The Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of the Natural Resources of Lake Tanganyika and its Basin

November 2010
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[Will be added]
Lake Tanganyika and its basin are endowed with exceptionally large and highly diverse heritage of flora and fauna. The lake is a global hotspot of biodiversity, and an extremely valuable aquatic ecosystem containing almost 17% of the global available surface freshwater supply and some of the largest freshwater fisheries on the African continent. Estimates suggest that Lake Tanganyika harbours at least 1500 species out of which approximately 600 are currently considered endemic to the lake. In addition to Lake Tanganyika’s elevated levels of aquatic biodiversity, the basin is renowned for its terrestrial biodiversity and scenic beauty. The basin contains several forest reserves and national parks including Kigwena Forest Reserve in Burundi, Gombe Stream, Katavi and Mahale Mountains National Park in Tanzania, and Sumbu National Park in Zambia. The lake and its basin provide a diverse range of ecosystem services that sustain the livelihoods of millions of people.

Environmental degradation caused mainly by human induced activities poses serious threats to the biodiversity and sustainable use of the natural resources in the Lake Tanganyika basin. In recognition of these threats, the four riparian countries Burundi, Democratic Republic of Congo, Tanzania and Zambia with support from international partners convened the first international scientific conference on the conservation of biodiversity of Lake Tanganyika and its basin in 1991. One of the main outcomes of this conference was international funding agencies were attracted. Between 1992 and 2003 the riparian countries and supporting partners jointly implemented the Lake Tanganyika Research Project (LTR), the Lake Tanganyika Biodiversity Project (LTBP) and the Lake Tanganyika Management Planning Project. The major outputs of these projects included the following:

- Special Studies programme, which provided substantial scientific and technical information on a range of issues including biodiversity, fishing practices, pollution, sedimentation and socio-economic aspects. The special studies were concluded in 2000.
- Transboundary Diagnostic Analysis (TDA), which was formulated and concluded in March 2000. The process included identification and ranking of the main threats to the biodiversity of Lake Tanganyika.
- Strategic Action Programme (SAP), which was adopted by the four riparian countries of Burundi, Democratic Republic of Congo, Tanzania and Zambia on 13th July 2000.
- Convention on the Sustainable Management of Lake Tanganyika, which was signed on 12th June 2003 by the four Contracting States Burundi, Democratic Republic of Congo, Tanzania and Zambia, and ratified in November 2007.

The SAP addresses major concerns that were raised by key stakeholders in the riparian countries. The proposed actions in the current, updated SAP are organised as six general action areas: i) adaptation to the effects of climate change, ii) control and prevention of biological invasions, iii) development of sustainable fisheries, iv) pollution control, v) sediment management and vi) habitat conservation. The SAP recognizes that implementation of the actions is the responsibility of the riparian countries who will also be expected to monitor the effectiveness of the SAP and revise it in accordance with the provisions of Article 13 of the Convention on the Sustainable Management of Lake Tanganyika. The SAP also recognizes that the Lake Tanganyika Authority will have the responsibility of coordinating the implementation of the programme of priority actions.

I welcome the updated SAP as an important framework upon which future actions for biodiversity conservation and sustainable management of the resources of the Lake Tanganyika and its basin will be based. The implementation of SAP priority actions will tremendously contribute to the achievement of the objective of the Convention on the Sustainable Management of Lake Tanganyika: to ensure the protection and conservation of the biological diversity and the sustainable use of the...
natural resources of Lake Tanganyika and its Basin by the Contracting States on the basis of integrated and co-operative management.

I would like to thank the UNDP/GEF Project on Partnership Interventions for Implementation of the Strategic Action Programme for Lake Tanganyika for supporting the process of updating the SAP. I would also like to thank the consultants Dr. Gaspard Ntakimazi and Mr. Eric Mugurusi, as well as all the participants of the national consultation workshops and the regional forum for their invaluable contributions to the updating of the SAP. Finally, I would like to call upon cooperating partners to provide timely and generous support for implementation of The Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of the Natural Resources of Lake Tanganyika and its Basin.

Date......

[Henry’s signature, and portrait here]

Henry Mwima

Executive Director Lake Tanganyika Authority
Executive Summary

The updating of the Strategic Action Programme (SAP) has been undertaken through a consultative process mandated by the Secretariat of the Lake Tanganyika Authority and supported by the UNDP/GEF Project on Partnership Interventions for the Implementation of the Strategic Action Programme for Lake Tanganyika. The updating by the UNDP/GEF Project on Lake Tanganyika, and the process included four national stakeholders’ consultative workshops, one in each of the four riparian States. Soon after the national workshops, a regional forum was convened in Bujumbura, Burundi to build regional consensus on regional priorities. This process culminated in the validation of threats in the SAP, and identification of new threats, on the basis of current knowledge and state of the Lake. Outcomes of this process formed the basis for updating the SAP.

The objective of the SAP remains ‘the protection and conservation of the biological diversity and the sustainable use of the natural resources of Lake Tanganyika and its Basin.

Chapter 1 is the Introduction, on the need for joint actions and joint commitment by the riparian States. It describes the lake environment and its basin, the people, and highlights the underlying causes of the threats to biodiversity and sustainable use of natural resources. It also provides a brief of the previous projects on, and in the Lake; and underscores the commitment of the riparian States to cooperating in the implementation of the actions described in the Strategic Action Programme, both through joint regional initiatives and through prioritising national actions within the regional framework.

Chapter 2 provides for the background, including the principles for environmental management and social development relating to the SAP. It provides for the rationale for the SAP and the geographical scope of its application. This Chapter also records the process of consultation involved in the SAP updating, reflects on the TDA, national policies relevant to SAP, as well as the evolution of SAP. Chapter 3 describes the Lake Tanganyika Authority, its background and structure, including the Conference of Ministers, the Secretariat and the Management Committee, in the context of the Convention. This Chapter also discusses the Lake Tanganyika Regional Integrated Management and Development Programme, its objectives and implementation arrangement.

Chapter 4 provides for the methodological framework used to establish priority actions. It describes the Analytical approach used, involving identification of Main Threats and General Action Areas, Specific Problems and proposed programme of actions to address the specific problems, as well as the basis for prioritization.

Chapter 5 presents the programme of priority regional and national actions. It addresses the four General Action Areas for Main Threats in the current SAP of the development of a sustainable fisheries, pollution control, sedimentation management and habitat conservation. In addition, it presents programme of priority actions related to the newly identified Main Threats of Climate change and biological invasion. Included under this Chapter are cross-cutting themes of Information Management, Socio-economic Development, Institutional Reform and Capacity Building, Environmental Policy, Environmental Education; as well as Environmental Monitoring.
Abbreviations and Acronyms

