamphlets, community workshops and other conventional formats for community outreach and awareness building. Programme content will be developed in Kiswahili and local language versions insofar as possible, drawing on materials already available as well as new material produced especially for fisheries-related topics.

316) Topics to be covered will include:

- fishing and fish biology (lacustrine ecology and production system dynamics (e.g. -- importance of species diversity and protected areas, impacts of different gear types and methods, fishing effort, fish biology and stock recruitment patterns, optimal harvest size of target species);
- post-harvest practices and the environment (impacts of fish smoking, reforestation needs);
- agricultural practices and water quality (soil erosion and sedimentation causes and effects, preventive measures);
- sanitation and health practices (causes and prevention of water borne related diseases, family and reproductive health.

317) Environmental education presentations will be implemented by contracting NGOs within each country. For video screenings, community outreach personnel will be equipped with television and video players, a small generator, and bicycle or boat transport as needed.

4.3.4 Draft and facilitate enactment of new legislation (Output 4)

318) TREFIP will facilitate drafting of a common set of laws to provide an adequate regional framework for the management of Lake Tanganyika fisheries.

319) The Programme will provide for short term technical assistance (4 months) to review the legislative regimes within each country and to develop, as appropriate, revised fisheries legislation and statutory instruments.

320) Careful account will be taken of previous FAO and LTR legislative assessments and recommendations, as well as initiatives that are already underway within the region to revise legislation in order to promote socio-economic objectives, especially with regard to community-based management.

321) Particular emphasis will be placed on the fulfilling the requirement for a legal framework for:

- co-management arrangements (Community Fishery Management Zones and Local Fisheries Councils) that would secure the participation of stakeholders in management decision-making functions (consultations to identify planning and development priorities and problem areas, establish regulations, etc.), including
- new property rights regimes that would allocate control of access to the community level, in order to counter the 'race to fish' tendency that free access regimes entail; and
- the establishment and operation of enforcement and compliance assurance mechanisms under local responsibility.

322) A further requirement that will be attended to is the elaboration of a common classification of fishing units, in order to ensure uniform implementation of conservation and management measures along with data collection procedures.

4.3.5 Assess and strengthen existing capabilities and facilities (Output 5)

Activity 5.1a: Finalise plan for expanded LTFMP

323) The TREFIP Co-ordinator will, in close collaboration with the Socio-Economic Advisor and Community Conservation Consultant, and Bio-statistical Consultant, officers of relevant technical divisions within the FAO Fisheries Department, and senior technical personnel from the respective national fisheries authorities of the lacustrine States, finalise plans for an expanded LTFMP.

324) The existing LTFMP developed for national execution in the final phase of the LTR Project will provide the core elements of the revised monitoring system, but provision will also be made to cover catch assessment and socio-economic parameters in data collection routines to be used within newly established pilot CFMZs, in partnership with members of LFCs.

325) Further provision will be made in the revised monitoring system to cover biodiversity parameters according to techniques developed by the LTBP Biodiversity Special Study team for recording data on habitat characteristics as well as fish and mollusc communities at designated sites.

326) Four monitoring sites in each country have already been identified, as shown in the list provided to the Mission by LTBP in Table 13. They include one 'pristine' control site and three other sites currently subject to one or more threats to biodiversity.

327) The Socio-economist in collaboration with the Community Conservation Consultant and the Bio-Statistical Consultant will develop standardised protocols for data collection in all monitoring areas as well as weekly compilation and monthly reporting procedures using electronic spreadsheets and email links. A workplan for field surveys will also be prepared for implementation by the respective country sub-offices.

Table 13. LTBP-recommended biodiversity monitoring sites

Country	Site	Lat/long	Biodiversity threat	Possible Collaborating agencies
Burundi	Gatororongo A	03º37'44"S 029º20'30"E	Control site	Nil
	Gatororongo B	03º37'57"S 029º20'27"E	Sedimentation - landslides	DGGM, Bujumbura (sedimentation team)
	Ntahangwa R. (mouth)	03º22'34"S 029º20'30"E	Pollution - industrial, domestic (nutrients)	INECN, Bujumbura (pollution team)
	Nyamugari Village	03º33'02"S 029º20'17"E	Fishing - beach seines	DEPP, Bujumbura (enumerators)
DRC	Luhanga	03º26'01"S 029º07'51"E	Control site	Nil
	Kalimabenge R. (mouth)	03º25'12"S 029º08'25"E	Sedimentation - suspended matter discharge	CRH - Uvira (sedimentation team)
	Kalundu Port	03º31'24"S 029º08'57"E	Pollution - industrial, transport	CRH - Uvira (pollution team)
	Bangwe Beach	03º34'09"S 029º09'02"E	Fishing - beach seine	DoF -Uvira (enumerators)
Tanzania	Jacobsen's Beach	04º54'35"S 029º35'52"E	Control site	Nil
	Hilltop Cliff, Kigoma	04º53'08"S 029º36'45"E	Pollution - sewage, industrial fuel leaks	TAFIRI, Kigoma (pollution team)
	'TT', Kigoma	04º53'10"S 029º36'46"E	Pollution - sewage, industrial fuel leaks	TAFIRI, Kigoma (pollution team)
	Kahama South (Gombe Stream N.P)	04º41'25"S 029º37'06"E	Fishing - gillnetting.	DoF, Kigoma (enumerators)
Zambia	Katoto	08º47'06"S 031º01'27"E	Control site	Nil

