



FISHERIES MANAGEMENT AND DEVELOPMENT PROCESSES IN LAKE TANGANYIKA

- ENHANCING REGIONAL FISHERIES MANAGEMENT PLAN

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Citation: AU-IBAR 2016. Fisheries Management and Development Processes in Lake Tanganyika - Enhancing the Fisheries Management Plan. AU-IBAR Reports

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Published by AU-IBAR, Nairobi, Kenya

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ISBN 978-9966-1659-5-4

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ACRONYMS AND ABBREVIATIONS

AU	African Union
AU-IBAR	African Union Interafrican Bureau for Animal Resources
AfDB	African Development Bank
BMU	Beach Management Unit
CAS	Catch Assessment Survey
CBD	Convention on Biological Diversity
CCRF	Code of Conduct for Responsible Fisheries
CIFA	Committee for Inland Fisheries for Africa
CIFAA	Committee for Inland Fisheries and Aquaculture for Africa
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMI	Co-management Institutions
CPUE	Catch Per Unit Effort
EAF:	Ecosystem Approach to Fisheries
EIFAC	European Inland Fisheries Advisory Council
ERA	Ecological Risk Assessment
FAO	Food and Agriculture Organization of the United Nations
FMP	Fisheries Management Plan
FFMP	Framework Fisheries Management Plan
FS	Frame Survey
GDP	Gross National Product
GEF	Global Environment Facility
IBAR	Inter African Bureau for Animal Resources
IUU	Illegal, Unreported and Unregulated (catches)
LTA	Lake Tanganyika Authority
LTBP	Lake Tanganyika Biodiversity Project
LTR	Lake Tanganyika Research Project
LTRIEMP	Lake Tanganyika Regional Integrated Environmental Monitoring Programme
LVFO	Lake Victoria Fisheries Organization
MCS	Monitoring, Control and Surveillance
NEPAD:	New Partnership for Africa's Development
NGO	Non-Governmental Organization
NCU	National Coordination Unit
PRODAP	Project to Support the Lake Tanganyika Integrated Regional Development Programme
PFRS	Policy Framework and Reform Strategy for fisheries and aquaculture in Africa
SAP	Strategic Action Programme for Lake Tanganyika
TDA	Transboundary Diagnostic Analysis
UNDP	United Nations Development Program
VCDC	Village Conservation Development Committee

ACKNOWLEDGMENTS

The Director of AU-IBAR wishes to acknowledge the assistance and contributions from Management of Lake Tanganyika Authority; Eng. Jean-Marie Nibirantije, Executive Director of LTA and Mr. Kaitira Katonda, Director of Fisheries at the LTA Secretariat as well as with Mme. Leoine Nzeyimana, the Director of Water, Fisheries and Aquaculture of the Republic of Burundi and some of her staff, and Dr. Phillipe Petite, Freelance Consultant at Bujumbura.

We also extend our thanks to Mr. Colin Apse, Director, the Nature Conservancy, based in Maine USA and Dr. Modesta Medard, Manager at the Nature Conservancy, African Great Lakes Programme Office, Arusha, Tanzania. Special thanks go to the consultant who prepared the document and the team at IBAR for the editorial work.

This work was done under the project '**Strengthening Institutional Capacity to enhance governance of the fisheries sector in Africa**' Project number, DCI-FOOD 2013/331 -056, funded by the EU to whom we are grateful for the financial support.

EXECUTIVE SUMMARY

Inland water bodies are natural capital assets which must be managed in a manner to not only maintain existing benefits (food security, livelihoods and income), but also seek to increase the sustainable contribution of the sub-sector to the blue economy growth of our member states. The current benefits are however under threat from a variety of sources, key amongst which include poor governance frameworks, open access nature, unsustainable fishing practices, weak capacity, threats by climate change, environmental and other natural disasters, lack of alternative livelihoods etc. The vast majority of these water bodies are shared ecosystems which in turn pose significant management challenges to fisheries management bodies.

The overall goal of the Policy Framework and Reform Strategy (PFRS) for fisheries and aquaculture in Africa is to create an enabling environment for food security, livelihoods and wealth. Therefore one of the PFRS key policy arenas is to promote sustainable development of small-scale fisheries on the continent that includes inland fisheries development. The formulation of realistic fisheries management plans informed by assessment of management and development issues could be a precursor to solving some of the challenges in the subsector. This study which was commissioned by the African Union with support from the European Union under the Fisheries Governance Project, assessed the issues which could ultimately contribute to realistic regional fisheries management plans in shared water bodies on the continent.

This paper, which is set against the above background, assesses the management of fisheries in Lake Tanganyika, analysis the key strategic transboundary issues and challenges that affect fisheries management and development, identifies gaps in the existing fisheries management plan and suggests strategies, processes and mechanisms to enhance the fisheries management plan

Lake Tanganyika is situated in the Albertine Rift Valley. The lake is shared by the Republic of Burundi, the Democratic Republic of Congo, the United Republic of Tanzania and the Republic of Zambia. The Lake is of inestimable value for the social and economic development, particularly of the riparian communities and nations dependent on the provision of its ecosystem services and resources. One of the important resources in the lake is the fisheries.

Lake Tanganyika has long been recognized as a global heritage that needs to be preserved and the Lake Tanganyika basin has a long history of research activities starting with the first explorations of the region in the 1800's, and followed by numerous subsequent scientific research expeditions. From the fisheries management perspective, concerted efforts to manage the fisheries resources in the Lake started in the 1970s. These combined efforts (conservation/preservation and fisheries) culminated into the establishment of the Lake Tanganyika Authority (LTA) whose Convention provides a legal framework for regional cooperation on the conservation of biological diversity, sustainable management and implementation of harmonized laws and standards for sustainable use of natural resources in the Lake Tanganyika basin¹.

The LTA Secretariat has executed a number of hands-on regional activities aimed at supporting national level programmes and has elaborated documents/instruments on important fisheries governance and

¹ The Convention was signed by the four riparian countries (Contracting Parties) on 12 June 2003 in Dar es Salaam, Tanzania; was formally registered with the Commission of the African Union on 30 July 2004; entered into force in September 2005 and by November 2007, all the four Contracting Parties had ratified the Convention.

management issues to facilitate cooperative management of the fisheries as a shared resource. Progress however has been slow because of institutional weaknesses in the Partner States.

The fisheries management in Lake Tanganyika is open access and the application of management measures is in general highly variable from one country to another, from the point of view of fisheries regulations and enforcement, fisheries policy and systems of management, research, cooperative approach, effectiveness, etc. Fishing communities in each country also exhibit a high propensity to catch as much of the resource during the time when the resources are available in its waters.

The take from the most recent (2011) lake-wide frame survey is that trends for fish harvests indicate a decline in most species in the last decade, the fishing capacity, i.e. the number of fishers, the number fishing vessels and the number of fishing gears, methods and boats, has doubled and the catch per unit of effort (CPUE) has decreased tremendously. Fishing pressures are said to be driven by increasing demand due to local population increases, higher consumer rates, and increased tourism after several years of political stability in some parts of the basin.

Management of the resource is impacted by both environmental stresses and other strategic transboundary issues and challenges. The four main sources of environmental stresses that are adversely impacting the Lake Tanganyika's ecosystem and the resources, as well as the region's economy and livelihoods, originate from the Lake, littoral zone (near shore), within the basin (upper watershed), and outside the basin. Cumulatively, they cause degradation of the Lake, reduce its resiliency and results in conflicts. In several cases these stresses reduce fish stocks and diversity, destroy critical habitats for spawning, etc.

The key transboundary issues and challenges which affect and could potentially impact on the sustainable exploitation and management of the fisheries in Lake Tanganyika are related to inadequate fisheries governance. The main issues are: absence of up-to-date policies, laws and regulatory standards at national level; the non-harmonization of policies, laws, regulatory standards at regional level; low compliance to fisheries laws and regulations and inadequate enforcement; and limited effective involvement of stakeholders in the fisheries management process.

These issues together with the prevalence of poverty and increase in population in the lake's basin contribute to: exertion of excessive pressure on the fisheries resources and the basin ecosystems; incidence of illegal, unreported and unregulated fisheries (IUU Fishing) and poor management practices resulting in declining fish stocks, destruction of critical habitats and the environment, and conflicts among stakeholders.

The key challenges are to correct the imperfections in the fisheries governance and in addition reduce the pressure on the resources; generate appropriate scientific knowledge and incorporate the use of local knowledge to guide resource management; ensure the availability of reliable data and information to guide management; and develop the human and institutional capacity to manage the complexity of resource uses and pressures, and also to understand and develop mechanisms for adaptation to climate variability and climate change.

The LTA is implementing its second Framework Fisheries Management Plan (FFMP). This study identified a number of gaps in the FFMP and strongly suggests that priority is given to assist LTA Secretariat to

develop a realistic Framework Fisheries Management Plan² for the transboundary fishery resources of Lake Tanganyika. Such a plan should address the shortcomings of the present plan. The tool to use for developing such a plan is the Ecosystem Approach to Fisheries (EAF).