ACVE  Association pour une Ceinture Verte et pour l’Environnement
ADT  Analyse Diagnostique Transfrontalière
AFDB  African Development Bank
ALT  Autorité du Lac Tanganyika
AT  Administration Territoriale
AVEPOMABU  Association des fournisseurs de poissons au marché de Bujumbura
BAD  Banque Africaine de Développement
BBN  Bureau Burundais de Normalisation
BRB  Banque de la République du Burundi
CADIC  Centre d’Actions et de Développement et d’Initiatives Communautaires
CBOs  Community-Based Organisations
CCIB  Chambre de Commerce et de l’Industrie du Burundi
CENADEP  Centre National d’Appui au Développement et à la Participation populaire
CIC  Conseil Interministériel de Consultation
CIFA  Committee for Inland Fisheries of Africa
CITES  Convention on International Trade in Endangered Species of Wild Fauna and Flora
CRGM  Centre de Recherches Géologiques et Minières
CRH  Centre de Recherches en Hydrobiologie
CRSN  Centre de Recherche en Sciences Naturelles
DEPP  Département des Eaux Pêches et Pisciculture
DGATE  Direction Générale de l’Aménagement du Territoire et de l’Environnement
DGFE  Direction Générale des Forêts et de l’Environnement
DMC  Département des Mines et Carrières
DMMU  Disaster Management and Mitigation Unit
DOF  Department of Fisheries (Zambia)
DRC  Democratic Republic of Congo
DVDA  Direction des Voies de Desserte Agricole
D-WASHE  District Water Supply and Sanitation Education
ECZ  Environmental Council of Zambia
EIA  Environmental Impact Assessment
EIE  Etudes d’Impact Environnemental
ETP  Ecole des Travaux Publics de Gitega
FAO  Food and Agriculture Organization of the United Nations
FBP  Fédération Burundaise des Pêcheurs
FEM  Fond pour l’Environnement Mondial
FFMP  Fisheries Framework Management Plan
FINNIDA  Finnish International Development Agency
FU  Fishing Unit
GEE  Groupement d’Etudes Environnementales
GEF  Global Environmental Facility
GIS  Geographic/Geospatial Information System
IA  Implementing Agency (for the GEF these are UNDP, UNEP and the World Bank)
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<td>IBTP</td>
<td>Institut des bâtiments et des travaux publics</td>
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<td>ICCN</td>
<td>Institut Congolais pour la Conservation de la Nature</td>
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<td>ICRAF</td>
<td>World Agroforestry Center</td>
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<td>IGEBU</td>
<td>Institut Géographique du Burundi</td>
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<td>ILD</td>
<td>Initiatives Locales de Développement</td>
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<td>INECN</td>
<td>Institut National pour l'Environnement et la Conservation de la nature</td>
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<td>INERA</td>
<td>Institut National d'Etudes et de Recherches Agronomiques</td>
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<td>INSP</td>
<td>Institut National de Santé Publique</td>
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<td>ISABU</td>
<td>Institut des Sciences Agronomiques du Burundi</td>
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<td>ISDR</td>
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<td>ISP</td>
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<td>Jane Goodall Institute</td>
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<td>LTBP</td>
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<td>LTFFMP</td>
<td>Lake Tanganyika Framework Fisheries Management Plan</td>
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<td>LTFMP</td>
<td>Lake Tanganyika Fisheries Monitoring Programme</td>
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<td>LTR</td>
<td>Lake Tanganyika Research Project for the Management of the Fisheries</td>
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<td>LTRIDMP</td>
<td>Lake Tanganyika Regional Integrated Development and Management Programme</td>
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<td>MACO</td>
<td>Ministry of Agriculture and Cooperatives</td>
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<td>MAE</td>
<td>Ministère de l'Agriculture et de l'Elevage</td>
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<td>MAFF</td>
<td>Ministry of Agriculture, Food and Fisheries</td>
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<td>Ministère de l'Environnement, de la Conservation de la Nature et du Tourisme, RDC</td>
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<td>MEEATU</td>
<td>Ministère de l'Eau, de l'Environnement, de l'Aménagement du Territoire et de l'Urbanisme</td>
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<td>MEM</td>
<td>Ministère de l'Energie et des Mines</td>
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<td>MICPT</td>
<td>Ministère de l'Industrie, du Commerce, des Postes et du Tourisme</td>
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<td>Minagri</td>
<td>Ministère de l'Agriculture</td>
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<td>MLFD</td>
<td>Ministry of Livestock and Fisheries Development</td>
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<td>MLGH</td>
<td>Ministry of Local Government and Housing</td>
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<td>MOH</td>
<td>Ministry of Health</td>
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<td>MPDC</td>
<td>Ministère du Plan et du développement Communal</td>
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<td>MSP</td>
<td>Ministère de la santé Publique et de lutte contre le Sida</td>
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<td>MTENR</td>
<td>Ministry of Tourism, Environment and Natural Resources</td>
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<td>MTERN</td>
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<td>MTTP</td>
<td>Ministère des Transports, des Travaux Publics et de l'Equipement</td>
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<td>NCU</td>
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<td>NEMC</td>
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<td>NLUPC</td>
<td>National Land Use Planning Commission</td>
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<td>NOPTA</td>
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<td>NSGRP</td>
<td>National Strategy for Growth and Reduction of Poverty</td>
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<td>OCBs</td>
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<td>OCC</td>
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<td>ODEB</td>
<td>Organisation pour la Défense de l’Environnement au Burundi</td>
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<td>ONAPHA</td>
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<td>ONGis</td>
<td>Organisation Non Gouvernementale Internationale</td>
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<td>OVD</td>
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<td>PAS</td>
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<td>PBLT</td>
<td>Projet pour la Biodiversité du Lac Tanganyika</td>
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<td>PME</td>
<td>Petite et Moyennes Entreprises</td>
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<td>PMO</td>
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<td>PMU</td>
<td>Project Management Unit</td>
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<td>PNLAÉ</td>
<td>Projet National de Lutte Anti-érosive</td>
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<td>PNUD</td>
<td>Programme des Nations Unies pour le Développement</td>
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<td>PRIGDLT</td>
<td>Projet Régional Intégré pour le Développement et la Gestion du Lac Tanganyika</td>
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<td>PRODAP</td>
<td>Lake Tanganyika Integrated Regional Development Programme</td>
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<td>Projet d’Appui au programme Régional d’Aménagement Intégré du Lac Tanganyika</td>
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<td>RDC</td>
<td>République Démocratique de Congo</td>
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<td>RVF</td>
<td>Régie des Voies Fluviatiles</td>
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<td>SADC</td>
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<td>SENAQUA</td>
<td>Service national d’aquaculture</td>
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<td>Service National de Vulgarisation</td>
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<td>SOBEL</td>
<td>Société Burundaise d’Elevage</td>
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<td>SUMATRA</td>
<td>Surface and Marine Transport Regulatory Act</td>
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<td>Tanganyika Catchment Reforestation and Education Programme</td>
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<td>TANESCO</td>
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<td>TBS</td>
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<td>TDA</td>
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<td>Travaux Publics</td>
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<td>UCB</td>
<td>Université Catholique de Bukavu</td>
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<td>UGP</td>
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<td>UNC</td>
<td>Unité Nationale de Coordination (PRODAP)</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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Glossary of Terms

**Agenda 21**: United Nations Conference on Environment and Development (Earth Summit) agreement on action to be taken to protect the environment. It proposes integrating environmental protection and economic development.

**Baseline Costs**: the reference point for calculating incremental costs. The GEF funds the difference between the cost of a project undertaken with global environmental objectives in mind and the costs of the same project without global environmental concerns. The baseline is the latter project that yields only national benefits.

**Benthic**: the environment where organisms are attached to, or rest on, the substrate.

**Biodiversity**: defined in the Convention on Biological Diversity: “Biological diversity” means the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

**Co-funding or co-financing**: Since the GEF funds the incremental costs of projects, with few exceptions (e.g. for enabling activities) GEF projects require additional funding from other sources to cover the national benefits costs. This additional funding component is referred to as co-funding. The incremental cost can be co-financed as well.

**Convention on Biological Diversity**: was opened for signature at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. The principal objectives of the Convention on Biological Diversity are the conservation and sustainable use of biological diversity, and the fair and equitable sharing of benefits arising from its utilisation. The Convention recognises that the key to maintaining biological diversity depends upon using it in a sustainable manner.

**Convention**: The Convention for the Sustainable Management of Lake Tanganyika

**Dublin Principles**: The Dublin Statement on Water and Sustainable Development, prepared at the International Conference on Water and the Environment (ICWE) in Dublin, Ireland, January 1992, calling for fundamental new approaches to the assessment, development and management of freshwater resources.

**Endemic**: An individual or species that is native to a particular area or a region; originating where it occurs; not found in other places

**Eutrophication**: a process in which increasing nutrient load in rivers or lakes triggers algal blooms which in turn result in de-oxygenation and a change in species.

**Gastropod**: The class Gastropoda or gastropods form a major part of the phylum Mollusca. Gastropods are more commonly known as snails and slugs, and include those that live in the sea, in freshwater and on land.

**Gazetted**: (e.g. Gazetted Forest Reserve) a legally established protected area, with boundaries published in the Government Gazette or some other formal record of government procedures.
GIS: Geographic/Geospatial Information System, refers to any system that captures, stores, analyzes, manages, and presents data that are linked to location.

Global environmental benefits: that accrue to the global community, as distinct from solely national benefits that accrue to the people of the country, in which a project is located.

Hot spot: a local land area, stretch of surface water or specific aquifer which is subject to excessive pollution or other human induced pressure and which requires a specific action to prevent or reduce degradation.

Incremental cost: the additional cost that the GEF funds between the cost of an alternative project that a country would have implemented in the absence of global environmental concerns and a project undertaken with global objectives in mind.

International waters: One of the four focal areas that the GEF focuses on. Defined as the seas, shared river and lake basins and shared estuaries and wetlands and shared groundwater aquifers. The distinguishing feature is that more than one nation has access to or makes use of them.

Investment project: A project where a significant part of the funding is used for the acquisition of capital equipment or the creation of infrastructural benefits.