Country	Site	Lat/long	Biodiversity threat	Possible Collaborating agencies
	Lunzua R. (mouth)	nr. Mpulungu	Sedimentation - suspended matter discharge	Dof, Mpulungu (sedimentation team)
	Samaki Fisheries	Mpulungu	Pollution - industrial, domestic	Dof, Mpulungu (pollution team)
	China Beach, Mutondwe Is.	nr. Mpulungu	Fishing - beach seining	Dof, Mpulungu (catch assessment team)

Activity 5.1b: Strengthen statistical capabilities

328) After final confirmation of the staffing, equipment, and physical plant situation at each of the TREFIP sub-offices and in accordance with the budget provided, a programme of in-service skill development for national staff and upgrading of office equipment and premises will be initiated in order to ensure proper implementation of the expanded LTFMP.

329) The Socio-economist in collaboration with the Community Conservation Consultant and the Bio-Statistical Consultant will convene training sessions at each national sub-office in order to familiarise the respective country Programme teams with revised LTFMP procedures and to ensure that field survey workplans are implemented according to schedule.

Activity 5.1c: Consolidate regional co-operation

330) The Socio-economist in collaboration with the Community Conservation Consultant and the Bio-Statistical Consultant will ensure that members of each country sub-office team are fully versed in the use of the standardised computer spreadsheet applications developed for the monitoring programme and the procedures to be followed for transmitting completed data reports to the PIU.

331) At the PIU, the TREFIP Co-ordinator and the Socio-economist will be responsible for the assembly of quarterly reports detailing LTFMP results and providing preliminary assessment of patterns of continuity and change under the parameters being monitored.

332) These reports will be used as a basis to provide technical advice to the Tanganyika Fisheries Centre, the Regional Fisheries Council and the respective National Fisheries Councils, as well as the LFCs operating within pilot CFMZs (see Sections 4.3.6 and 5.1.1).

4.3.6 Establish a regional management authority (Output 6)

Activity 6.1: Elaborate institutional arrangement

333) The TREFIP Co-ordinator will, in close collaboration with the Legal Advisor, LEGN, FIPP Fisheries Policy and Planning Division (International Institutions/Liaison Service), and senior fisheries ministry officials of the respective lacustrine States, facilitate the establishment of a permanent 'Lake Tanganyika Regional Fisheries Council,' whose secretariat/executive, the Lake Tanganyika

Fisheries Centre, will be housed in the former headquarters office of the LTR Project in Bujumbura.

334) As a first step towards this goal, the Co-ordinator will negotiate with appropriate national authorities at a special meeting of the CIFA Sub-Committee for Lake Tanganyika in order to settle details of the Council's organisational structure and scope of activities and responsibilities, as well as its funding base for both the immediate- and long-term future.

335) Once agreement has been obtained from all parties concerned, the Co-ordinator will, in close collaboration with the Legal Advisor, ensure that the Council's charter is established in order to give legal effect to these arrangements.

336) The charter will also provide for formal institutional linkages to be established between the Council and the proposed Lake Tanganyika Authority, if and when the latter entity is created through ratification of the 'Convention on the Sustainable Management of Lake Tanganyika' (see Section 4.2.6 above).

Activity 6.2: Set up of logistical and financial arrangements.

337) The TREFIP Co-ordinator will supervise the expansion and upgrade of the building that was originally constructed as LTR Headquarters in 1992, located in the compound of the Département des Eaux, Pêches et Pisciculture in Bujumbura (Burundi), in order to house the offices of the new Tanganyika Fisheries Centre.

338) The Co-ordinator will also organise the ordering and installation of office equipment, utilities, and services, as detailed in ANNEX 8.1.

339) The Co-ordinator will further oversee preparation of the Centre's budget to cover the first five years of operation, consistent with the financial arrangements agreed to by the four States and the availability of supplemental exterior financing from international and bilateral agencies.

Activity 6.2: Commence of operations.

340) The Lake Tanganyika Regional Fisheries Council will commence full operations as the successor agency to the CIFA Sub-Committee during the fourth year of TREFIP implementation, in order to allow adequate time for the completion of institutional and legal arrangements on the one hand, and a period of overlap for technical backstopping by TREFIP personnel on the other.

4.4 Programme Assumptions and Risks

341) Different risks may delay the implementation of the Programme and hamper progress towards realisation of its objectives.