² We call it a framework fisheries management plan because Member States would be expected to review on an annual basis or following the customs in the country extract from the FFMP for inclusion in their national plan.

SECTION ONE: INTRODUCTION

1.1. Purpose of the Paper

This paper assesses the management of fisheries in Lake Tanganyika, analysis the key strategic transboundary issues and challenges that affect fisheries management and development, identifies gaps in the existing fisheries management plan and suggests strategies, processes and mechanisms to enhance the fisheries management plan.

1.2. Context and Rationale

Inland water bodies are natural capital assets which must be managed in a manner to not only maintain existing benefits (food security, livelihoods and income), but also seek to increase the sustainable contribution of the sub-sector to the blue economy growth of our member states. The current benefits are however under threat from a variety of sources, key amongst which include poor governance frameworks, open access nature, unsustainable fishing practices, weak capacity, threats by climate change, environmental and other natural disasters, lack of alternative livelihoods etc. The vast majority of these water bodies are shared ecosystems which in turn pose significant management challenges to fisheries management bodies.

The overall goal of the Policy Framework and Reform Strategy for fisheries and aquaculture in Africa (PFRS) is to create an enabling environment for food security, livelihoods and wealth. Therefore one of the PFRS key policy arenas is to promote sustainable development of small-scale fisheries on the continent and this includes inland fisheries development. The formulation of realistic fisheries management plans informed by assessment of management and development issues could be a precursor to solving some of the challenges in the subsector. This study which was commissioned by the African Union with support from the European Union under the Fisheries Governance Project, assesses the issues which could ultimately contribute to realistic regional fisheries management plans in shared water bodies on the continent

Africa has about 80³ transboundary water basins that serve multiple functions. The transboundary water basins cover approximately 64% of the continent's land area, which contain 93% of the water resources and are inhabited by 77% of the population (UNEP, 2010). The water basins contain fisheries resources and a wealth of aquatic and other biodiversity. Lake Tanganyika the second largest lake in Africa is one of these transboundary water basins.

Inland fisheries make very significant contributions to nutrition and food security, employment, income generation and improvement of livelihoods to populations in African countries. In several countries, especially land-locked countries and riparian communities along major rivers and lakes of the continent, fish is probably the major protein source. Inland fisheries are the fourth (10.66%) most important source of animal protein after cattle (22.4%), marine fish (21.10%) and chicken (15.79%) (AUC-NEPAD, 2014). Although most of the catch of inland water fisheries is consumed locally, products from inland fisheries are also important in regional, intra- and international trade. For example the value of the exports of catch from Lake Victoria in 2014 was over US300 million (LVFO, 2015).

The most recent estimate (2014) of the total fish production from Africa is 10.35 million tonnes. Of this, about 2.85 million tonnes or 33.1% is from inland capture fisheries. Total aquaculture production

³ Source: *Water and Sustainable Development in Africa: An African Position Paper African Water Task Force, August 2002*

was 1.71 million tonnes and marine capture fisheries 5.78 million tonnes (FAO, 2016, Garibaldi, pers. com). The value added by the fisheries sector as a whole in 2011 was estimated at more than US\$24 billion, 1.26% of the GDP of all African countries. Of this, about US\$6.2 billion was inland fisheries (US\$4.7 billion from direct fishing and US\$1.5 billion from post-harvest). The fisheries sector as a whole employs 12.3 million people as full-time fishers or full-time and part-time processors, representing 2.1% of Africa's population of between 15 and 64 years old. The share of inland fisheries was about 5 million (3.3 million as fishers and 1.5 million processors). The estimated number of women in the inland fisheries sector was slightly over 1.3 million with the majority of them (about 1.1 million) in the post-harvest sub-sector (de Graff and Garibaldi, 2014)

Conventional wisdom holds that the contribution of inland fisheries is grossly under-estimated because of the difficulty of collecting data from highly dispersed landing sites (Welcomme et al. 2014); implying that with good management, inland fisheries can become a strong engine for development and economic growth.

Effective fisheries management is dependent on among other things the availability and implementation of appropriate fisheries and aquaculture policies; the conduct of fisheries management practices in a regulatory framework that is consistent, harmonized and applicable, and the development and implementation of an appropriate fisheries management plan which in the case of transboundary resources should be a negotiated instrument between the fisheries management authorities of the concerned countries and their stakeholders; an instrument that provides a clear vision for the fishery, realistic and measurable objectives and other parameters as a road-map for moving the fishery forward on an agreed schedule of shared responsibilities among the fisheries management authorities and the stakeholders.

Efforts to promote the rational management of inland fisheries particularly in transboundary water bodies in Africa date back to 1970⁴. At the Fifty-four Session of the FAO Council, African countries, Members of FAO, conscious of the fact that several rivers and lakes are common to two or more countries, and that their fisheries resources constitute a field of international interest requested FAO to establish a body similar to the European Inland Fisheries Advisory Council (EIFAC) for the African Continent. In follow up to this request, an ad hoc Consultation on the Proposed Establishment of an Inland Fishery Body for Africa was held in Rome in April 1971. The Consultation among other things estimated that the presence of several shared rivers and lakes as well as extensive floodplains and wetlands suitable for inland fisheries necessitated joint policy and the adoption of a uniform and standard methodology for resource appraisal and for collection of statistics and biological data in order to determine the consequences of fishing on stocks and strongly recommended the establishment of such body. Consequently, the FAO Council at its Fifty-six Session, in June 1971 established the Committee for Inland Fisheries for Africa (CIFA)⁵.

Since then several actions were taken by African countries with the assistance of development partners, including in particular FAO, to promote the sustainable development of inland fisheries particularly in transboundary inland water bodies. CIFA among other things established three sub-Committees, namely: the Sub-Committee for the Protection and Development of the Fisheries of the Sahelian Zone,

⁴ The Author is aware that studies had begun in several water bodies as early as the late 1800s; but we refer to joint efforts at the international level.

⁵ The FAO Council at its Hundred and Thirty-third Session in 2007 changed the name to "The Committee for Inland Fisheries and aquaculture of Africa" (CIFAA) to reflect the importance of aquaculture in global fishery sector but also in Africa

(1974), the Sub-Committee for Development and Management of the Fisheries of Lake Tanganyika (1977), and the Sub-Committee for the Development and Management of Fisheries of Lake Victoria (1981) to coordinate fisheries research and development activities on these major inland water bodies, floodplains and wetlands.

1.3. Main Areas Covered

This paper systematically

- Describes the main features of the Lake Tanganyika Basin and the fisheries in Lake Tanganyika;
- Presents the institutional arrangements and regulatory frameworks for the management of fisheries in Lake Tanganyika and recapitulates the main achievements of the Lake Tanganyika Authority Secretariat;
- Analyzes the status and trends in the Lake Tanganyika fisheries;
- Assesses the fisheries governance and management approaches that are applied in the fisheries;
- Identifies and analyzes the environmental stresses and key strategic transboundary issues and challenges which affect and could potentially impact on the sustainable exploitation and management of the fisheries;
- Identifies major gaps in the existing fisheries management plan, and
- Suggests strategies, processes and mechanisms to enhance the fisheries management plan

1.4. Methodology

The assignment was essentially a Desk Study combined with two day mission to the headquarters of the Lake Tanganyika Authority (LTA) Secretariat in Bujumbura, Burundi. The approach for the study consisted of four distinct but interrelated phases of literature search/review and virtual search of websites; a field visit to Bujumbura at which Semi-structured interviews were conducted.

SECTION TWO: Main Features of Lake Tanganyika Basin and its Fisheries

2.1. Main Features of Lake Tanganyika Basin

Lake Tanganyika, the second largest lake in Africa, the second deepest and the second largest lake in the world by volume, is of inestimable value for the social and economic development, particularly of the riparian communities and nations dependent on the provision of its ecosystem services and resources. The lake is a source of water supply, provides food and nutrition security and employment and is used as means of transport and for other economic purposes such as tourism which generates millions of dollars annually (LTA Secretariat 2012). Imports passing through the lake were estimated at US\$4.8 billion and exports at US\$1 billion in 2008-2009 (The Courier, 2010).

The current population in the lake basin is estimated to be between 12.5 and 13 million people and with a growth rate ranging from 2.0 -3.0% annually, the population is likely to increase significantly in the near future (LTA Secretariat, 2012).

Lake Tanganyika is situated in the Albertine Rift Valley and has a surface area of approximately 32,600 km². The lake is shared by the Republic of Burundi (8% of the total surface area), the Democratic Republic of Congo (45%), the United Republic of Tanzania – the Main land (41%) and the Republic of Zambia (6%). Figure 1 depicts the lake and its basin.

Many rivers enter the lake, but only the Lukuga River flows out. With a length of 673 km, a total shoreline of 1,828 km and an average width of 50 km, the lake is estimated to have a volume of 18,900 km³ containing almost 17% of the global available surface freshwater supply (Bootsma & Hecky, 2003). This gives the lake an enormous buffer capacity, but also makes it extremely difficult for the lake to recover if it is polluted. Some basic information on the lake is summarized in Table 1.