Lake Tanganyika Basin refers to the lake itself as well as its wider catchment/drainage basin. Although the Lake Tanganyika catchment basin technically and biologically also includes the Lake Kivu basin, Rwanda is currently not included as an official member of the Lake Tanganyika Authority.

Leveraging refers to the ability to secure, or “leverage” additional funds for GEF project implementation. GEF projects generally require such co-financing from host governments, the Implementing Agencies (UNDP, UNEP and the World Bank), multilateral development banks, bilateral agencies and/or other funding sources.

Littoral: the near-shore environment (down to about 40m depth in Lake Tanganyika).

Macrophyte: an aquatic plant that grows in or near water and is either emergent, submergent, or floating.

Ostracod: a class of the Crustacea, sometimes known as the seed shrimp because of their appearance: tiny marine and freshwater crustaceans with a shrimp-like body enclosed in a bivalve shell.

Pelagic: the open water environment.

Point source, Non-point source: a localized discharge of pollutants, (e.g. from an industrial plants; non-point source indicates diffuse pollution (e.g. agricultural runoff).

Protected area: a geographical area or territory with legally defined boundaries, established to afford protection to certain natural characteristics of particular value or interest, in the case of Lake Tanganyika this is generally only used to refer to the formal network of National Parks or Natural Reserves.

Public involvement: a basic operational principle for GEF project development and implementation is that the public be involved at all stages. Public involvement consists of information dissemination, consultation, and stakeholder participation. The GEF policy on public involvement is outlined in Public Involvement in GEF-Financed Projects, 1996.

Ramsar: The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilization of wetlands, i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the town of Ramsar in Iran.

Riparian: Relates to the area where land meets water (e.g. a stream, river, or lake).

Riparian countries: The countries that border Lake Tanganyika (Burundi, Democratic Republic of Congo, Tanzania, Zambia).
**Species flock:** In evolutionary biology, a species flock is a diverse group of closely related species in an isolated area. It refers to an ecologically distinct group of species descended from a single parent (monophyletic) that have evolved in an isolated geographic area (i.e. lake or island).

**Stakeholder:** the term applied to those potentially affected by a project, including recipient country governments, implementing agencies, project executing agencies, groups contracted to conduct project activities at various stages of the project, and other groups in the civil society which may have an interest in the project.
1 Introduction

1.1 Need for Joint Action - Shared Resources in Lake Tanganyika and its Basin

Lake Tanganyika is exceptionally endowed with a large and highly diverse heritage of flora and fauna. It is home to internationally recognized areas of particularly high species richness and endemism, referred to as “biological hotspots”. By volume, Lake Tanganyika is the second largest lake in the world, with almost as much freshwater as the five North American Great Lakes combined. 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. However, environmental degradation poses considerable challenges to the sustainability of these ecosystem services and resources. Several factors combine to magnify the vulnerability of the lake and its basin to environmental degradation, and the challenge is compounded by the growing demand for these services. Current population increase and poverty levels of the riparian communities imply a formidable increase in demand for, and consumption of biological and physical resources, as well as escalating impacts on ecosystems and the services they provide. There are many indications that increasing demands on ecosystems will continue to grow in the coming years, with major implications on the biodiversity and sustainable use of natural resources of the lake and its basin. As resources become scarce in the region, conflicts between conservation and other land uses are likely to increase and communities will become more vulnerable, with adverse effects to the economies of the riparian nations and the state of lake resources. Ensuring long-term supply of ecosystem services is therefore of utmost importance. Poverty alleviation must be considered an integral part of the strategy for conservation of biodiversity and sustainable use of the lake’s natural resources.

1.1.1 The Lake Tanganyika and its Basin

Lake Tanganyika is a global hotspot of biodiversity, and an extraordinary and extremely valuable aquatic ecosystem offering an immense source of freshwater and some of the largest freshwater fisheries on the African continent. In addition, Lake Tanganyika offers many other natural resources that sustain the livelihoods of people living in its basin as well as beyond.

Situated in the Albertine Rift Valley, Lake Tanganyika is part of African Great Rift System. As a result of the cracking of the tectonic plate that includes the African continent, a large fault runs from the Jordan Valley in the Middle East, through the Red Sea and continues south through eastern Africa to Mozambique (Figure 1). This fault (rift) started to develop during the Tertiary period, approximately 65 million years ago and continues to deepen and widen. The same tectonic forces that formed the Rift Valley have caused the volcanic uplifting of the Ruwenzori Mountains and the Kilimanjaro in Tanzania.

Figure 1: Eastern Africa Rift Valley and their lakes

With an estimated age of 9-12 million years, and a maximum depth of 1470 meters, Lake Tanganyika is the oldest and deepest lake in Africa (Cohen et al., 1997a; Tiercelin & Mondeguer, 1991). A wide diversity of aquatic habitats can be found in the lake, including dense macrophytes, shallow nutrient-rich sediments, near river deltas, extensive beds of empty Neothauma tanganyicense shells, cobble stones, rocky habitats, stromatolite congregations, and large muddy areas that extend...
to the deepest depths of the lake. These habitats provide feeding and hiding areas for a remarkable amount of different species.

Similar to the other Great East African lakes Malawi/Nyassa and Victoria, Lake Tanganyika is renowned for their outstanding species richness and high levels of endemcity, representing some of the most diverse aquatic ecosystems in the world (Groombridge & Jenkins, 1998; Thieme et al., 2005). Estimates suggest that Lake Tanganyika harbours at least 1500 species (Coulter, 1991), although species numbers vary according to taxonomic authority. Approximately 600 species are currently considered endemic to the lake, including 245 morphologically diverse and colourful cichlid fish species (Snoeks, 2000; but see Genner et al., 2004). Lake Tanganyika is furthermore unique in harbouring endemic species clusters of bagrids, cyprinids, mastacembelids, and mochokids (Coulter, 1991; Vreven, 2005; Day & Wilkinson, 2006). Moreover, a large diversity of endemic ostracods, gastropods, shrimp, crabs (e.g., Martens, 1994; West et al., 2003; Marijnissen et al., 2004; Fryer 2006), as well as many other taxa can be found in Lake Tanganyika. The lake is valuable not only for the presence of these unique species, but also as a microcosm in which to study the processes of evolution that have led to this diversity. The value of the lake to global biodiversity is beyond measure.

Lake Tanganyika is situated between Burundi, Democratic Republic of Congo, Tanzania and Zambia, and it has an extensive catchment area that includes the Lake Kivu basin (Figure 2). With a length of 673 km, a total shoreline of 1,828 km and an average width of 50 km, the lake has a surface area of approximately 32,600 km$^2$, its estimated volume is 18,900 km$^3$ containing almost 17% of the global available surface freshwater supply (Bootsma & Hecky, 2003).

The Lake receives water from many tributaries, with significant contribution from the Rusizi River, which is the main outflow of Lake Kivu, continuing along the borders of Rwanda, DRC and Burundi, as well as the Malagarasi River, which flows between Burundi and Tanzania. Lake Tanganyika has only one major outflow: the Lukuga River in the DRC, which connects to the Congo River.

Figure 2: Lake Tanganyika and its catchment basin.

The Lake Tanganyika basin is not only renowned for its elevated aquatic biodiversity, but also for its terrestrial diversity and scenic beauty. Both the Rusizi River Delta Reserve in Burundi and the Malagarasi-Muyovozi wetlands in Tanzania are included in the Ramsar List of internationally important wetlands$^1$, harbouring a wide diversity of birdlife as well as crocodiles and hippos. The basin furthermore contains several forest reserves and national parks including Kigwena Forest Reserve in Burundi, Gombe Stream, Katavi and Mahale Mountains National Park in Tanzania, and Nshumbu National Park in Zambia. Gombe and Mahale have become famed as some of the few remaining habitats for chimpanzees, whereas Nshumbu is known for its unique itigi thickets and for harbouring the rare blue duiker, as well as the swamp dwelling sitatunga. Other wildlife that can be found in some of the parks and protected areas in the basin are a range of antelopes including roan, sable, eland and hartebeest, buffalo, zebra, bushbuck, warthog, hyena, jackal, serval, and occasionally elephant, lion, and leopard.

1.1.2 The People

The population of the catchment area of Lake Tanganyika was estimated, in 2000, to be around 10 million; if we consider the average growth in the region of about 2.5%, this population should be more than 12 million in 2010. The majority of the inhabitants of the basin rely on small-scale

$^1$See: www.ramsar.org
agriculture for their food and income. Industrial activity and associated pollution in the catchment is localised and, with the specific exception of Bujumbura, still at a low level, owing to the largely undeveloped nature of the basin.