342) Of overriding concern is the security situation in both the DRC and Burundi. At present it is not possible to mount any field activities whatsoever along the DRC coastline, and in Burundi the state of civil unrest makes any work outside of Bujumbura highly problematic.

343) The regional political situation may improve sufficiently before the IOP date, now anticipated for early 2002, to allow operations to commence in all four countries. If not, national TREFIP activities could be started in Tanzania and Zambia as planned, and in Burundi on a more limited scale pending developments in the peace process.

For the DRC, national programme activities could be held in abeyance until the situation within the country's eastern regions is normalised.

344) Other risks to be taken into account relate to issues of environmental integrity, stakeholder collaboration, and political will within the respective lacustrine States.

345) Maintenance of the Tanganyika fisheries depends absolutely on the maintenance of lacustrine environmental integrity. Problems of deforestation and sedimentation are clearly apparent within the basin, and pollution and other forms of environmental deterioration are obvious in and around major port areas and transport vessel routes. These trends are serious, and if allowed to continue unchecked could serious compromise the productive capacity of the entire lake. However, they are at present relatively localised, and TREFIP is itself intended as one means for their amelioration.

346) Successful implementation of the Programme will only be achieved through the full collaboration with local stakeholders. It is anticipated however that a high level of interest and participation will develop within lakeshore communities once Programme objectives are promulgated and the advantages of Local Fisheries Council scheme (e.g. micro-credit and village facilities improvement) demonstrated.

347) A large measure of political will on the part of senior policy makers and ministerial officials within the respective States is necessary to carry out TREFIP activities. All States through their representatives to the CIFA Sub-Committee for Lake Tanganyika have indicated a willingness to support a regional fisheries management undertaking, but it remains to be seen if this commitment in principle will be backed by definite actions in such areas as provision of sufficient numbers of high quality personnel to support the Programme at both regional and national levels, revision of fisheries legislation, devolution of management responsibilities and revenue sharing, and contributions towards a lakewide fisheries management entity.

4.5 Programme Costs

348) The total Programme cost is estimated to be US$42.2 million, broken down in terms of a foreign currency component of US$15.3 million (36%) and a local currency equivalent component of US$ 26.9 million (64%). These costs include a 10 percent physical contingency and 2.5 percent inflation factor per year from year 2000 on foreign currency, and 5 percent on local currency. Prices are based on an assumption of exemption from all taxes and customs levies for the duration of the Programme.

4.5.1 Regional PIU

349) The umbrella or programme component or PIU cost is estimated at US$6.1 million. Details of PIU functions and cost breakdowns are provided in ANNEX 8.1.

4.5.2 Burundi

350) The Burundi National Project Component cost is estimated at US$4.5 million. Details of component functions and cost breakdowns are provided in ANNEX 8.2.

4.5.3 Democratic Republic of Congo

351) The DRC National Project Component cost is estimated at US$13 million. Details of component functions and cost breakdowns are provided in ANNEX 8.3.

4.5.4 Tanzania

352) The Tanzania National Project Component cost is estimated at US$10.7 million. Details of component functions and cost breakdowns are provided in ANNEX 8.4.

4.5.5 Zambia

353) The Zambia National Project Component cost is estimated at US$7.9 million. Details of component functions and cost breakdowns are provided in ANNEX 8.5.

4.6 Sources of finance

354) TREFIP is proposed for financing primarily through AfDB loans to the four lacustrine States, and through technical assistance grants from GEF and other interested donors.

355) The AfDB is also expected to provide funds for technical assistance to allow operation of the PIU, which will serve as the Programme's regional co-ordination component.

356) Depending on the amount of AfDB and GEF funding to be made available to the States, the Programme will seek additional support for technical assistance activities from other bilateral and international donor agencies.

4.7 Environmental Impacts

357) TREFIP will clearly yield positive environmental effects in terms of the maintenance of commercial fish stocks and biodiversity, amelioration of public health risks, and reduction of deforestation rates around the Lake Tanganyika littoral.

358) The maintenance of commercial fish stocks and biodiversity will be achieved through a gradual decrease in the use of destructive gear and fishing practices through introduction of alternative fishing technology and environmental education activities, and through measures to establish lacustrine protected areas.

359) Improved fish processing facilities (drying tables) will decrease the risk of product contamination for consumers, and introduction of fresh fish collection, distribution, and marketing facilities (ice chilling and storage) will reduce the amount of fish being smoked and thus lessen demand for fuelwood supplies.

360) Village infrastructure works will also have a positive impact on aquatic and terrestrial environmental quality around local landing sites, as facilities to be constructed include latrines (reduction of human waste contaminants), domestic water supply systems (reduction of water-borne diseases), health centres (treatment of water-borne diseases), and 'green' energy production systems (solar panels and ovens, fuel-efficient stoves, and wind-powered water pumps and generators).

361) Improved community welfare services, including education and health services, will promote balanced population growth and lessen the risk of exposure to sexually transmitted diseases, especially HIV/AIDS.