Table 1: Basic information about Lake Tanganyika and its Drainage Basin

Riparian Countries	Burundi, DR Congo, Tanzania and Zambia
Altitude (surface)	773 m
Surface area	32,600 Km ²
Volume	18,900 Km ³
Maximum depth	1,470 m
Average depth	570 m
Residence time	440 years
Drainage area	223,000 Km ²
Population in drainage area	13 million
Population density in drainage area	45/Km ²
Length of lake	670 km
Length of shoreline	1,823 km
pH	8.6-9.2

Source: *Lake Tanganyika: Experience and Lessons learned*
Brief by Sven Erik Jorgensen et al. undated

The Lake is bordered by four national parks or nature reserves, namely;

- Rusizi River Nature Reserve (Burundi)
- Gombe River National Park (Tanzania)
- Mahale Mountain National Park (Tanzania), and
- Nsumbu National Park (Zambia)

Lake Tanganyika's ecosystem is sensitive to climatic conditions and the productivity of the lake is highly dependent on hydrodynamic states and climatic conditions particularly wind and temperatures (Coulter et al. 1991a, Plisnier and Coenen 2001). There are two main weather seasons- the wet and dry seasons. The wet season, from September to May, is characterized by high humidity, considerable precipitation and frequent thunderstorms. Heating of the lake occurs mainly during the beginning of this season, between September and November. At this time, thermal stratification establishes all over the lake, with the temperature difference between the surface and bottom water layers within 4oC. The dry season from May to September is characterized by dry weather and strong southern and southeastern monsoon winds. The lake loses heat by evaporation caused by strong winds. The cooling is stronger in the southern basin from May to September (Coulter et al. 1991b). Southeastern winds drive warm epilimnion surface water towards the north end of the lake, while water flows south as deep current, causing upwelling along the southeastern coast, resulting in a tilting of the epilimnion (Lewis et al. 1995).

Several studies have been undertaken of the lake that provides a good understanding of its chemistry, hydrology and ecology. These include:

- Lake Tanganyika Research (LTR) Project "Research for the management of the Fisheries on Lake Tanganyika" (GCP/RAF/271/FIN)
- Pollution Control and other Measures to Protect Biodiversity in Lake Tanganyika (LTBP) UNDP/GEF RAF/92/G32
- Limnologic and Paleolimnologic Investigations of Lake Tanganyika by the University of Arizona researchers
- CLIMLAKE – Climate variability and ecological dynamics in Lake Tanganyika –DWTC-project IGBP/PAGE, IDEAL
- UNDP/GEF/UNOPS Lake Tanganyika Management Planning Project (LTMP)

- Recent ENSO and paleo-ENSO events during the last 1000 years in Lake Tanganyika –DWTC-Duurzame Ontwikkeling
- Ecology of the pelagic fish resources of Lake Tanganyika, Ph.D Thesis by Piero Manini (1998), University of Hull
- Study on the Impact of Environmental Degradation on Fisheries in Lake Tanganyika Doc ALT/LTA (LTA Secretariat, 2012)

2.2. The Fisheries of Lake Tanganyika

A wide diversity of aquatic habitats are found in the lake, including dense macrophytes, shallow nutrient- and sediment rich plateaus near river deltas, extensive beds of empty *Neothauma tanganyicensis* shells, cobble stones, rocky habitats, stromatolite congregations and large muddy areas that extend to the deepest depths of the lake. These habitats support a remarkable diversity of species, which have formed complex interrelationships and depend on the integrity of the lake ecosystem for their productivity.

Estimates suggest that the Lake is home to over 2000 species among which 600 are endemic (Coulter, 1991, Snoeks, 2000), although species numbers vary according to taxonomic authority. The lake contains at least 250 morphologically and colourful cichlid fish species and 150 species of non-cichlid fish most of which live along the coast at an approximated depth of 180 m. However, the largest fish biomass is found in the pelagic area (open water) and is dominated by six species: two clupeid species (*Stolothrissa tanganyicae* and *Limnothrissa miodon*) and four types of Lates species (*Lates stappersii*, *L. angustifrons*, *L. mariae* and *L. microlepis*).

There are two distinct but overlapping fisheries in Lake Tanganyika, the near-shore (the littoral zone) fisheries and the offshore (pelagic zone) fisheries. The annual fish production for Lake Tanganyika generally fluctuates between 165,000 and 200,000 metric tons/annual (Molsa et al., 1999). The annual estimated value of the fisheries is USD 700 million (PRODAP Appraisal Report, 2004)⁶.

Several of the fish species in Lake Tanganyika are shared or transboundary resources; although the degree of sharing of stocks of the species varies greatly. The biomass of some of the species fluctuates significantly due particularly to hydro-climatic changes of the aquatic environment. These resources therefore require a management approach that emphasizes cooperation among the countries sharing the resources and the application of ecosystem-based approach and the precautionary principle in the management of the fisheries.

2.3. Past and Current Efforts to Preserve, Develop and Conserve the Resources

Lake Tanganyika has long been recognized as a global heritage that needs to be preserved and the Lake Tanganyika basin has a long history of research activities starting with the first explorations of the region in the 1800's, and followed by numerous subsequent scientific research expeditions.

Most of the research has been synthesized in the book "Lake Tanganyika and its life" (Coulter 1991a).

Since the 1960s, FAO executed a series of projects at national levels. The activities of these projects were coordinated periodically by the Committee for Inland Fisheries for Africa (CIFA) and more specifically by CIFA's Sub-Committee for Lake Tanganyika which was established in 1977. Issues such as fish stock management, fisheries statistics and information, fisheries regulations, post-harvest processing

⁶ There is no recent economic valuation of the fisheries in the lake.

and trade were discussed nationally and regionally at the FAO meetings. Unfortunately most of the recommendations of these meetings were not implemented in a coordinated manner at regional level. In 1991 the holding of the International Scientific Conference on the Conservation of Biodiversity of Lake Tanganyika acted as a catalyst for a number of partnerships and initiatives to further enhance knowledge relevant to sustainable management of biodiversity and natural resources in the lake basin (LTA Secretariat 2012). Following this Conference, among other initiatives, two major projects were executed. From 1992 to 2001, the Lake Tanganyika Research Project (LTR) funded by the Government of Finland was implemented by the Food and Agriculture Organization of the United Nations (FAO) in close collaboration with research institutions in the riparian countries of Burundi, Democratic Republic of Congo, Tanzania and Zambia. The LTR investigated the production and fisheries potential of the lake, and developed modalities for regional management of fisheries resources. The LTR major output was the establishment of a Lake Tanganyika Framework Fisheries Management Plan (FFMP), which is based on the FAO Code of Conduct for Responsible Fisheries (CCRF). The FFMP was adopted by the Lake Tanganyika Subcommittee of CIFA at its eighth session in 1999 (Reynolds et al. 1999).

In parallel with the LTR, the project on pollution control and other measures to protect biodiversity in Lake Tanganyika (LTBP) took place from 1995 to 2000. The LTBP was funded by the Global Environment Facility (GEF) and was implemented in partnership with the United Nations Development Programme (UNDP), the governments and relevant national research institutions of the four riparian countries as well as non-governmental organizations (NGO).

Both the LTR and LTBP contributed a wealth of knowledge on the status of fisheries and biodiversity in the lake and highlighted the need for the riparian countries to find joint management solutions for transboundary environmental threats. This knowledge together with those from special studies programme on biodiversity, fishing practices, pollution, sedimentation and socio-economic provided supportive scientific and technical reports, for the elaboration of the Transboundary Diagnostic Analysis (TDA) of the lake. The TDA⁷ in turn provided the technical and scientific basis for the logical development through broad consultations with stakeholders at national level and negotiations at regional level of the Strategic Action Programme (SAP)⁸ which provide policy directions for the Lake. The SAP was finalized in 2000⁹ and a draft Convention on sustainable management of the lake was developed to provide a formal framework for the joint management of Lake Tanganyika.

⁷ A scientific and technical fact-finding analysis of the relative importance of sources, causes and impacts of transboundary waters problems

⁸ A negotiated policy document that identifies actions in terms of policy, legal institutional reforms and investments needed to address priority transboundary problems. The SAP defines national priorities within a regional framework, as there are incremental benefits to shared international water resources and global biodiversity

⁹ To adequately reflect the changes in magnitude and nature of threats to the biodiversity and natural resources in the lake basin over the past decade, the SAP was updated in 2012 as SAP 2.

SECTION THREE: Institutional and Regulatory Frameworks/ Arrangements

3.1. Institutional Frameworks

Based on the outcomes of the LTBP and LTR, as well as those of other projects and research activities in the Lake Tanganyika basin, stakeholders in the riparian countries of Lake Tanganyika came to the fundamental conclusion that most of the threats to biodiversity and management of the natural resources are transboundary and therefore require regional cooperation. The governments of Burundi, Democratic Republic of Congo, Tanzania and Zambia subsequently committed to undertaking joint actions and supporting national and regional initiatives to ensure long-term conservation of biodiversity and sustainable management of the natural resources in the Lake Tanganyika basin. The riparian countries formalized their commitment to ensure a solid foundation for regional cooperation by adopting two key instruments: the Convention on the Sustainable Management of Lake Tanganyika and the Lake Tanganyika Authority (LTA).