Comparatively, Lake Tanganyika has less human impact, relative to other African Great Lakes, including Lake Victoria. However, the basin population estimated at 10 million people, is growing very rapidly, at a rate of about 2.5% per annum. Population growth rates range from 2.0-3.2 percent in the riparian States, resulting in a rapid doubling time of 25-30 years. Population densities vary considerably in the riparian countries. Life expectancy in the riparian nations averages 42-51 years. Literacy rates range from 45-76 percent. Per capita income ranges from 110-320 US$ per year with significant proportions of the population living below the national poverty lines and at less than $1 US per day.

Burundi’s population density was estimated at 250 persons per km², Congo was 21 persons per km², Tanzania 35 persons per km² and Zambia 13 persons per km². In the Tanganyika Basin, settlements are typically small and concentrated on areas of relatively flat topography. Relief is often steep between them. The main lakeside urban settlements for the four countries are: Bujumbura, Burundi (pop: 400,000), a capital city with an international airport and more than eighty industries (paint, brewery, textile, soap, battery etc.); Kalemie and Uvira, D.R. Congo (pop: 100,000), Kalemie has some industries and a rail link to other centers in D.R. Congo, Uvira has cotton processing and sugar production industries but depends heavily on nearby Bujumbura for goods and services; Kigoma, Tanzania (pop: 135,000) the largest transit point for goods and people entering/exiting the lake region, with a rail link to other centers in Tanzania; Mpolungu, Zambia (pop: 70,000) the seat of the industrial fishing fleets. These towns are all served by ports, which link people and cargo between Tanganyika’s riparian nations. Land-locked Burundi and Eastern Congo in particular, depend heavily on goods coming by rail from Dar es Salaam to Kigoma or by road from South Africa to Mpolungu. Railways link Kalemie and Kigoma to larger economic centres in D.R. Congo and Tanzania, respectively. Mpolungu links to other economic centres in Zambia by a paved and maintained road. Burundi has a good road extending the length of its coastline. Congo has a road extending from Uvira to Baraka. Most of the other roads run tangential to the lake and are not well maintained. At population centres, people are often involved with administration and aspects of international trade between the four countries (e.g. buying/selling goods, providing transport). Outside of these areas, subsistence and small-scale commercial fishing and farming dominate people’s livelihoods. Most households have diversified into both domains.

The impact of the population growth will give rise to adverse effects to the lake’s environment, in the absence of sustainable management measures. The future use of the lake by local communities relies on sound management of the environment of the lake and the catchment, sustaining the ecological balance and hence the resources on which local communities depend. The effects of socio-economic development activities and global climate change are increasingly threatening the health of the ecosystems in the lake and its catchment basin. The riparian countries have recognized these threats, as well as the need to work together in order to ensure sustainable management of the natural resources of the lake and its basin for the benefit of present and future populations.

With the exception of Bujumbura, most of the settlements along the shoreline are relatively underdeveloped, mainly due to lack of infrastructure and their remoteness from international airports, seaports and economic centers. The basin still lacks basic infrastructure (access, electricity, running water, communications) and little industrialization has taken place. The majority of these people rely on small-scale agriculture for their food and income. Industrial activity in the catchment is mainly concentrated in the most densely populated and urbanised areas, including Bujumbura (Burundi), Uvira and Kalemie (DRC), Kigoma (Tanzania), and Mpolungu (Zambia).
Lake Tanganyika has great value for the livelihoods of the people who are living in its basin as well as outside. More than one million people in the lake basin are directly dependent on fish as their main source of protein. Furthermore, the harvesting, processing, transport and marketing of fish provide an important source of income for many. Lake Tanganyika fish is transported to markets hundreds of kilometers away in Lubumbashi (DRC), Dar es Salaam (Tanzania), the Copper Belt and Lusaka (Zambia).

The lake furthermore provides key transport and communication links, and provides a permanent source of water for industrial and agricultural development as well as for domestic use. The sustainable use of lake resources clearly depends on the activities of lake adjacent communities, but also on those with little direct dependence on the lake, living in other parts of the catchment.

1.1.3 Causes of Threats to Biodiversity and Sustainable Use of Natural Resources in the Lake Basin

The main threats to the biological richness and sustainable use of the resources in the lake basin result from the intensification of human activities. The accelerating rate of environmental change caused by human activities is now much faster than the fauna’s adaptive capabilities and the absorptive capacity of the environment.

The increasing demand for fish for local consumption and for sale to distant markets has increased fishing pressure to the extent that the sustainability of the lake fisheries is threatened. These problems affect both the commercial offshore fisheries and the artisanal activities of the near-shore fisheries.

Lake Tanganyika receives its waters from rivers draining a quarter of a million square kilometres of the surrounding countries. Many rivers enter the lake, but only one flows out (the Lukuga River). The greatest loss of water is through evaporation. The large volume of the lake means that materials carried in from the land accumulate steadily and are removed only very slowly. The lake is a trap for sediment and pollutants. While natural erosion has always occurred, the increase in demand for agricultural land for food production and other economic activities has greatly accelerated the erosion rate in recent years. Eroded sediments enter the lake changing habitats and disturbing the primary production on which many organisms depend. Furthermore, this agricultural expansion has been accompanied by an increase in the use of agrochemicals, such as artificial fertilisers, pesticides and herbicides.

Urbanisation is another phenomenon that creates a different set of threats; household and industrial wastes find their way into watercourses and ultimately into the lake. These unwanted pollutants are slowly distributed throughout the lake by wind-driven currents. What begins as a problem for an individual area may eventually affect the lake waters of all the riparian countries.

1.1.4 Previous Projects and Research on Lake Tanganyika

The Lake Tanganyika Biodiversity Project

In recognition of the burgeoning threats to Lake Tanganyika’s extraordinary biodiversity, the First International Scientific Conference on the Conservation of the Biodiversity of Lake Tanganyika was convened in Bujumbura in 1991. One of the main outcomes of this conference was that steps were
taken to attract the interest of international funding agencies in order to support regional projects to address the identified problems.

Funding was secured through the United Nations Development Programme/Global Environmental Facility (UNDP/GEF)\(^2\). As a result, a project was developed – “Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika.” The project became effective in 1995 following the signing of the Project Document. The project related to GEF interests in both biodiversity and international waters, giving greater emphasis to management objectives for sustainable development. The project’s ultimate objective, generally referred to as the Lake Tanganyika Biodiversity Project (LTBP) as stated in the Project Document, was: “to demonstrate an effective regional approach to control pollution and to prevent the loss of the exceptional diversity of Lake Tanganyika’s international waters. For this purpose, the development objective, which has to be met, is the creation of the capacity in the four participating countries to manage the lake on a regional basis as a sound and sustainable environment.”

The LTBP operated from 1995 to 2000 under a financing agreement between the United Nations Development Programme (UNDP) on behalf of the Global Environment Facility (GEF) and the four Lake Tanganyika riparian governments of Burundi, Democratic Republic of Congo, Tanzania and Zambia. The LTBP had three key outputs:

- Strategic Action Programme (SAP) with priority national and regional actions.
- Convention providing a formal framework for the joint management of Lake Tanganyika.
- Special Studies programme, providing supportive scientific and technical reports.

Furthermore, the LTBP led to formulation of a final Transboundary Diagnostic Analysis (TDA). The special studies programme included biodiversity, fishing practices, pollution, sedimentation and socio-economics to provide the human context, within which conclusions could be discussed, developed and implemented. The project also completed a range of training and environmental education programmes.

The Lake Tanganyika Research Project

From 1992 to 2001, the Lake Tanganyika Research Project (LTR) investigated the lake’s production and fisheries potential and devised modalities for regional management of the fisheries resources. The LTR was implemented by the United Nations Food and Agriculture Organization (FAO) in collaboration with the four riparian countries. Principal funding was provided through the Department for International Development Cooperation of the Finnish Ministry of Foreign Affairs (FINNIDA). In 1997, the project brought together a team of advisers to synthesise the research conclusions to support the development of regional pelagic fisheries management plan, and in 1998 the team presented a report on the Regional Framework Planning for Lake Tanganyika Fisheries Management. Thereafter, the Lake Tanganyika Framework Fisheries Management Plan (FFMP), based on the FAO Code of Conduct for Responsible Fisheries (CCRF), was developed and adopted by the four riparian State members of the Committee for Inland Fisheries of Africa (CIFA) Subcommittee for Lake Tanganyika at its eighth session in 1999.