4.8 Impacts on Women

362) It is anticipated that the Programme will yield extensive benefits for women.

363) As noted earlier on (see Section 3.3), women are heavily involved in the post-harvest sector. Improvement of processing, storage, and marketing facilities will create

better working conditions for all involved in fish processing and trading, and will open possibilities for increased earnings through sale of higher value products.

364) Furthermore, Programme activities aimed at improving village infrastructure and services in the areas of reproductive health, water supplies, and education will generally improve women's circumstances in terms of quality of life measures and civic empowerment.

4.9 Impacts on Poverty Reduction

365) TREFIP will contribute to poverty reduction within local fishing communities both directly and indirectly.

366) Indirectly, it will underpin fishing community welfare in the long run by reducing present threats to resource sustainability in the form of uncontrolled access, use of destructive gear and methods, and lack of protected (fish breeding and refuge) areas. Without the Programme, overexploitation trends would continue to build towards the inevitable point of general socio-economic marginalisation of fisherfolk communities.

367) The Programme will generate more direct benefits in the form of improved quality of life conditions for lacustrine community residents, as derived from upgraded educational, health, sanitation, and water supply facilities, and enhanced income generation possibilities due to availability of better productive equipment (e.g. appropriate fishing kits and drying tables through micro-credit schemes), improved marketing channels for fresh product (ice chill-chains), and alternative employment (e.g. development of ecotourism).

5. PROGRAMME IMPLEMENTATION

5.1 Executing Agency

368) In view of its extensive experience with LTR and numerous other projects related to the fisheries of Lake Tanganyika and other inland water bodies within the Eastern and Southern Africa region, the Mission recommends that FAO function as the executing agency for TREFIP.

369) Under this arrangement, FAO would thus assume responsibility for fielding the Programme Co-ordinator and other officers to serve in the PIU who would in turn be responsible for the regional 'umbrella' TREFIP component under which the four national project components would function.

5.2 Organisation and Management

5.2.1 Institutional framework

370) The loan recipients will be the respective Governments of the four lacustrine States. Executing Agencies for the respective National Project Components will be the competent ministries and departments or divisions of fisheries of the respective Governments. Thus,

- for Burundi, the Ministère de l'Agriculture et de l'Elevage (Département des Eaux, Pêches et Pisciculture);
- for the DRC, the Ministère de l'Environnement, de la Conservation de la Nature, et du Tourism in the DRC;

- for Tanzania, the Ministry of Agriculture (Fisheries Division); and
- for Zambia, the Ministry of Agriculture Food and Fisheries Management (DOF).

371) Routine administration and co-ordination of the Programme will be the responsibility of the Programme Implementation Unit (PIU), which would be located at the former LTR headquarters offices within the compound of the Département des Eaux, Pêches et Pisciculture, in Bujumbura.

372) Specifically, the PIU will be charged with tasks of:

- overall Programme implementation;
- administrative and financial management;
- preparation of annual work plans and budgets
- selection of short term consultants;
- preparation of tenders to acquire equipment and award construction contracts;
- preparation of Programme workshops and meetings;
- monitoring and evaluation of Programme activities;
- preparation of Programme progress reports; and
- acting as the Secretariat for the Lake Tanganyika Regional Fisheries Council until the Tanganyika Fisheries Centre comes into full operation.

373) A National Lake Tanganyika Fisheries Council headed by the Director of Fisheries will be set up in each country, within a month after the signature of the loan agreement. The members of the National Council will be one senior officer each from the ministries/departments in charge of Agriculture, Finance, and Planning, and later including one representative from each of the Community Fisheries Management Zones within each country.

374) The National Council members will be responsible for supervision of the respective national project components, including review of annual work plans and budgets and provision of advice to the PIU on issues related to regional co-ordination.

375) Each National Council will convene meetings at least once a year in order to carry out the above duties, the proceedings of which will be recorded in a report for transmittal to the PIU and the CIFA Sub-Committee for Lake Tanganyika.

376) Finally, each National Council will elect from amongst its members one senior fisheries administration or research official and one person representing community fisheries interests to serve on a Lake Tanganyika Regional Fisheries Council.

377) The Regional Council will be responsible for overseeing overall Programme content and progress, including annual work plans and budgets, and accordingly for providing advice to the PIU, which will serve as the Council Secretariat/Executive.

378) The Lake Tanganyika Regional Fisheries Council will, after a suitable trial period (see Section 4.3.6 above), eventually function as the successor agency to the CIFA Sub-Committee.

5.2.2 Personnel

379) At the regional level (PIU), the TREFIP staff establishment will be comprised of both locally and internationally recruited personnel.