The Convention on the Sustainable Management of Lake Tanganyika

The Convention on the Sustainable Management of Lake Tanganyika¹⁰ provides a legal framework for regional cooperation on the conservation of biological diversity, sustainable management and implementation of harmonized laws and standards for sustainable use of natural resources in the Lake Tanganyika basin¹¹.

The Convention unites the countries in recognizing that Lake Tanganyika is a shared heritage with unique biological and other diversity. It implicitly addresses the three main objectives of the Convention on Biological Diversity (CBD) namely: a) Conservation of biological diversity; b) Sustainable use of the components of biological diversity; and c) Fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The Convention furthermore recognizes the significance of the lake for the development of the riparian countries and the necessity of cooperative management of natural resources.

The Lake Tanganyika Authority (LTA)

Article 23 of the Convention provides for the establishment of the Lake Tanganyika Authority (LTA), whose function is to coordinate the implementation of the Convention by the Contracting States. Furthermore, the LTA has the mandate of advancing and representing the common interests of the Contracting States in matters concerning the management of Lake Tanganyika and its catchment basin. The key functions and capacities of the LTA as stated in Article 23, paragraphs 3, 4 and 7 of the Convention are reproduced in Box 1.

Box 1: Key functions and capacities of the Lake Tanganyika Authority

1. The function of the Authority is to co-ordinate the implementation of the present Convention by the Contracting States and, in accordance with this Convention and the decisions of the Conference of Ministers, to advance and represent the common interests of the Contracting States in matters concerning the management of Lake Tanganyika and its Basin.
2. The Authority shall have international legal personality and such legal capacity as may be necessary to perform its functions and mission.
3. Each Contracting State shall, having regard to the diplomatic rules governing international organizations, grant to the Authority and its property, funds and assets, the privileges, immunities and facilities that it needs to carry out its activities; and the members of the Management Committee and of the Secretariat the privileges, immunities and facilities that they need to perform their official functions

¹⁰ This instrument will hereafter be referred to as the “Convention”

¹¹ The Convention was signed by the four riparian countries (Contracting Parties) on 12 June 2003 in Dar es Salaam, Tanzania; was formally registered with the Commission of the African Union on 30 July 2004; entered into force in September 2005 and by November 2007, all the four Contracting Parties had ratified the Convention.

National Institutions

All the four riparian countries of Lake Tanganyika have national fisheries management authorities, research institutes and regulatory organizations with a mandate to collect information on the lake and its natural resources and promote rational management of the fisheries resources. These include specialized fisheries, wildlife, hydrobiology, water, agriculture and land use, as well as health agencies. However, the work of these national institutes are not coordinated and fed in a systematic manner to increase knowledge of the lake basin as a whole.

3.2. Regulatory Frameworks

As an initial step towards the harmonization of fisheries laws to fulfill the Convention's requirements, the LTA Secretariat commissioned a study in 2011¹². The Study revealed that only two countries had recent fisheries-related policies (Burundi 2006 and Tanzania 1997). New policies were and still are being developed in Tanzania and Zambia. None of these policies so far are harmonized or focus on implementation of the Convention. In terms of fisheries legislation only Tanzania and Zambia have fisheries and aquaculture laws. The fisheries laws of Burundi and DR Congo date to 1937, (the Fishing and Hunting Law) and both countries are in the process of revising their laws¹³.

When the provisions in the fisheries laws in the four countries were compared with those in the Model Act developed by the Consultant it is reported that only a few of the required provisions appeared in national laws of all four countries and, among the countries, the content of those provisions varied significantly. There were also significant inconsistencies and gaps among them and most of the obligations under the Convention had not been implemented by any country. The Study thus identified areas where harmonization are needed in the laws to fulfill the LTA Members' duties under the Convention and related LTA instruments but also how the harmonization could be accomplished.

3.3. Main accomplishments of LTA Secretariat

In order to facilitate the implementation of the Convention, the first SAP and the Framework Fisheries Management Plan (FFMP), the governments of the riparian countries and a range of international partners elaborated in 2008 the Lake Tanganyika Regional Integrated Management and Development Programme (LTRIMDP). There were two projects under the LTRIMDP:

- i. the UNDP/GEF Project on Partnership Interventions for the Implementation of the SAP for Lake Tanganyika, and
- ii. The African Development Bank (AfDB) and Nordic Development Fund (NDF) funded Project to Support the Lake Tanganyika Integrated Regional Development Programme (PRODAP¹⁴).

The two projects are complementary in scope, and aim to take collaborative action at both national and regional levels.

The LTA Secretariat coordinated the implementation of these two projects at regional level.

With reference to the fisheries specific project PRODAP, the aim of the project was to rationalize the exploitation of the fishery resources, protect the lake environment in a sustainable manner and reduce poverty of local communities. PRODAP was executed by National Coordination Units (NCUs)

¹² *Consultant Services to harmonize the fisheries policies and regulations of the Lake Tanganyika riparian countries of Burundi, Democratic Republic of Congo, Tanzania and Zambia, by Judith Swan, June 2012*

¹³ *Mme Nzeyimana Directrice des Eau, de la Pêche et de l'Aquaculture, Burundi, pers.com.*

¹⁴ PRODAP is the French acronym for the project which is also used by Anglophone stakeholders.

in the four countries, under the coordination of the LTA Secretariat. Furthermore, the PRODAP made provisions for the LTA Secretariat to execute regional activities aimed at supporting national level programmes.

The LTA Secretariat has executed a number of regional activities aimed at supporting national level programmes and to meet the expected outputs of PRODAP, which include:

- Institutional capacity built at regional, national and local levels for the sustainable management of the lake
- Revitalization and/or creation of viable socio-professional groups
- Sustainable management of fishery resources through introduction of joint fisheries management
- Establishment of sustainable financing systems for community micro-projects
- Establishment of a system for lake surveillance and rational exploitation of fisheries resources
- Environmental and biodiversity protection through treatment of waste water and protection of catchment areas

The activities that have been undertaken consists of a number of field or hands-on activities and the elaboration of documents on important fisheries governance and management issues. The hands-on actions include:

1. Strengthening of the Monitoring, Control and Surveillance on Lake Tanganyika through construction of or rehabilitation of fisheries surveillance centres along the lake's coast line in the four riparian countries and the equipment of riparian States with patrol boats
2. Establishment of 22 Beach Management Units (BMUs) in Tanzania, Comite de plage in Burundi and DR Congo, and Village Conservation and Development Committees (VCDC) in Zambia as well as 18 fishers cooperatives in Burundi
3. Conduct of the lake-wide Frame Survey in 2011
4. Conduct of Catch Assessment Survey

Governance and management documents elaborated include:

- Updating of Framework Fisheries Management Plan for Lake Tanganyika¹⁵
- Guidelines for the harmonization of fisheries policies and legislation
- Joint management mechanisms (Co-management)
- Harmonization of fisheries statistics, and data collection systems
- Development of a Regional Plan of Action for the Management of Fishing Capacity on Lake Tanganyika (RPOA-CAPACITY TANGANYIKA)
- Development of an aquaculture Protocol for Lake Tanganyika
- Studies for the establishment of a regional fund for the Sustainable Management of Lake Tanganyika and its Basin

The contents of the elaborated documents are yet to be implemented in the participating countries.

¹⁵ In the absence of funding upon the conclusion of LTR, the first FFMP elaborated in 1999 was not implemented.

SECTION FOUR: Status and trends of the fisheries

Scientific knowledge about Lake Tanganyika and its fisheries is often affected by the spatially fragmentary nature of the available information as most research has been carried out in restricted areas and therefore it is difficult to obtain results, the validity of which extends to the whole lake. Moreover, the lake's remoteness and its huge size create formidable logistical problems to implement lake-wide research.

A number of lake-wide acoustic surveys were conducted in 1973, 1975 and 1976 to estimate fish biomass (Johansson, 1975; Mathisen, 1975). The LTR undertook simultaneous data collection, at fixed localities around the lake, and executed lake-wide pelagic trawl surveys using the R/V Tanganyika Explorer. No acoustic surveys have been undertaken over the last fifteen years; hence most of the knowledge of the state of the resources is based on catch statistics, frame surveys and local knowledge of fishing communities (Katonda and Petite, pers. Com).

Fishing communities report of the historical decline of fisheries biodiversity particularly the important commercial fish species. The evidence is based on their observation of the declining catches and populations of commercial fish species such as the Lates species (*Lates stappersii*, *L. mariae*, *L. angustifrons* & *L. microlepis*), Clupeid species (*Stolothrissa tanganyicae* & *Limnothrissa miodon*), and Cichlid species among others, to levels that can no longer sustain long term commercial or even food supply purposes. In some cases juveniles and even fries are reported in the catches (Petite and fisheries staff of Burundi, pers. Com).

The Lake-wide frame survey conducted by LTA in 2011 indicated that significant changes have occurred in the lake as compared to the results of lake-wide frame surveys undertaken in 1995 by LTR. The total number of fishermen on the lake approaches 100,000 with over 28,000 fishing units (many of which consist of two or more canoes). The sector provides an estimated 159,000 jobs out of which 95,000 are fishers as indicated in Table 2.