1.2 Joint Commitments to Future Actions: The Convention on the Sustainable Management of Lake Tanganyika

Burundi, DRC, Tanzania, and Zambia demonstrated their commitment to cooperative actions for the conservation of biodiversity and sustainable management of the natural resources in the Lake Tanganyika basin. The convention was agreed upon and signed in 1999.

\(^2\) The Global Environmental Facility was endorsed at the 1992 Rio Environmental Summit meeting as a mechanism for financing activities with global environmental benefits.
Tanganyika basin through the implementation of regional activities under the LTBP. The four countries also jointly implemented the LTR and agreed on a framework to further develop a management plan for the pelagic fisheries.

Both the LTBP and the LTR came to the same fundamental conclusion that the sustainable management of the lake requires a community based integrated approach, whether the objective is fisheries production or biodiversity conservation. The four countries committed to cooperating in the implementation of the actions described in the Strategic Action Programme, both through undertaking joint regional initiatives and through prioritising national actions within this regional framework.

The Convention on the Sustainable Management of Lake Tanganyika was drafted in the context of LTBP in order to provide a legal framework to the riparian States cooperation in the sustainable management and implementation of harmonized laws and standards for sustainable use of natural resources and amenities of Lake Tanganyika and its Basin. The Convention was signed on 12th June 2003 by the four Contracting States (Burundi, Democratic Republic of Congo, Tanzania and Zambia) in Dar es Salaam, Tanzania. On 30th July, 2004, the Convention was formally registered with the Commission of the African Union. In September 2005, the Convention entered into force and by the end of November 2007, all the four Contracting States had ratified the Convention.

The Convention provides the necessary rights, responsibilities, institutions and framework in international law, which compel the countries to cooperate in the management of the Lake and its Basin. Specifically, it creates a binding legal framework ensuring certain standards of protection, establishes the institutions for implementing the Convention, establishes the mechanisms for implementing the Strategic Action Programme and establishes procedures for settling disputes. Furthermore, the Convention provides for regional oversight and management of the lake and its resources, and is particularly significant as it is one of the few examples of a regional agreement designed to achieve the conservation and sustainable use of unique and shared resources.

The overall objective of the Convention is to ensure the protection and conservation of the biological diversity and sustainable use of the natural resources in the Lake Tanganyika basin. The Convention unites the countries in recognizing that Lake Tanganyika is a shared heritage with unique biological and other diversity. It recognizes the significance of the lake for the development of the riparian States, and the necessity of cooperative management of natural resources.

2 Background and Principles of the Strategic Action Programme

2.1 Rationale of the Strategic Action Programme

The Strategic Action Programme is a response to the need to plan and implement complex integrated natural resource and social development programmes that affect multiple sectors and in many cases with impacts that extend across national boundaries.

The GEF describes the purpose of the SAP as follows: “The SAP should establish clear priorities that are endorsed at the highest levels of government and widely disseminated. Priority transboundary concerns should be identified, as well as sectoral interventions (policy changes, programme development, regulatory reform, capacity-building investments, and so on) needed to resolve the transboundary problems as well as regional and national institutional mechanisms for implementing elements of the SAP” (GEF Operational Strategy, 1996).
Fundamental to this is the recognition that because management plans have to be revised in response to changing circumstances, there can be no final plan. The SAP therefore establishes an agreed planning and management process and prioritises an initial programme of interventions based on present needs and knowledge.

Furthermore, the programme provides a regional framework for actions to achieve the objective of the Convention on the Sustainable Management of Lake Tanganyika. This objective is “to ensure the protection and conservation of the biological diversity and the sustainable use of the natural resources of Lake Tanganyika and its Basin by the Contracting States on the basis of integrated and cooperative management” (Article 2, paragraph 1 of the Convention).

2.2 Geographical Scope of the Lake Tanganyika SAP

Although the specific focus of the SAP is Lake Tanganyika itself, human population growth, urbanisation and other socio-economic activities in the wider catchment can have adverse impacts on its biodiversity and natural resources. For instance, deforestation and associated erosion and sedimentation high upstream in the catchment can have significant effects on aquatic biodiversity. Conversely, changes in the availability of natural resources from the lake can affect people living inside as well as outside the catchment basin. The demand for Lake Tanganyika fish extends to urban centres a thousand kilometres from the lake and also affects international markets. Therefore, priority actions may need to be implemented within the wider socio-economic and geographical catchments of the participating countries with particular focus on the lake catchment.

2.3 The Purpose of Prioritization

Throughout the region, government and private resources are stretched by existing demands for development. The resources that can be directed towards biodiversity conservation and sustainable development at the lake will always be limited by conflicting demands for national poverty alleviation, employment creation and food security. As a result it is necessary to establish priorities to direct limited resources (financial, material and/or human), to address the most critical problems and thus make the best use of available resources.

The prioritisation used in the SAP is based on the national and regional examination of the problems and opportunities presented by biodiversity conservation and the sustainable management of natural resources within a regional framework. This prioritisation guides national interventions, within the context of the accepted regional programme.

2.4 National Actions within a Regional Framework

The SAP addresses a shared regional concern, defines a regional framework for a programme of actions, and includes some immediate regional actions to address constraints to conserving biodiversity and achieving sustainable use of lake resources.

As the problems and opportunities that the SAP addresses all relate to activities carried out within the national waters or national territories of the participating countries, the actual implementation of these actions is a national responsibility.

While the majority of actions are defined to the national level, they provide regional and global benefits, over and above the national benefits of promoting sustainable development. They therefore include the incremental costs of conserving the regional and global benefits of biodiversity and are also a priority for multilateral, bilateral and other forms of support.
2.5 Principles of Environmental Management and Social Development

The four countries share a common desire for the sustainable management of the natural resources and biodiversity of Lake Tanganyika and its Basin for the benefit of present and future generations and recognize their role in conserving the global value of the biodiversity resource.

The participating countries have agreed on a set of principles and values that underlie the proposed objectives and actions set out in this Strategic Action Programme (see Box 1). Many of these principles are embodied in existing Conventions to which the four countries are Parties, or have adopted, in particular the environmental and social principles that underlie the Convention on Biological Diversity, the United Nations Convention to Combat Desertification and Drought, the United Nations Framework Convention on Climate Change, Agenda 21 and the Dublin Principles.

Box 1: Principles and Values Underlying the Proposed Objectives and Actions of the SAP

**Precautionary Principle:** Preventive measures are to be taken when there are reasonable grounds for concern that an actual or planned activity within the territory or under the jurisdiction and control of a Contracting Party may bring about an adverse impact, even if there is no conclusive scientific evidence of a causal relationship between the activity and the adverse impact.

**Polluter Pays Principle:** The costs of pollution prevention, control and reduction measures are to be born by the polluter.

**Principle of Preventive Action:** Action shall be taken to prevent adverse impacts arising by taking timely action to address the actual or potential causes of the adverse impacts.

**Principle of Participation:** Concerned and affected natural and legal persons and Lake Basin communities must be given the opportunity to participate, at the appropriate level, in decision making and management processes that affect the Lake Basin; appropriate access to information concerning the environment that is held by public authorities; and effective access to judicial and administrative proceedings to enable them to exercise their rights effectively.

**Principle of Fair and Equitable Benefit Sharing:** Local communities are entitled to share in the benefits derived from local natural resources.

**Principle of Gender Equity:** Importance of recognising the roles of both men and women in environmental management. As regards men, their role is usually well recognised in institutional arrangements for the development and management of environmental resources. However, the key role of women as users and guardians of specific natural resources is often overlooked. Acceptance and implementation of the support of women’s central role in environmental management requires positive policies to address practical and strategic gender needs. Women in particular should be empowered and equipped to participate at all levels in the development of sustainable management strategies and environmental conservation programmes. This must include women’s involvement in decision-making as well as implementation in ways determined by local communities themselves.

2.6 The Process of Consultation for the SAP

The SAP is based on a concept of strategic joint fact finding as a means of arriving at a consensus on the actions that are needed to address threats, in line with the methodology that is recommended by the GEF. Following this methodology, collaborating countries established teams that work together to establish a common baseline of facts and analysis of the problem in the form of a Transboundary Diagnostic Analysis (TDA), which was then used to set priorities for national actions to address threats to international waters in the form of the SAP.
2.6.1 Transboundary Diagnostic Analysis

The TDA is a planning framework used in GEF international waters programmes that forms the basis of the SAP. Its purpose is to define immediate management objectives within the overall aim of addressing global concerns, conserving biological diversity and ensuring the sustainable use of these and other resources for local communities and other users into the foreseeable future.