380) Local recruitment will be carried out to fill the following posts:

- One Programme Assistant
- One Civil Engineer Assistant.
- One Fishing Technology Assistant.
- One Fisheries Post-Harvest Assistant.
- One Monitoring and Evaluation Assistant.
- One Administrative Assistant/Secretary.
- Four Drivers

381) International recruitment will be carried out to fill the following posts:

- One Programme Co-ordinator.
- One Socio-Economist Advisor.
- One Fisheries Post-Harvest Advisor.
- One Civil Engineer Advisor.
- One Fishing Technologist.
- Fisheries Legal Advisor/Consultant.
- Biodiversity/Conservation/Ecotourism Advisor/Consultant
- Bio-Statistician Consultant
- Infrastructure/facility Consultants (various).

382) Further details and post descriptions are provided in ANNEX 8.1.

383) At national levels, the TREFIP staff establishment will be comprised primarily of locally recruited personnel. Subject to availability, TCDC/UNV/APO personnel will be appointed to assist with various aspects of Programme activity at TREFIP sub-stations within each of the lacustrine States.

384) Further details and post descriptions are provided in ANNEX 8.2 through ANNEX 8.5, which review the respective national project components of TREFIP.

5.2.3 Accounting, reporting and auditing.

385) Programme accounts will be maintained separately from those of the respective DOFs. The accounting systems should be established according to a format acceptable to the AfDB/donors and the governments of the respective lacustrine States.

386) TREFIP staff accountants in each country office will transmit expenditure returns on a monthly basis to the regional office for checking and to aggregate the results. Every three months the results will be transmitted to the AfDB/donor agencies.

387) An independent office financed by the AfDB/donors and recruited according to the AfDB procedures will carry out a yearly control of the accounts. The audit will take place once in a year and the report will be transmitted to the AfDB/donor agencies within six months of the end of the fiscal year.

5.3 Procurement of Goods and Works

388) Procurement of goods and works financed by the AfDB will be carried out according to current Bank procedures.

389) Civil works at the village level will be undertaken through a local tendering procedure. The Programme will float open tenders and small contractors having relevant experience (e.g. in school or health centre construction) will be selected.

390) In the case of major works such as roads, jetties, or municipal markets, a short list of contractors able to demonstrate relevant experience will be established and a tendering procedure will be opened to the same.

391) Material and equipment like vehicles, boats, office equipment etc. will be tendered locally (in each country). Most of the required material and equipment is available in the four countries, with enough suppliers to guarantee a fair competition. Whenever equipment has to be imported (e.g., ice machines, lacustrine park marker buoys), an international tendering procedure will be applied.

392) Travel between the regional office and the sub offices will be more efficient time and cost-wise when carried out by small chartered plane, as opposed either to the use of commercial (scheduled) airline companies or lake passenger/cargo vessels. Small planes can easily reach Kalémie, Kasaba Bay, Mbala, Kasama, Sumbawanga, Mpanda, Mahale National Park, and Kigoma. TREFIP will thus negotiate a contract with one of the local charter companies to provide air transport on the basis of an estimate 40 trips per year between the regional office (Bujumbura) and the above mentioned cities.

5.4 Implementation Plan and Expenditure Schedule

393) The Programme will be implemented over a five year period, starting from early 2002.

394) A yearly expenditure schedule (see ANNEX 9) has been prepared effective from the beginning of 2002.

395) After the Financial Agreements have been signed it would be advisable to schedule a six-month Preparatory Phase, to begin in the latter half of 2001, in order to complete the necessary groundwork for successful commencement of full Programme operations (see ANNEX 10).

396) The Programme Co-ordinator with the assistance of the TREFIP Socio-Economist and the Legal Advisor would as a first priority during the Preparatory Phase work to facilitate the establishment of necessary legal foundations for a pilot co-management system (see Section 4.2.1 above), carry out selection of and arrange contracts with NGOs to conduct village outreach and environmental education programmes, contact relevant government and local council authorities and private/NGO construction firms to discuss plans for civil works activities (mainly roads, jetties and markets), and prepare the Monitoring and Evaluation Programme..

397) This phase would also allow Programme management to float tenders for the acquisition of vehicles, boats, and other essential equipment so that these items will be available in a timely fashion.

398) It would further allow time for the recruitment of local staff and of international personnel scheduled to join TREFIP after the IOP date.

399) During the Preparatory Phase the Programme Co-ordinator and the Socio-economist will prepare a detailed work plan for the first year of full operation.

400) As soon as appropriate NGO agencies have been identified and contracts finalised, training of their respective staff to carry out pilot village outreach and environmental education programmes will be initiated under the supervision of TREFIP officers.

401) The Programme will work with five villages in each of the countries during the first year, and this period will provide TREFIP officers and NGO partners with an

opportunity to refine procedures before significant expansion of activities beginning in the second year.

5.5 Monitoring and Evaluation

402) A Monitoring and Evaluation (M&E) routine will be established at IOP 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.

403) The 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, etc. facility infrastructures, environmental education sessions, etc.

404) 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.

405) 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.