Table 3: Number of fishing units and gears by type on Lake Tanganyika in 2011

	1995	2011
Active fishers	44957	94886
Landing sites	786	683
Total number of vessels	19356	38416
Total number of vessels operational	18243	34720
Fishing vessels	13192	28212
Lamp carriers/ helpers	2256	8688
Transport boats	532	
Motorised vessels	1264	3336
Fishing lamps	20379	65954
Traditional gears		
Lines	20744	220317
Gill nets	6300	53269
Lusenga (scoop nets)	316	155
Castnets		84
Traps	13	371

	1995	2011
Artisanal gear		
Liftnets	2976	4429
Beach seine (day)	1143	1792
Kapenta beach seine (night)	154	1
Apollo liftnets	128	796
Chiromila seines	16	
Ringnets		991
Mutobi		512
Mutimbo		92
Industrial gear		
Purse seiner units Total	52	
Purse seiner units operational	28	
Zambia	16	
Congo	6	
Tanzania	4	
Burundi	2	

Source: 2011 Lake-wide Frame Survey

Other salient features are the high rate of motorization, increased number of all fishing gear (except night beach seine) and illegal beach seines from 1143 to 1792¹⁶. In practical terms the overall fishing effort has increased substantially, and the only decrease observed was the number of distinct landing sites, as some sites expanded and merged with nearby smaller ones.

The take from the 2011 frame survey is that trends for fish harvests indicate a decline in most species in the last decade, the fishing capacity, i.e. the number of fishers, the number fishing vessels and the number of fishing gears, methods and boats, has doubled and the catch per unit of effort (CPUE) has decreased tremendously. Fishing pressures are said to be driven by increasing demand due to local population increases, higher consumer rates, and increased tourism after several years of political stability in some parts of the basin (Katonda and Petite, pers.com.).

¹⁶ Such high numbers of illegal gear despites sporadic raids by the fisheries administrations to confiscate and destroy them (Petite and Nzeyimana pers. Com).

SECTION FIVE: Governance of the Fisheries and Management approaches applied

5.1. Governance of the Fisheries

The fisheries management in Lake Tanganyika is open access and the application of management measures is in general highly variable from one country to another, from the point of view of fisheries regulations and enforcement, fisheries policy and systems of management, research, cooperative approach, effectiveness, etc. Fishing communities in each country also exhibit a high propensity to catch as much of the resource during the time when the resources are available in its waters.

Presently, the key regional document guiding the management and development of fisheries in Lake Tanganyika is the “Convention on the Sustainable Management of Lake Tanganyika”. In addition to the above there are the National Fisheries Legal Frameworks which embody the principal fisheries laws (Fisheries Acts/Codes/Laws) and subsidiary legislation; international fisheries legal framework reflected in national laws; and non-fisheries specific laws impacting on fisheries such as environmental laws, health/veterinary laws, and Customs laws. In this respect, the four countries are Party to the Convention on Wetlands of international Importance especially as Waterfowl Habitat (RAMSAR Convention), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on Biological Diversity (CBD). The four countries also are implementing National Environmental Action Plans. These plans provide a framework for integrating environmental concerns when designing and implementing projects. These are expected to be applied by the countries to maintain the health of the water bodies in which fish live by: taking measures to avoid excessive nutrient enrichment.

The four riparian countries have embraced the Code of Conduct as their working instrument of reference for the management of the fisheries and is of common usage in the fisheries administration documents of the riparian countries.

5.2. Management approaches

Individually the countries are implementing a number of the following measures: mesh size restrictions, closed areas and seasons, observation of lunar breaks, licensing, assessment of catches together with monitoring, control and surveillance and enforcement. Participatory management is also being applied howbeit at a limited scale through establishment of co-management institutions, including BMUs, VCDC and Comite de plage.

In general, these measures are not effective. For example Burundi ostensibly implement closed season – which is not replicated in the other countries. Ironically however, when closed seasons are instituted in Burundi, fishers migrate from Burundi to the Tanzanian portion of the lake to fish, and this presents a major management issue as they sometimes result in conflicts. Similarly, Beach Management Units are applied in Tanzania but not in the other countries and even in Tanzania existing BMUs are unstable, poorly resourced financially and leaders are not provided adequate capacity¹⁷. Devolution of responsibilities of the fisheries to local Governments is practised in Tanzania and Zambia which provide significant revenues for the local government (sub county and district) but there are no clearly conceptualized procedures for ploughing back some of these revenues for maintenance of fisheries infrastructure or the collection of data.

¹⁷ The Tanzanian fisheries legislation stipulates that each fish landing site must have an established BMU.

The countries have instituted licensing schemes but these licenses are primarily taxation mechanisms to increase the contribution of the fisheries sector to the national budget and not as would be expected a management tool to know, and control, the size of the active fishing community, to communicate with it for fisheries incentives or limitations. In addition, significant attention has been given to strengthen Monitoring, Control and Control (MCS) in the various countries through the acquisition and use of surveillance boats and patrols; however some of the patrol boats are not used for the purpose they were intended (Petite, Pers. Com). In addition, a number of bad management practices that are being perpetuated in the lake. For example, there is a switch from using lanterns to using LED (light-emitting diode) solar and generator powered lighting systems. The LED system reduces the operational costs and increases the profit margins for the fishers. However the efficiency and impact of the LED light on catchability and sustainability of the fisheries is yet to be determined. The use of ring nets in coastal waters; close to shore, in bays which are the nurseries for juvenile fish is also rampant, meaning that the fishers are fishing both during the day and at night catching juveniles and sometimes close to fries. This could have adverse impact in the form of reduced recruitment and growth overfishing.

Government efforts to manage the fisheries have been ineffective, prompting a search for alternatives approaches. The riparian countries are presently promoting Co-management institutions (CMIs) through the development of detailed harmonized guidelines in an attempt to strengthen co-management in the context of Lake Tanganyika and its Basin. The countries are aware that these efforts need reinforcement and strengthening and have developed the Regional Plan of Action for the Management of Fishing Capacity (RPOA- Capacity) which will compliment these initiatives once implemented. In addition LTA Secretariat is considering the possibilities of introducing rights-based fisheries approaches as management tools to Lake Tanganyika (Katonda, pers.com.).

SECTION SIX: Environmental Stresses, Key transboundary issues and challenges

6.1. Environmental stresses and potential effects on fish stocks and fisheries

The generic root causes of transboundary threats and challenges in the Lake Tanganyika Basin as updated by the SAP in 2012 are summarized in Table 4.

Table 4: Generic causes of transboundary threats and challenges in Lake Tanganyika Basin

Increasing Population Pressure	<ul style="list-style-type: none"> • Rapid population growth is leading to an increasing demand for ecosystem goods and services. • High urbanisation rates are leading to increased generation of pollutants.
Poverty and Inequality	<ul style="list-style-type: none"> • Large proportions of the population live below the poverty line and rely on exploitation of natural resources. • Large proportions of the population are insufficiently literate. • Large proportions of the population have lack of access to alternative livelihoods.
Inadequate Governance	<ul style="list-style-type: none"> • Weaknesses in policy, legal and institutional structures hamper good governance possibilities.
Insufficient Resources	<ul style="list-style-type: none"> • Resources of relevant government, management and research institutions are limited, either due to lack of financial means or due to inadequate priority setting.
Inadequate Knowledge and Awareness	<ul style="list-style-type: none"> • Knowledge on the value and importance of services and goods provided by healthy aquatic and terrestrial ecosystems is limited. • Large proportions of stakeholders are insufficiently informed about causes and possible solutions to environmental challenges.
Economic Drivers	<ul style="list-style-type: none"> • Demand for services and goods exceeds availability and regeneration capacity of elements of aquatic and terrestrial ecosystems in the region.

Source: LTA Secretariat, 2012. Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of Natural Resources in Lake Tanganyika and its Basin, Bujumbura, Burundi, 118 pp

Presently, there are four main sources of environmental stresses that are adversely impacting the Lake Tanganyika's ecosystem, as well as the region's economy and livelihoods. These distinct sources of stresses originate from the Lake, littoral zone (near shore), within the basin (upper watershed), and outside the basin. Cumulatively, they cause degradation of the Lake, reduce its resiliency.

- i. Stresses within the Lakes** - mainly from unsustainable fishing practices and pollution in the Lake and on Islands (e.g. from fuel and oil spills, solid wastes, and untreated liquid wastes). Pollution reduces fish stocks and diversity and destroys important spawning areas.
- ii. Stresses from outside the basin** - include nutrients transported into the basin as airborne particulates and climate change.
- iii. Stresses from the basin** - include reduced water inflows into the Lake, over abstraction of lake water, inflow of water hyacinth, increased watershed degradation, including soil erosion and loss of vegetation cover; and increased water pollution from industries, livestock, agriculture, and urban runoff. These stresses are altering the hydrological and ecological processes. As a result, they accelerate eutrophication, impact fisheries and navigation.
- iv. Stresses on the littoral zone** - result from conversion of shoreline wetlands for urban and agricultural development. Farming along sensitive littoral zone without adequate environmental mitigation measures (e.g. buffering strip, sewage treatment and disposal) increase liquid and solid waste loads into the lakes. In addition, wetland conversions for these purposes result in loss of aquatic habitat and reduced filtering capacity).