The Lake Tanganyika TDA process took place from August 1998 until March 2000, and was conducted by a SAP Planning Group with support of the LTBP Special Studies teams. The evaluation started with a review of the major threats, and defined specific problems or sub-problems that together make up the threat. Subsequently, a sequence of management interventions was proposed to counteract each specific problem. The value of this approach is that it splits ambitious objectives into a series of manageable priority actions that address specific problems, many of which could be initiated by local institutions and implemented with available resources.

2.6.2 National Stakeholder Consultations

The initial process of consultation for the SAP was led by National Working Groups (NWG), and a regional Technical Advisory Committee (TAC) that was expanded to include additional representation and expertise. In order to ensure that the national representatives responsible for developing the regional SAP were in a position to fully reflect national concerns, as well as to bring national information into the regional planning process, two workshops were held for each of the countries: a National Sectoral Problem Review and a National Environmental Priorities and Strategies Review, which took place between September and November 1998.

The National Sectoral Problem Reviews brought together a range of stakeholders including representatives from lakeshore communities and town councils, commercial enterprises, national and international non-governmental organisations, research institutions and universities, parastatal organisations and government ministries. The purpose of the Sectoral Problem Reviews was to identify: i) the main biodiversity problems of Lake Tanganyika; ii) causal chains from perceived problems to their societal root causes; and iii) possible management actions. The National Environmental Priorities and Strategies Reviews subsequently analysed the available potential and limitations of existing institutional mechanisms to counteract threats and support the actions identified in the Sectoral Problem Reviews, and agreed on an overall priority for the sequence of proposed actions.

In 2010, National Stakeholder Consultations were conducted in each of the four riparian countries³ with the purpose of updating the SAP. Using the matrices that were produced during the consultations in 1998 as a basis⁴, stakeholders ranging from local community representatives, natural resource managers, NGOS, universities and research institutions, NCU and PMU personnel, officials from government ministries, and representatives of the LTA Management Committee, focused on identifying gaps and deficiencies, as well as proposing updates and additions to the SAP. The strategy of the stakeholders followed a similar common analytical framework as adopted by the riparian

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³ National Stakeholder Consultation Workshops were held in Democratic Republic Congo and Zambia on 23 August, in Tanzania on 26 August, and in Burundi on 30 August 2010. Reports of the workshops are available on www.lta-alt.org
⁴ See: UNDP/GEF 1998. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika, Conclusions of the National Consultation Process for the Regional Strategic Action Plan. Report for Burundi (PASbu3FR), DRC (SAPrdc3FR), Tanzania (SAPTAN4) and Zambia (SAPZAM4) respectively. Available on www.lta-alt.org
countries in 1998 (see section 4.1, Figure 4). This approach allowed for the conclusions of the national stakeholder consultations to be brought together in coherent and comparable national frameworks.

One of most important outcomes of the National Consultations in 2010 was the unanimous recognition of stakeholders in the four riparian countries of the fact that both the effects of climate change as well as invasive species pose significant threats to the biodiversity and sustainable use of the natural resources in the Lake Tanganyika basin, which had thus far not been included in the SAP. In addition, for each of the previously identified main threats and general action areas, the specific problems, proposed actions, key agencies, stakeholders and uncertainties were updated.

2.6.3 Regional Consultation

In 1998, SAP Planning Groups were formed in each of the four riparian countries. Each Planning Groups was headed by a National Coordinator, and included three or four additional experts, who were identified on the advice of the participants of the National Consultations in order to provide a range of skills and knowledge relevant to the drafting of the SAP. The drafting process was supervised by a Steering Committee, who amended and endorsed draft documents at meetings held in May 1999 and May 2000. With the support of the LTBP Special Studies and additional regional perspectives, the SAP Planning Group prepared the Transboundary Diagnostic Analysis, defining regional priorities for management interventions, as well as the programme of priority actions described in this document.

Following the National Stakeholder Consultations in 2010, a Regional Forum was organised in Bujumbura, Burundi. A range of stakeholders participated in the forum, including representatives of NGO’s, research institutions, natural resource management institutions, members of the LTA Management Committee, and other senior representatives of the Contracting States. Furthermore, the forum was attended by a number of international experts on topics that were identified by national stakeholders as relevant for the updated SAP (climate change, fisheries, invasive species, land use, and pollution). By using the available knowledge and recent scientific findings, the participants of the forum were able to assess and integrate the national contributions, regional concerns and interventions that form the basis of the current SAP.

Following the Regional Forum, the updated SAP was reviewed by the LTA Management Committee, and subsequently amended.

2.6.4 National Policies and Action Plans

Among relevant policies and action plans in Lake Tanganyika riparian counties, are the National Environment Policies, the Water Sector Policies and Strategies, the National Fisheries Policies, the National Forest Policies, the National Biodiversity Strategy and Action Plans, and the National Adaptation Programme of Action on Climate Change. In addition, the four countries are parties to the Convention on Biodiversity; the United Nations Framework Convention on Climate Change; the Kyoto Protocol of the UNFCCC; the United Nations to Combat Desertification and Drought; the Ramsar Convention on Wetlands, among others. They are therefore implementing several of the provisions of these treaties, including provisions relating to conservation of biodiversity and sustainable use of its natural resources like those of Lake Tanganyika and its basin. The SAP priority actions being updated will therefore further implement lines already taken in current national policies.

See Appendix III for list of background documents and scientific references.
2.6.4.1 Burundi

For Burundi, the most relevant policy document developed during the last 10 years is the National Adaptation Plan of Action to Climate Change (NAPA/CC). The main sectors identified as being the most vulnerable to impacts of climate change are: (1) landscape and natural ecosystems, (2) water resources, (3) agriculture, livestock and forestry, (4) energy, and (5) health sector.

Impacts are foreseen on Lake Tanganyika in the pelagic as well as in the littoral zone, and have been transferred in the updated SAP. The national priority actions with direct or indirect focus on Lake Tanganyika identified in Burundi (NAPA Burundi, 2006) are the following:

1. Undertake an overall and integrated management of the flood plain around Lake Tanganyika.
2. Promote the conservatory management of the biological resources in the Rusizi marshlands and delta flood plain.
3. Management of water drainage and river courses, especially in high slope zones, for water and soil conservation.
4. Construction of contour level lines to control erosion.
5. Reinforce the conservation capacity for protected area effective conservation.
6. Fight against bush fires in natural ecosystems.
7. Reforest the water basins and especially bare mountain.
8. Elaborate and enforce forest planning and management plans.
9. Promote livestock keeping in animal housing.
10. Promote improved techniques in wood utilization and wood substitute energies.

It is noticeable that most of these actions are similar to those proposed in 2000’s SAP to address lake destruction of sensitive habitats (actions 1, 2, 7), pollution (actions 4, 5), and sedimentation (actions 3, 4, 6, 8, 9, 10, 11, 12). Twelve projects have been proposed and are all relevant for Lake Tanganyika’s biodiversity and resources degradation.

Another important policy document is the National Strategy and Action Plan for Biological Biodiversity (SNPA-DB), adopted in 2000. It is structured on 13 global objectives and 29 specific objectives, and 93 actions have been identified. Most of them are of interest for the unique biodiversity in Lake Tanganyika and its basin.

2.6.4.2 Democratic Republic of Congo

For the Democratic Republic of Congo, the most relevant policy document available is also the National Adaptation Plan of Action (NAPA) for Climate Change adopted in 2006. The adaptation options agreed upon at national level are, in the priority order, as follow:

1. Urban and rural electrification.
2. Reinforcement of agriculture and livestock production capacity.
4. Rural population stabilisation.
5. Communication pathways improvement and development (roads, railways and fluvial navigation).
7. Reinforcement of national meteorological services.
8. Rational management of forest resources.

Projects related to the three first priorities have been developed:
- Energy related projects
- Strengthening of agricultural production capacities: Multiplication of improved seeds of Corn, Rice and Cassava
- Biodiversity conservation and restoration of Mangroves Marine Park

Although there is no clear reference to Lake Tanganyika basin, most the options above provide for action to address excessive erosion, through forest and land cover management, development of intensive agriculture and livestock techniques, rural population, stabilization, erosion and floods management (option 1, 2, 4, 8 and 9)

For issues related to biodiversity protection, resources sustainable management and pollution control within the LT basin, they are provided by the commitment of the DRC in signing and or ratification of the related international conventions.