5.6 Recurrent Costs

406) Recurrent costs represent $13,008,400 or 29.6 percent of total Programme costs. Of this amount, salaries account for $11,222,900 (26.6 % of Programme costs), and Operation and Maintenance (O&M) for $1,785,400 (4.2% of Programme costs).

407) The yearly breakdown of recurrent costs is shown in the following table.

Table 14. Recurrent costs by year.

2002	2003	2004	2005	2006	TOTAL
$2,109,900	$2,400,500	$2,744,500	$2,856,600	$2,897,000	$13,008,400

408) Further details on recurrent costs for the regional office and the four countries are given in ANNEX 9.

5.7 Programme Sustainability

409) TREFIP is expected to have strong positive social and environmental impacts (see Sections 4.7 - 4.9) and, as its basic objective is to implement the FFMP and the CCRF principles contained therein, the goal of sustainability is implicit.

410) The protection of the lake's fisheries against overexploitation will be sustainable to the extent that Programme activities are successfully implemented

411) At EOP, with management of the resource base put on a new footing, involving extensive partnerships with local fisherfolk, self-financing community-level fisheries councils, a well-developed public appreciation of responsible fisheries principles and practices, and a system of lacustrine Protected Areas to help maintain fish stocks and biodiversity, future prospects for the lake should be extremely promising.

412) Furthermore, Programme elements should become self-perpetuating as experiences and advantages realised in the pilot CFMZs are appreciated and accepted by ever-wider circles of fisheries stakeholders.

413) The LFC Micro-Credit Scheme in particular will be possible to maintain, so long as there is compliance with obligations for regular payment of licensing fees and catch levies, revenue sharing between local fisher groups and government agencies, and servicing of loans. At EOP the loan system will still be running, and its management will be the direct responsibility of the LFCs themselves.

5.8 Co-ordination with Other Donors

414) It will be necessary to establish a close working relationship between TREFIP and the project or set of projects anticipated as a follow-up to the GEF-funded Lake Tanganyika Biodiversity Project, whose principal outputs have been the preparation of a Strategic Action Plan (SAP) for the Sustainable Management of Lake Tanganyika and a draft 'Convention on the Sustainable Management of Lake Tanganyika' (see Section 4.2.6 above), which now awaits ratification.

415) The five-year LTBP is due to end in July 2000. Efforts are now underway to develop regional and national project proposals to implement the SAP and for this purpose a one-year planning phase for the initial set of projects is being requested for GEF funding.

416) SAP implementation projects will address specific 'hot spots' and sources of transboundary problems, especially in the area of pollution control and sedimentation.

417) In this context TREFIP could operate as a largely independent but complementary programme concentrating on the fisheries sector, which is at present by far the most significant locus of management challenges and socio-economic consequence on the lake.

418) As mentioned in Section 4.2.6, measures should in due course be taken to establish technical consultation or other modalities of formal linkage between the Lake Tanganyika Regional Fisheries Centre and the Lake Tanganyika Regional Fisheries Council, to be founded under TREFIP, and the Lake Tanganyika Authority that will be founded under the Convention on the Sustainable Management of Lake Tanganyika, when it eventually comes into effect.

419) One way to ensure that this co-ordination is effected would be to have one executive agency responsible both for the follow-on actions proposed in connection with the SAP and the Convention, and for TREFIP.

6. TECHNICAL AND ECONOMIC JUSTIFICATION

6.1 Technical Justification

420) The findings of the LTR and related fisheries projects that have been undertaken on Lake Tanganyika, as well as field observations by the Mission itself, clearly indicate that it will be impossible to implement the FFMP, and therefore to realise the application of responsible fishing practices, unless major constraints can be overcome in both the harvest and post-harvest dimensions of the fisheries.

421) The interventions to be pursued under TREFIP are intended to address these constraints, bearing in mind that each of the lacustrine States suffer from severe budget

shortages and simply lack the wherewithal, now and for the immediate future, to mobilise required resources on their own.

422) The package of interventions has been designed to be as technically feasible and efficient as possible. Thus, for example, the allocation of greater responsibility to local communities for the control of resource access and for MCS activities is seen as the most effective way to resolve the present deficiencies of the respective fisheries authorities in providing for these crucial management requirements.

423) In the same fashion, facilitation of an LFC Micro-Credit Scheme is proposed as an efficient and replicable means of mobilising funds and local initiative to improve productive capabilities in the face of conditions of extreme poverty and the lack of commercially available credit.

424) Finally, proposed interventions in the area of fishing technology and post-harvest practices are those that appear most appropriate in terms of familiarity and accessibility to local stakeholders, and the likelihood of easy integration with existing physical infrastructure, transportation links, marketing channels, and consumer preferences for fish product formats.

6.2 Economic Justification

425) The Programme aims in the long run to promote a sustainable level of production and reverse trends towards overexploitation, now evident in localised cases, brought on by conditions of free access. This implies that current production levels, estimated at 165,000-200,000 mt per year, will not be enhanced.