6.2. Key strategic transboundary issues and challenges specific to fisheries

The key transboundary issues and challenges which affect and could potentially impact on the sustainable exploitation and management of the fisheries in Lake Tanganyika are related to inadequate fisheries governance. The main issues are: absence of up-to-date policies, laws and regulatory standards at national level; the non-harmonization of policies, laws, regulatory standards at regional level; low compliance to fisheries laws and regulations and inadequate enforcement; and limited effective involvement of stakeholders in the fisheries management process.

These issues together with the prevalence of poverty and increase in population in the lake's basin contribute to exertion of excessive pressure on the fisheries resources and the basin ecosystems; incidence of illegal, unreported and unregulated (IUU) fisheries and poor management practices resulting in declining fish stocks, destruction of critical habitats and the environment, and conflicts among stakeholders.

The key challenges are to correct the imperfections in the fisheries governance and in addition reduce the pressure on the resources; generate appropriate scientific knowledge and incorporate the use of local knowledge to guide resource management; ensure the availability of reliable data and information to guide management; and develop the human and institutional capacity to manage the complexity of resource uses and pressures, and also to understand and develop mechanisms for adaptation to climate variability and climate change.

Absence of up-to-date policies, laws and regulations and the absence of harmonized policies, laws, regulations and standards

The starting point for good fisheries management is policy from which should be derived legislations, regulations etc. In two of the four countries the fisheries policies are outdated and generally lack an integrated approach to developing and managing the fisheries. The same is true for legislation and regulations. There is also the absence of harmonized policies, laws and standards concerning the management of Lake Tanganyika fisheries. Attempts to harmonize the laws and regulations of the riparian countries have not been successful because in some countries there is no legislation that can be used. Furthermore, the process for enactment of policies and regulatory frameworks seems to be slow and highly political. For over four years revised fisheries laws in Burundi and DR Congo are yet to be approved through the deliberative processes.

Low compliance to fisheries laws and regulations and inadequate enforcement:

Major challenge in the management of the fisheries is the low compliance to fisheries laws and regulations by resource users. Compliance and enforcement levels of the various laws of relevance to the Lake vary among the countries. In all cases where compliance and enforcement is poor, the causes are more or less the same namely: shortage of manpower, financial constraints, logistical constraints, lack of awareness by the fisheries communities, and inadequacy in the dissemination of relevant information, inadequate capacity and laxity on the part of the enforcement agencies and high poverty levels.

These weaknesses could be addressed through awareness campaigns, improvement in information exchange, greater involvement of the community in management, such as ensuring properly functional BMUs, VCDC, CMI; focus on increased cooperation on monitoring, control and surveillance (MCS) and promote the more effective involvement of resource users in enforcement through the institution of participatory MCS, etc. and capacity building through training and logistical support.

Additional problems of implementing regulations relate to non-deterrent penalties that do not discourage the offender, and would be offenders, from committing a similar offence and varied levels of penalties applied in the four countries. Given the transboundary nature of the fisheries, it is important to reflect the gravity of each offence in respective penalties in a uniform manner. The penalty for an offence should carry the same gravity no matter where it is committed. This would deter offenders from committing particular offences on the basis of the weakness in the penalty in one country as opposed to the other. Furthermore, incentives must be adopted to support behaviour that fosters the conservation objectives and encourage resource users to go beyond mere compliance with the rules.

Non- effective involvement of all stakeholders in the management process

The many problems and challenges that the fishery faces, especially declining fish stocks and habitat loss, poor data and data management, low legitimacy of regulations and the consequent poor enforcement of regulations can be better solved by fisheries management authorities partnering with local communities, Civil Society Organizations (CSOs) and the private sector, indeed involving (representatives of) all stakeholders in all the functions and responsibilities of fisheries management. Stakeholders should not merely be consulted to rubber-stamp decisions but should participate. The fisheries management authorities cannot and will never be able to achieve the ambitious objective of the sustainable development of fisheries alone. It is believed that the reason effective involvement of stakeholders in the fisheries management process is limited is because such partnerships have to be carefully designed to be appropriate for the situation, as well as accountable and effective. However, knowledge and experiences accumulated over the past three decades allow the identification of the conditions and situations which are good predictors of successful partnerships.

Partnering would among other things permit the making of appropriate regulations that are consistent, harmonized and applicable; permit the monitoring of compliance to regulations by both the management authority and local communities; permit common access to data and data analysis on the status of the resource; contribute to the effective enforcement of regulations; permit the resolution of conflicts in a timely manner through informal and formal means.

Limited scientific and other knowledge to guide resource management-

The absence of scientific information and other knowledge such as local and traditional knowledge to guide management is a major issue and challenge for fisheries management in the lake. It is important to emphasize that the cooperative management of transboundary fishery resources that are highly vulnerable to various factors requires the adoption of a systematic, inclusive and accelerated process/ working style to better understand the abundance and distribution of fish stocks over time.

The last lake-wide hydro-acoustic survey in the Lake was conducted in the 1990s (Katonda, pers. com). Individual research institutions in the riparian countries undertake research but the activities are not coordinated in a systematic manner. In March 2010, a workshop was organized with stakeholders from relevant research and monitoring institutions to establish a basis for implementation of Lake Tanganyika monitoring programme. The stakeholders agreed that monitoring activities should be consistent with the SAP, and inform the long-term management of the natural resources in the Lake Tanganyika basin. Monitoring of parameters relevant to water quality, fisheries, biological invasions, erosion and climate change were identified as important to allow for analyses of biodiversity as a function of these different threats.

Scientists in charge of stock assessments, including economists and sociologists must work with managers and other users of fishery resources to develop appropriate methods to collect, manage and use biological, economic and social data and eventually produce information that is as accurate and precise as possible relying, as appropriate, on local and traditional knowledge to fulfill their responsibilities. In addition to undertaking stock assessment, research should also focus more on the definition of management measures. Emphasis should be placed to address gaps in knowledge about the socio-economic aspects of the artisanal and industrial fisheries and to better assess the interactions between the categories of the fishery

Excessive Pressure on fisheries resources and other basin resources

The root causes for the excessive pressure on the resource is poverty and the growing population in the lake basin. This is compounded by the lack of alternative livelihoods and employment, the high demand for fish and the non-selective nature of the market in that almost all sizes of fish are acceptable. These conditions have induced fishers to fish both intensively and extensively, and encroaching in waters under the jurisdiction of neighbouring states, adopt poor management practices and engage in IUU fishing. The results are declining fish stocks and conflicts.

It is important to involve stakeholders in the management process, ensure compliance and enforcement but also put in place Conflict Resolution Mechanisms, identify and promote alternative sources of livelihoods, and introduce rights-based management.

Rights-based management is an approach to fishery management that focuses on the rights, together with the responsibilities held by individuals, communities and governments relating to fishing. Rights-based management is an effective way to manage access and harvesting. There are many types of rights approaches and it is important to decide which is appropriate for the particular purpose of Lake Tanganyika.

Alternative sources of livelihoods: An integrated fisheries management approach¹⁸ usually has two axes: the Vertical axis that refers to everything pertaining to the fisheries and the Horizontal axis which addresses non- fisheries issues (FAO, 1984, Satia, 1993). Usually these non-fisheries issues could include the opening up of feeder roads to fishing communities, building schools, health clinics in or close to fishing communities, community ran supplies shop; the creation of alternative sources of livelihoods through for example market gardening, apiculture, livestock raising; skills empowerment through programmes as knitting, crocheting, literacy and numeracy training, boat building and mending, to reduce pressure on the resources while improving income generating capacity of fishing community and food security and improve the standard of living of fishers. The activities on the horizontal axis are often beyond the competence of fisheries staff. Some of the capital works and the provision of social amenities fall within the competence of other government ministries and agencies. Others such as skills empowerment are better handled by CSOs. It is important to collaborate with these agencies and CSOs to ensure the desired activities for improved livelihoods are realized and this emphasizes the need for partnering in the development and management of the fisheries in the Lake basin.

Conflict management/resolution mechanism: Natural resource conflicts are disagreements and disputes over access to, and control and use of, natural resources. These conflicts often emerge because people have different uses for resources. Disagreements also arise when these interests and needs are incompatible, or when the priorities of some user groups are perceived not to be considered in

¹⁸The Integrated Strategy for the Development of Small-scale Fisheries was adopted at the World Conference on Fisheries Management and Development held in Rome in 1984

policies, programmes and projects. Such conflicts of interest are an inevitable feature of all societies and are frequent where fishery resources are shared or transboundary stocks. In recent years, the scope and magnitude of the conflicts have increased and intensified due to increase fishing pressure. These conflicts, if not addressed, can temporarily reduce the efficiency of the management regime, escalate into violence, cause environmental degradation, disrupt projects and undermine livelihoods. It is therefore strongly suggested that preferably participatory conflict management and resolution mechanisms be incorporated into the portfolio of LTA.