2.6.4.3 Tanzania

The most relevant policy documents adopted after 2000 are the National Biodiversity Strategy and Action Plan (2001), the Water Sector Policy and Strategy (2002), and the National Adaptation Programme of Action for Climate Change (2007).

The National Biodiversity Strategy and Action Plan embraces overall cross-sectoral and sectoral goals. A number of broad category objectives have been identified regarding policy, regulatory and international cooperation; planning and coordination; education and information; research and development; ecosystems and species conservation and sustainable utilisation; biodiversity monitoring and evaluation; and capacity building.

In the Water Sector Policy and Strategy, the specific objectives of the water resources management include:
- development of equal and fair procedures in access and allocation of the water resources;
- and efficiency of water resources utilization;
- improvement in the management and conservation of ecosystems and wetlands;
- promoting integrated planning and management of water resources;
- raising public awareness and broadening stakeholder participation in the planning and management of water resources;
- financial sustainability and autonomy of Basin Water Boards;
- and promoting regional and international cooperation in the planning, management and utilization of water.

The National Adaptation Programme of Action (NAPA) for Climate Change identifies immediate and urgent Climate Change Adaptation Actions, leading to long-term sustainable development for effectively reducing the risks that a changing climate poses. A number of adaptation activities to address the most urgent needs have been identified, including:
1. In the agricultural sector: alternative and improved farming systems and irrigated agriculture.
2. In the water sector: water harvesting and recycling, developing alternative water storage programmes and low-cost technology for communities.
3. **In the energy sector:** investment in alternative clean and renewable energy sources e.g. wind, solar, bio-diesel, etc. to compensate for lost hydro-potential.

4. **In the forest sector:** afforestation programmes in degraded lands using more adaptive and fast growing tree species; developing community forest fire prevention plans and programmes; community based catchments conservation and management programs.

5. **In the wildlife sector:** enhancing wildlife extension services and assistance to rural communities in managing wildlife resources;

6. **In the health sector:** raising community awareness programmes on preventable major health hazards.

7. **In the tourism sector:** implementing sustainable tourism activities in the coastal areas and relocation of vulnerable communities from low-lying areas.

Most of these actions are prone to have a direct and/or indirect impact on lake Tanganyika basin’s resources.

2.6.4.4 Zambia

The most recent policy and action plan is the National Adaptation Programme of Action (NAPA) to Climate change, adopted in 2007. It evaluates the potential impacts of climate change on the relevant sectors and ranks the identified most urgent needs to prioritize immediate adaptation interventions. The sectors that are analyzed are agriculture and food security (livestock, fisheries and crops), energy and water, human health, natural resources and wildlife.

It indicates that climate change would have serious impacts on agricultural productivity, including livestock and fisheries, undermining food security; diversity and abundance of wildlife; regeneration of forestry resources; and human health, through climate-sensitive diseases.

A number of coping strategies are suggested, such as:

1. **In the agricultural sector:** planting of crops that are more resistant to climate variability, including promotion of early maturing/drought resistance crops; promotion of irrigation and efficient use of water resources; water harvesting; improvement in post-harvest storage and marketing of produce; development of dams and dip tanks and sustainable supply of feed to mitigate the effects of droughts; promotion of Improved crop and livestock management practices; use of technologies for fertility improvement and moisture storage.

2. **In the fisheries sector:** promotion of aquaculture and fish breeding to restock lakes, rivers and dams.

3. **In the wildlife sector:** improved fire management in wildlife protected areas, including forest fire management at the community level; breeding programmes for selected species in National Park; construction of watering points e.g. boreholes for watering wildlife; identifying and protecting migratory routes of wildlife; restocking of depleted game areas; undertaking protective management measures to protect displaced wildlife populations.

4. **In the health sector:** use of Insecticide Treated Nets (ITNs) and other vector-control measures to prevent malaria.

5. **In the water sector:** water treatment for quality control to prevent water-borne diseases, developing small dams, and other storage facilities to mitigate droughts /flooding, harvest water and initiate community-based fish farming and breeding.

6. **In the forest energy sectors:** targeting afforestation and re-afforestation programmes to control siltation of streams and rivers as well as to provide fuel wood to minimize encroachment to the forests; promotion of community woodlots for the provision of fuel wood and as sources of alternative cash income; use of renewable energies; efficient use of charcoal and expanded use of ethanol stoves; developing and implementing strategies for drought preparedness, flood zoning and mitigation works.
In all sectors: application of GIS/remote sensing in mapping of drought and flood prone areas; strengthening of early warning systems and preparedness; use of climate-based early warning systems and GIS-mapping of vulnerable localities.

It is noticeable that number of these strategies and actions allow addressing issues related to Lake Tanganyika and its basin’s resources, as those in the sectors of fisheries (2), wildlife (3), water (5) and forest energy (6).

2.6.5 Future Evolution of the SAP

The updated SAP has been undertaken in recognition of the need to respond to current threats and opportunities for sustainable use and for conservation of biodiversity of the lake and its basin, as well as the changing needs and aspirations of lakeshore communities and overall regional development.

The proposed actions in this document are based on the best available knowledge, drawing on the considerable experience of those using and managing the lake resources, as well as the most recent scientific findings. However, even as the actions described in this document are undertaken, the environmental and socio-economic situation in the Lake Tanganyika basin will continue to change. New activities in the lake basin may require new responses to protect and conserve lake and basin resources. New opportunities may be developed to make better use of lake resources. New research may allow proposed actions to be refined and may define the need for further interventions. The Convention, in Article 13 paragraph 3, requires the Contracting States to “monitor the effectiveness of the strategic action programme and ...revise it as necessary.”

As the objectives and the actions within the SAP are to be continuously adapted to the changing environment and policies, the proposed interventions and the participating stakeholder are to evolve along time. LTA and the riparian governments are therefore invited to revise or to update it as required. Future iterations of the SAP and detailed development of the proposed interventions will therefore continue to expand to involve an ever broader participation of stakeholder communities.

3 The Lake Tanganyika Authority

3.1 Background and Establishment of the LTA

Elaboration of regional and national project proposals for the implementation of the SAP and finalization of the Convention on the Sustainable Management of Lake Tanganyika took place under the Lake Tanganyika Management Planning Project funded by GEF from early 2002 to mid 2003. The Convention provided the legal framework for establishing the LTA to facilitate cooperation in the sustainable development and management of the natural resources of the Lake Tanganyika basin.

3.2 Organs of the LTA

Article 23 of the Convention on the Sustainable Management of Lake Tanganyika has made provisions for the establishment of the Lake Tanganyika Authority (LTA) whose function is to coordinate the implementation of the Convention by the four riparian countries. 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 Basin. There are three organs of the LTA namely: the Conference of Ministers, the Management Committee and the Secretariat.
3.2.1 The LTA and the Convention

Figure 3: Structure of the Lake Tanganyika Authority

Please add explanatory text (consult with Henry Mwima)

CONSULTANTS: please note that there is not text under section 3.2.1.....

3.2.2 The Conference of Ministers

The Conference of Ministers is the supreme organ of the LTA and consists of four Ministers, one from each of the Lake Tanganyika riparian countries. Conference of Ministers meetings are normally held once a year and chaired by the host Cabinet Minister. However, the Convention provides for extraordinary meetings to be held at any other time decided by the Conference of Ministers. Three ordinary meetings have so far been held, the first meeting was held in April, 2007 in Dar es Salaam, Tanzania. At the end of the first ordinary meeting, the ministers signed the Dar Es Salaam Declaration to reaffirm their commitment to support the operations of the Lake Tanganyika Authority (see Box 2). The second meeting was held in April, 2008 in Bujumbura, Burundi while the third meeting was held in August, 2009 in Uvira, Democratic Republic of Congo. One extraordinary meeting was held in December, 2008 primarily to launch the LTA activities. The major function of the Conference of Ministers is to regularly evaluate the implementation of the Convention. Other functions as stated in Article 24 of the Convention are indicated below:

- Consider and adopt protocols to be included in the Convention;
- Consider and adopt amendments to the Convention and its Annexes;
- Establish whatever subsidiary bodies considered necessary for effective implementation of the Convention; and
- Use adaptive management approaches to undertake any additional action deemed necessary for effective achievement of the objectives of the Convention.