426) Moreover, given the level of investments in activities which do not yield a direct economic return (schools, health centres, water and sanitation systems), TREFIP does not lend itself to conventional cost-benefit analysis and rate-of-return calculations.

427) However, it must be recognised that under 'No Programme' conditions, the continuation of a free access regime coupled with use of destructive gear and methods would likely result in commercial fish stock depletion in years to come. In other words, the 'No Programme' scenario would reflect the familiar 'race to fish' pattern whereby production increases to a certain extent and then declines sharply to well below previous levels.

428) The economic justification of TREFIP is thus found in the way that it can help prevent the loss of earnings for some 20,000 fisher families, i.e. all of those associated with pilot CFMZ villages. Such earnings currently can be estimated to amount to something in the range of $20-25 million (40-50,000 mt valued at $0.50/kg).

429) TREFIP activities will not result in the 'conservation' of all these earnings, since their effects on individual fishers and processors within any one village will be variable. The most direct earnings effects will apply to those who improve their productive capabilities through access to LFC Micro-Credit Scheme services. Other Programme benefits will be more diffuse in their effects, such as those that derive from improved educational and health services.

430) The Mission estimates that by EOP around one quarter of the present value of pilot CFCM village earnings will be conserved as a direct result of Programme activities -- i.e. around $5 million or the value of some 10,000 mt of production.

431) The above considerations provide a basis for the economic analysis of Programme impacts presented in ANNEX 11. Specific assumptions used for this analysis include the following:

- The Programme yields a net production savings of 2,000 mt by Year 3, and 5,000 mt by Year 5.
- This figure reaches a level of 10,000 mt within 2 years after EOP;
- The value of fish production equals $0.50/kg (ex-vessel).
- Added value on 50 percent of fish production by Programme Year 3 is 20 percent of landing site sales.
- The average number of pilot village inhabitants is 700.
- From Programme Year 2, each inhabitant receives a benefit equivalent to $50/year deriving from improvement of village facilities (access to school for children, better health services, etc.).

432) Under these conditions, the Economic Rate of Return (ERR) for the Programme reaches 14 percent.

433) Sensitivity analysis reveals the following range of ERR.

Table 15. ERR Sensitivity Analysis

Assumptions	ERR
1) Value of production decreases by 10% & added value on sales is 10%	13%
2) Value of production decreases by 10% & production decreases by 30%	10%
3) Value of production increases by 10%	15%
4) Benefit for inhabitants equals $100	29%
5) Price per kg is $1.50	31%

6.3 Financial Justification

434) Financial justification of the Programme is readily apparent in terms of improvements in the areas of post-harvest practices and fish distribution and marketing networks.

435) Investments to be made by local fish processors in drying racks appear to be highly profitable, with full loan repayments possible within the first year of operation. The extra income is due to an average 15 to 20 percent added value in comparison with fish dried on sand/gravel. In the case of 30 m^2 drying rack area investment ($300), the extra income on 14 mt of fresh fish reaches $230 the first year and $493 from year 2 (see ANNEX 7).

436) The development of fresh fish marketing with refrigerated trucks is also profitable. The Mission estimates an Internal Rate of Return (IRR) of 20 percent (basic costs study -- see ANNEX 7), with sensitivity analysis indicating that the IRR reaches 170 percent when the selling price increases by 10 percent (all else remaining equal).

437) Other infrastructure improvements at village level, such as schools, health centres, potable water networks, and sanitation facilities, are not direct production investments. The same is true of works to be carried out at key marketing points, such as roads, jetties, and electricity networks. These facilities will be shared by a variety of users and cannot show financial justification directly related to the fisheries.

438) At the same time, it has to be recognised that infrastructure and service improvements at all levels represent a substantial package of benefits from a wider societal or quality-of-life perspective. Other Programme activities will generate positive impacts that, whilst highly significant, are similarly difficult to measure in strictly financial terms. Local empowerment, improved food security, and responsible use of resources, for example, all fall into this order of benefit. Their effects are broad and cumulative, and must be appreciated according to more abstract measures of socio-economic and ecological sustainability.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

439) The AfDB/FAO/FISHCODE Mission to Lake Tanganyika was assigned to evaluate earlier proposals related to the Regional Framework Fisheries Management Plan (FFMP) made under the auspices of the FAO/LTR Project and FAO/FISHCODE, and accordingly to develop a full FFMP Implementation Programme.

440) The Mission was specifically requested to elaborate: a) one national project for each participating lacustrine State; and b) one overall project that will handle management and co-ordination of all FFMP Implementation Programme activities on a regional level.

441) In this context special attention was to be given to possibilities for developing viable solutions to problems of localised over-exploitation, the use of destructive fishing techniques, and post-harvest losses associated with poor infrastructure and lack of marketing opportunities.