Fragmented data and information to guide management

The effective management of the natural resources in the Lake Tanganyika will depend on the timely provision of key information to planners and decision makers. Presently the lack of reliable information makes it difficult to integrate the activities of the fisheries sector in the national economies of the riparian countries. Apparently Catch Assessment Surveys and Frame Surveys are undertaken only by a couple of countries, and basic information for the improvement of knowledge and understanding of fishery status and trends are lacking or inadequate. Fisheries Statistics Experts from the four riparian countries were trained on the underlining principles of the “Strategy for improving information on status and trends of capture fisheries.¹⁹” The Strategy provides a practical framework for the improvement of knowledge and understanding of fishery status and trends. The knowledge acquired is yet to be applied in the fisheries of Lake Tanganyika.

A challenge to the effective collection of information and data is the lack of resources to data collectors and the manual entry of the data several days after collection. Consideration should be given to the introduction of electronic data collection mechanism using Tablets which permits the input of the data virtually instantly. This would require that resources are provided to a central information service, responsible for maintaining a GIS database, a literature reference system and other shared data sources. The LTA in collaboration with the UNDP/GEF Project has established a website www.ita-alt.org), which should eventually also function as a clearinghouse mechanism through which relevant data can be disseminated.

Inadequate human and institutional capacities

Managing transboundary fishery resources requires a portfolio of skills that cut across disciplines (fisheries, political, economic, social and environmental). Even in the strictly fisheries discipline capacity is limited in several areas (science/research, fisheries economics, development, statistics, organizational aspects, etc.). In all the countries, fisheries offices have inadequate budgets, and are poorly staffed and equipped, which hinder the provision of technical services, build capacity at local community level and to monitor fisheries activities in the lake. In such a context the need for an on-going and targeted capacity enhancement and development preferably through partnering with CSOs is readily evident.

Destruction of critical habitats and ecosystems

Several critical habitats as detailed below are being destroyed and this has adverse effects on the sustainability of the fisheries, with impacts on the economy and livelihoods of fisheries communities:

- a. Wetlands destruction:** Fringing wetlands and the littoral zones are closely connected to the ecological health of the lake. Development around the littoral zone of the Lake has resulted in the destruction and/or degradation of fringing wetlands that are sites for fish breeding. Wetlands

¹⁹ A voluntary instrument adopted by the FAO Committee on Fisheries (COFI) at its Twenty-fifth Session on 28 February 2003 and endorsed by the Hundred and Twenty-fourth Session of the FAO Council on 28 June 2003. Its objectives are to provide a framework, strategy and plan for the improvement of knowledge and understanding of fishery status and trends as a basis for fisheries policy-making and management for the conservation and sustainable use of fishery resources within ecosystems.

are also involved in the exchange of nutrients with the Lake and act as filters, trapping incoming sediments and pollutants.

- b. **Increased Sedimentation** - Land degradation in the Lake basin is the main cause of the increased sediment loads into the rivers discharging into the lake. High population growth, coupled with poverty and unsustainable agricultural practices have increased pressure on land. The small scale farmers have resorted to cultivating in areas with steep slopes, riverbanks, forests, and wetlands. Their activities have contributed to increased soil erosion, decreased nutrient retention in soils and wetlands, hence increased mineral and biogenic sedimentation. These unsustainable land use practices, together with high demand for fuel wood, contribute to the denudation of the hill tops. The highest erosion risks are fields cultivated with annual crops, and rangelands on bare hills.
- c. **Invasive Aquatic Weeds Problem** - Water hyacinth (*Eichhornia crassipes*) has become a major invasive weed in Lake Tanganyika. The water hyacinth is native to tropical America, and was introduced in the Congo River and Lake Victoria several decades ago. It entered Lake Tanganyika in the late 1990's and early 2000's, possibly from cultivated water gardens where it was grown for its attractive flowers. The water hyacinth is a serious threat to aquatic ecosystems, affecting fish stocks and water quality. Extensive, tightly packed water hyacinth mats along the shoreline impair environmental quality for biodiversity maintenance, fish breeding grounds and nurseries of young fish, inshore feeding zones, and refuges for fish. The interior of extensive mats are normally deoxygenated and or have low levels of light and oxygen, and produce poisonous gases like ammonia and hydrogen sulphide. Water hyacinth contaminates watering points for domestic supply, livestock and game. Mobile mats obstruct access to landing beaches, fishing grounds and transport routes. The aquatic weeds are also a preferred breeding habitat for the alternative host for Schistosomiasis (*bilharzia*), namely the *Biomphalaria* snail, a home for the vector mosquito for malaria, and a haven for snakes.
- d. **Forest degradation:** This is caused by encroachment of agriculture and increasing demands of the growing population for fuelwood, charcoal, timber, and construction purposes. Deforestation has been severe over the last few decades, including loss of high altitude forests, riverine forests, and lowland forest/woodlands in national parks and reserves. The loss in permanent vegetation cover has accelerated runoff and increased exposure of soils to sheet and gully erosion.

The Convention under Articles 5.2 and 6.1 and 6.2 has provisions that prohibit the taking of action that would have negative effects on the environment. To facilitate their application there is need to lay emphasis on environmental education at all levels of society, reinforce local consultation and capacity building to identify community-driven solutions and resolve conflicts between different users. The riparian countries would need to maintain the productive capacity of the habitats of the fishery resources; this would include the identification of critical areas, such as breeding areas and mapping them and designating them as protected areas²⁰. The surveillance of such protected breeding areas can be entrusted to local communities under the framework of participatory MCS.

Climate change (Adaptation to climate variability and climate change)

It has been suggested that any future climate change may potentially have a relatively strong impact on the hydrology of inland waters of Africa. Already in Lake Tanganyika declining wind speeds and rising temperatures, which have reduced the mixing of nutrient-deep rich waters with the surface waters (Verburg and Hecky, 2009, Langenberg, 2006) that support fish production, may be responsible for the declining fish yields from the lake. In the 1990s the total fish production was estimated to be between 160,000 and 200,000 metric tonnes. Currently there is no realistic estimate of the total fish harvest.

²⁰ It is reported that Burundi has already identified, mapped and officially designated 20 such areas in the part of the Lake under its jurisdiction (Mme Nzeyimana, per. Com).

SECTION SEVEN: Gaps in existing fisheries management plan and Suggestions to strengthen the Plan

This Section of the report identifies gaps in the Framework Fisheries Management Plan II and provides suggestions to enhance the fisheries management system by elaborating a framework fisheries management plan premised on the principles of the Ecosystem Approach to Fisheries (EAF) and ensuring its effective implementation by Partner States and other stakeholders, donors, non-governmental organizations, etc.

7.1. Gaps in the Framework Fisheries Management Plan

Fisheries is a dynamic sector and presently it is recognized that to ensure the proper management of the sector three concepts – sustainable fisheries, responsible fisheries and ecosystem based approach should be adopted in tandem. The updated FFMP recognized this and states that “the FFMP concentrates on the Ecosystem Approach to Fisheries Management and/or Precautionary Approach for the situation in Lake Tanganyika...”²¹ But neither in process nor content is the EAF applied in the document. Experience has shown that an effective manner of incorporating ecosystem-based management in other transboundary fisheries such as are found in the Benguela Current Large Marine Ecosystem (BCLME), or the Sardinella stocks in the Canary Current Large Marine Ecosystem (CCLME), the Black Sea, etc., where transboundary diagnostic assessments had been carried out, is by developing a fisheries management plan on the principles of the Ecosystem Approach to Fisheries (Cochrane et al. 2008, B. Samb, Per. Com.). This is because TDAs do not amplify and prioritize the problems and challenges related to fisheries to permit the elaboration of the appropriate management plans.²²

The updated FFMP was not developed through a participatory process with the active involvement of the stakeholders. Broad participation of the interested parties from all the Member States would ensure judicious choices in the design of the plan; it would provide legitimacy to the output and is likely to facilitate its implementation. The updated FFMP like its predecessor was developed in the conventional manner by experts and the stakeholders were invited to approve the document through consultative workshops.

There is no assignment of roles in the FFMP giving the impression that the activities will be undertaken not by the Member States but by the LTA Secretariat whereas the LTA Secretariat by virtue of Article 2 of the Convention is not a management organization but its functions are coordination and advice, to help Member States in applying the terms of their agreement.

Even with abundant resources and goodwill it is generally impossible to address all issues. Some issues are more important than others and since resources are often limited it is important to prioritize. However the issues and actions in the FFMP are not prioritized.

²¹ The FFMP of 1999 was developed using the Code of Conduct as the policy matrix and took into account the need for responsible and sustainable fisheries.

²² This fact is recognized by the LTA Secretariat in that in Methodology of the updated FFMP it states: *The Lake Tanganyika Convention is basically concentrating on environmental issues, with less specific attention for fisheries-related issues (Article 7). The original SAP, as well as the updated SAP (Version 13, November 2011) mention the major fisheries problems on the lake, but does not present (any detailed approaches for the fisheries problems and management issues. The latest SAP refers to all the topics as summed up in the FFMP of 1999 and provides the necessary actions as proposed during national workshops in each country as well as one regional workshop, albeit without a clear prioritization*”

Plans do not just document the way to reach management goals in the future, but also describe how to manage the fishery in the present and these are better illustrated by having a robust log-frame, which is not the case in the FFMP.