442) Over the course of a four-month period between late March and late July 2000, the team conducted technical consultations at FAO Headquarters in Rome and carried out an extensive programme of field visits to major fishing and administrative centres around Lake Tanganyika. Further consultations were held with members of the LTR Scientific Co-ordination team at the University of Kuopio, Finland, in the course of preparing an Environmental Impact Assessment to supplement the present report.

443) Interviews were held with local harvest and post-harvest operators, commercial fishing company representatives, fisheries administrators and researchers, and senior ministerial officials from each of the lacustrine States.

444) Relevant documentation pertaining to the lake and its fisheries was also reviewed.

445) This report presents Mission results, in the form of proposal to the AfDB and other interested donors for the establishment of a 'Tanganyika Regional Fisheries Programme' (TREFIP).

446) TREFIP has the overall objective of putting the FFMP and its underlying processes into full operation, as endorsed by the CIFA Sub-Committee for the Management and Development of the Fisheries of Lake Tanganyika, at the Eighth Session of the Sub-Committee held in Lusaka, Zambia, in May 1999.

447) FFMP aims are to counter present trends towards non-sustainability by promoting responsible fisheries development, protection of the aquatic environment, and the maintenance of a diverse ecosystem. The achievement of these aims would secure Lake Tanganyika's continuing role as a major pillar of regional food security now and for the sake of future generations.

448) In accordance with the CCRF principles upon which the FFMP is based, TREFIP builds into itself a combination of normative orientations and practical measures that feature the following themes:

- adaptive or interactive management practices that allow for adjustments in fishing pressure;
- multi-disciplinary monitoring capability for measurement of continuity and change across a range of bio-physical and socio-economic parameters, as appropriate to the complexities of ecosystem – human system interactions;
- partnerships with local stakeholder groups in management decision-making and in fashioning modalities of enforcement and compliance;
- allocation of access and fishing rights to local communities; and
- use of integrated development strategies and coastal area management models in order to accommodate interplay and possible conflicts between fishing and non-fishing activities and to reduce pressure on the fishery resource base through economic diversification.

449) The Programme thus has strong participatory, developmental, and environmental ambitions. 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.

450) Six principal and closely interlinked outputs are anticipated.

451) ***Output 1***, the 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.

452) 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.

453) 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.

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

455) 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.

456) ***Output 3*****,** the 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.

457) ***Output 4***, improved fisheries legal regimes and MCS capabilities, involves work to facilitate harmonisation of fisheries legislative frameworks and elaboration of specific regulatory measures for 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.

458) ***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.

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

460) 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.

461) In pursuit of these outputs, and taking into account the particular circumstances, problems, and prospects existing within each of the Lake Tanganyika national fisheries, the Mission has designed TREFIP as a set of four country project components and a regional umbrella component that together will involve 200 local fishing communities in pilot co-management arrangements. Some 20,000 fishing families or from 140,000 to 150,000 people are expected to be direct beneficiaries of Programme activities.

462) Estimated costs for five years of TREFIP operations projected for the 2002 - 2006 period amount to $42.2 million. An additional $342,000 has been budgeted to support a six-month Programme Preparatory Phase.

463) Although it is difficult to quantify all Programme benefits in strict economic or financial terms, the Mission calculates an ERR of 14 percent for TREFIP benefits related to production savings and extra income for residents of villages within pilot CFMZs.

7.2 Recommendations and Conditions of Loan Approval

464) In order to ensure the timely implementation of TREFIP the Mission recommends that the following preconditions be met by the four lacustrine States during or before the Preparatory Phase of the Programme.

465) First, legal foundations for CFMZ and LFC arrangements should be elaborated and put in place, as it will otherwise be extremely difficult to implement activities related to proposed co-management measures and the operation of the LFC Micro-Credit Scheme.

466) Secondly, provision should be made to ensure that all national fisheries research and administrative stations/offices around the lakeshore are staffed with sufficient personnel of the appropriate calibre to allow effective participation in TREFIP activities. The Mission notes with concern that most stations/offices are at present understaffed and/or staffed with personnel who lack sufficient training, skill levels, and motivation.

467) Finally, representatives of the relevant funding and executing agencies should as soon as possible investigate appropriate modalities of technical and financial co-operation that could be established between the Lake Tanganyika Authority (proposed

under terms of the yet-to-be ratified 'Convention on the Sustainable Management of Lake Tanganyika' drafted under GEF/LTBP auspices), and the Regional Fisheries Management Council (proposed for establishment under TREFIP).

468) One way to ensure that his co-ordination is effected would be to have FAO serve not only as the TREFIP executing agency, but also as the executing agency for implementation of the GEF/LTBP-drafted SAP for Lake Tanganyika.

469) With regard to Programme financing, the Mission proposes that the AfDB provides 47 percent and the GEF 53 percent of the overall budget. This would be broken down as an AfDB grant of $5.3 million (Preparatory Phase and infrastructure), AfDB loans to individual States totalling $14.8 million (infrastructure), and a GEF grant of $22.4 million (technical assistance, lacustrine parks, and recurrent costs).