7.2. Suggested Strategies, Processes and mechanisms to strengthen the FFMP

It is strongly suggested that priority is given to assist LTA Secretariat to develop a Framework Fisheries Management Plan²³ for the transboundary fishery resources of Lake Tanganyika. Such a plan should address the shortcomings of the present plan, some of which are given above. The tool to use for developing such a plan is the Ecosystem Approach to Fisheries (EAF). The following paragraphs succinctly describe EAF, the process and output.

First it is important to stress that a FFMP for transboundary fishery resources should be seen as a negotiated instrument between the fisheries administrations of the concerned Member States and their stakeholders; it provides a clear vision for the fishery, realistic and measurable objectives and other parameters as a road-map for moving the fishery forward on an agreed schedule of shared responsibilities among the fisheries administration and stakeholders.

There are several reasons why it is advisable to work on the basis of a FMP: It provides a blue print for action based on current information; it provides realistic milestones with which to measure achievements and assess results, it fosters successful communication and team work among stakeholders of the international inland water body, it also permits bilateral development partners and other donors and NGOs to realistically contribute to the sector on the basis of an agreed programme rather than each organization promoting its own agenda which may not be in line with endorsed programmes, etc.

Why use the EAF process and tools.

The Ecosystem Approach to Fisheries (EAF) has been adopted by the FAO Committee on Fisheries (COFI) as the appropriate and practical way to fully implement the Code of Conduct for Responsible Fisheries. EAF is a risk based management planning process that covers the principles of sustainable development including the human and social elements of sustainability, not just the ecological and environmental components. EAF is also an effective planning framework that facilitates the planning, coordination and prioritization of current and proposed activities, making them clearer by giving a “home” to the many strategies and monitoring programmes that are underway. In addition, EAF helps to develop comprehensive fishery management systems that seek the sustainability and equitable use of the whole system (ecological and human) to best meet the community’s needs and values.

However, the effectiveness of the EAF process and the contribution of EAF to long-term sustainable development of the resources are greatly enhanced by the conduct of an Ecological Risk Assessment (ERA) as an integral and essential part of the process. Ecological Risk Assessment is a means of identifying the ecological risks associated with the management of the major fisheries in a given region, and to prioritize appropriate management responses. As a tool, it is helpful in ensuring cost-effective decisions and actions are taken because it ensures that time, effort and resources are not wasted on pursuing issues, which may appear important but which are generally insignificant in the context of the broader fishery.

²³ We call it a framework fisheries management plan because Member States would be expected to on an annual basis or following the customs in the country extract from the FFMP for inclusion in their national plan.

As a process, the conduct of the ERA is fundamentally participatory and seeks to build consensus among diverse stakeholders about identifying and prioritizing ecosystem issues and a programme of action. Secondly the ERA process sees the “ecosystem” in its broadest definition, including the biological, social, and economic as well as governance systems. This latter principle is of particular importance given the fact that in fisheries management, many biological recommendations are undermined by the lack of consideration of the social and economic implications or governance systems required to implement these recommendations. The conduct of an ERA also makes it clear that contrary to the concerns of those skeptical of the intentions of EAF, humans are seen as an integral component of the ecosystem in the approach²⁴.

A four step process is used to develop FFMP using EAF principles:

1. Develop a clear description of the fishery, identify high policy goals and the relevant societal values attached to the fisheries;
2. Identify issues, assets, and challenges; and assess the risks associated with each issue and prioritize these issues and consider the key elements that will deliver successful outcomes. The process is facilitated by using an EAF Log-Frame²⁵ to provide a snapshot version of all the important elements of the management system (plan). The elements are besides an identification of the issue number and its risk value:
 - a. Management objectives that provide a link between the principles, policy goals, major issues and what participants agreed the fishery should try to achieve.
 - b. Operational objective(s) that is/are clear, measurable and directly linked to one or more of management objectives; noting that an operational objective could be applicable to more than one issue.
 - c. Management measures, specific controls applied in the fishery to contribute to achieving the objectives²⁶.
 - d. Indicators, variables that can be monitored to give a measure of the state of the fishery at a given time. Each indicator should be linked to one or more reference points and used to track the state of the fishery in relation to those reference points.
 - e. Reference points, benchmark against which to assess the performance of management in achieving an operational objective, corresponding to a state considered to be desirable (target reference point) or undesirable and requiring immediate action (limit reference point).
 - f. Performance measure, a function that relates the value of an indicator to its reference point, and that guides the evaluation of fisheries management performance in relation to its stated operational objective.
 - g. Means of verification, the sources of information used to indicate accomplishments, in other words sources of information on the indicators. They are usually recorded details such as publications, reports, databases, statistics, surveys, etc.
 - h. Data requirements: the type of data/information that would need to be collected to ensure suggested measures could be implemented within the time-frame and in a cost-effective manner.

²⁴ It is important to emphasize that we manage fish mainly through managing people. Indeed, our failure to manage people effectively has turned out to be the main limiting factor in fisheries management today.

²⁵ The Logical Framework Approach (LFA) was developed in 1969 by the United States Agency for International Development (USAID) as a planning and management tool for designing, tracking and evaluating projects. An important output of the LFA was a Log-Frame (Document) which has since been adopted and modified by several bilateral and multi-donor organizations and NGOs. The Log-Frame used by the participants is that modified by FAO for EAF management plans.

²⁶ In some cases such as in the US and in Canada the column « Management Measures » is represented by “Strategies”. Strategies here refer to the full set of management measures applied to reach the operational objectives in a given fishery.

- i. Responsibility: who or what institution would be responsible for specific management actions or arrangements that will achieve the desired level of performance.
3. Identify and select key elements for the management systems and summarize the elements by component (ecological wellbeing, human wellbeing and governance) to fit into the management plan
4. Elaborate the Log-frame for the Management Plan

The framework (EAF Log-Frame) which is a major product of the process can be considered an asset. It provides countries elements on which they can establish coherence between national plans and the regional initiative. The table below is an extract of the log-frame for the management plan of a transboundary fishery.

Issue #	OPERATIONAL OBJECTIVE	MANAGEMENT MEASURES	INDICATORS	REFERENCE POINTS	PERFORMANCE MEASURES	MEANS OF VERIFICATION	DATA REQUIREMENTS	RESPONSIBILITY
ECOLOGICAL WELLBEING								
Management Objective No.1: Rebuild over-exploited stocks and protect those stocks that are threatened								
EW 1, 9 & 17	1. Reduce fishing mortality and adopt regional cooperative management approach for Sardinella aurita, Trachurus species, and Ethmalosa fimbriata in the Gambia and Senegal	1. Limits on catches, 2. Protection of spawning areas, 3. Zoning by fleet type, 4. Biological Rest 5. Harmonize size at first capture	Level of catch and spatial distribution	Catch level compared to those recommended by scientists	Reported level of actual catches in relation to recommended level of catches	Stock Assessment reports	1. Catch statistics, 2. Scientific reports 3. Scientific survey data	Scientists, Fisheries Administrations, Fisheries Operators
EW 18	2. Reduce fishing mortality of Sardinella pilchardus in Morocco Zone A+B	1. Limit catches, 2. Protection of spawning areas, 3. Zoning by fleet type, 4. biological Rest	1. Catch level 2. Spatial distribution	Catch level compared to those recommended by scientists	Reported level of actual catches in relation to recommended level of catches	Stock evaluation reports	1. Catch Statistics 2. Scientific reports 3. Scientific survey data	Scientists, Fisheries Administrations, Fisheries Operators
EW 4, 8, 12 & 19	3. Reduce catches of juveniles of Sardinella aurita, Sardinella maderensis, Trachurus sp. And Sardinella pilchardus in Morocco Zone A + B	1. Concerted monitoring system, 2. Mesh size regulation 3. Revision of size at first capture 4. Use of VMS 5. Better control of landings	Level or quantity of juveniles caught	1. Size at first capture 2. Limits of juveniles authorized in the catches	1. Significant reduction of juveniles caught 2. Recommended sizes of fish are caught	Scientific reports with emphasis on demographic structure	1. Trade statistics of catches, 2. Sampling data at landing sites	Scientists, Fisheries Administrations, Fisheries Operators
EW 3, 7 & 11	4. Reduce impacts of illegal fishing on Sardinella aurita, Sardinella maderensis & Trachurus sp.	1. Sensitize operators 2. Strengthen control systems	1. Number of observed infractions 2. Number of complaints by fishers 3. Number of illegal (pirate) vessels	1. Recommended mesh sizes; 2. Authorized fishing zones; 3. Total allowable catch, by-catch and rejects	Significant reduction in the number of infractions	Reports on violations of regulations	1. Statistics on surveillance missions, 2. Observations	Fisheries Administration (Surveillance Unit) and Operators

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