Box 2: Dar es Salaam Declaration on the Lake Tanganyika Authority

We the representatives of the four riparian countries of lake Tanganyika, namely the Republic of Burundi, the Democratic Republic of Congo, the United Republic of Tanzania, and the Republic of Zambia,

Having participated in the First Conference of Ministers as called by the Convention on the Sustainable management of Lake Tanganyika,

Noting that the Convention on the Sustainable Management of Lake Tanganyika entered into force in 2005,

Having assured ourselves that the necessary procedures for starting the institutional organ as prescribed by the Convention have been put into place,

Do hereby pronounce that the Lake Tanganyika Authority, established by the Convention, is now made operational, with the Headquarters hosted by the Republic of Burundi in Bujumbura and the staff to be appointed by the e of Ministers and the Executive Director on approval by the Lake Tanganyika management Committee

Do Hereby reaffirm our commitment to support the operations of the Lake Tanganyika Authority,

Done in Dar es Salaam, the United Republic of Tanzania, this fifth day of April 2007 and signed by:
3.2.3 The Management Committee
The second organ of the LTA is the Lake Tanganyika Management Committee, which consists of four members from each of the Contracting States representing fisheries, environment, water and finance sectors. The LTA Executive Director is an ex-officio member of the Management Committee and serves as the Secretary. The functions of the Management Committee according to Article 25 of the Convention are to:

- Implement the policies and decisions of the Conference of Ministers and undertake tasks assigned by the Conference of Ministers;
- Provide scientific and technical advice to the Conference of Ministers;
- Prepare and propose for approval by the Conference of Ministers, a Strategic Action Plan for Lake Tanganyika;
- Co-ordinate and supervise the implementation of any Strategic Action Program approved by the Conference of Ministers;
- Prepare and propose for approval by the Conference of Ministers, additional protocols and Annexes to the Convention;
- Negotiate with donors interested in supporting the implementation of the Convention;
- Commission studies and assessments to enable the Convention to be effectively implemented and to monitor and evaluate its effectiveness;
- Supervise the activities of the LTA Secretariat including assigning tasks to it; approving annual work program and monitor the execution of that program and budget; and
- Undertake, at the request of the Chairperson of the Conference of Ministers, any urgent or important task under the Convention and to report progress at the Conference of Ministers meeting.

3.2.4 LTA Secretariat
The third organ of the LTA is the Secretariat which consists of the Executive Director, Deputy Executive Director and four Directors each responsible for i) Environment, ii) Fisheries, iii) Finance & Administration and iv) Monitoring and Evaluation. This is the executive organ of the LTA responsible of coordinating actions aimed at implementing the Convention and the Strategic Action Programme. Other functions of the LTA Secretariat as stated in Article 26 of the Convention are to:

- Carry out tasks assigned by the Management Committee;

The present Convention provides for three members, but the decision to raise the number to four was reached during the second ordinary meeting of the Conference of Ministers held in April, 2008. The process of amending the Convention is in the process.
• Provide technical and scientific services and advice required by the Management Committee and the Conference of Ministers;
• Perform the financial and other administrative services required for the proper and efficient operation of the three main organs of LTA: Conference of Ministers, Management Committee and the Secretariat;
• Formulate annual work programs and budgets for LTA;
• Prepare plans, projects, assessments, reports and the like as required by the Management Committee;
• Regularly obtain and update information relevant to the implementation of the Convention and ensure that it is disseminated to all Contracting States;
• Maintain databases of information as required by the Management Committee or the Conference of Ministers and to facilitate the exchange of information under the Convention;
• Arrange and support meetings of the Conference of Ministers and the Management Committee;
• Perform the functions assigned by any protocol;
• Prepare reports on the execution of the Secretariat functions under the Convention and to present them to the MC; and
• Perform any other functions as may be determined by the Conference of Ministers.

3.3 The Lake Tanganyika Regional Integrated Management and Development Programme

The LTA activities are implemented within the framework of the Lake Tanganyika Regional Integrated Management and Development Programme (LTRIMDP). The development of the LTRIMDP was done during the LTR and LTBP implementation and involved the governments of the four riparian countries with support and participation of a range of international partners. The LTRIMDP is intended to bring about integrated sustainable management and protection of Lake Tanganyika and its Basin and to alleviate poverty and improve the socio-economic development of the riparian populations. The LTRIMDP is designed to facilitate the implementation of the Convention on the Sustainable Management of Lake Tanganyika, SAP and the Framework Fisheries Management Plan (FFMP). The programme falls within the policies of the Poverty Reduction Strategy Papers (PRSP), which were developed by each of the four governments to provide sustainable economic growth for poverty reduction. The LTRIMDP has two immediate objectives:
1. To achieve sustainable management of the natural resources of Lake Tanganyika through implementation of activities prioritized in the SAP;
2. To improve livelihoods through physical and social infrastructure development.

The first immediate objective of LTRIMDP is supported by UNDP/GEF funding through its project on Partnership Interventions for the Implementation of the SAP for Lake Tanganyika. The second immediate objective of LTRIMDP is supported through the ADB and NDF funded Project to Support the Lake Tanganyika Integrated Regional Development Programme (PRODAP).

Implementation of the LTRIMDP started in 2008 and: a) Engaged the participating countries in concerted action toward finalization and ratification of the draft Convention. b) Addresses the priority issues described in the SAP and the TDA through priority projects and sub-components.

3.3.1 UNDP/GEF Partnership Interventions for the Implementation of the SAP for Lake Tanganyika Project

Comment [N25]: With these two sentences, we can have two subsections to briefly discuss the two projects: UNDP/GEF and PRODAP – it is not necessary to provide excessive information since the reference list in the SAP document will include project documents. Suggested subsections:

3.3.1 UNDP/GEF Partnership Interventions for the Implementation of the SAP for Lake Tanganyika Project
3.3.2 Project to Support the Lake Tanganyika Integrated Regional Development Programme

Comment [N26]: This sub-title has been over-developed in this framework. Should be reduced and comparable to the subsequent sub-title on PRODAP.
The project pilots the implementation of the SAP in the four countries and supports the development of the Lake Tanganyika Authority and Secretariat, based in Bujumbura, Burundi. SAP Priorities for GEF funding in DRC, Zambia and Tanzania include catchment management to reduce siltation which is adversely affecting lake processes, productivity and biodiversity. Priorities in Burundi, and in one site in Tanzania, include reducing waste water effluents which cause significant pollution in the lake. Co-Finance supports reduced sustainable fisheries, inputs to wastewater treatment and lake monitoring. The project is being implemented through two major approaches: NEX execution in Tanzania and Zambia, with a long history of project execution, including areas around the Lake; and Agency Execution via UNOPS for Burundi, DRC and Regional Components. UNOPS provides regional contractual support to ICRAF for catchment management and IUCN for enhanced monitoring programmes.

The Zambian component of the supported by ADF/GEF focuses on sedimentation control, which is within the framework of priorities of the sub-regional Strategic Action Programme (SAP). In the SAP, the control of sediment inflows from the steep mountainous terrain bordering Lake Tanganyika in both Mpulungu and Kaputa Districts is one of the most important areas for support. Over-fishing is addressed through co-finance and technical cooperation from the African Development Bank, FAO and other partners. Sediment inflows will be reduced through an increase in the area of land brought under sustainable land use, particularly for agriculture and forestry. Emphasis is on institutional strengthening with support to community participation in agriculture, forestry, and soil-erosion prevention. Best practice and innovation, as well as regional coordination and dissemination of lessons will be assured by linking the project to ICRAF’s training and demonstration programmes as a regional activity.

The Tanzania component on catchment management aims at empowering communities to properly manage the land and wetlands for environmental conservation purposes with the subsequent benefits of improving livelihoods, conserving biodiversity and maintaining the integrity of Lake Tanganyika. Specifically the project will develop local competencies in sustainable natural resources management within the lake catchment and promote conservation and biodiversity management through improving the human capacity to manage land resources. In compliance with the Land and Water policy of Tanzania, these actions aim at empowering people at local level and involving them in all aspects of conservation programmes.

The regional component addressed the SAP priority of ratification and now supports the implementation of the Lake Tanganyika Convention and associated environmental protocols. It supports the regional interaction and regional institutional activity behind the Convention – the Lake Tanganyika Management Committee and the Secretariat for the Management of the Lake. Updating the SAP lies within this component. It covers as well, the development of the Monitoring Programme for the Lake, linking national processes and institutions at regional level, and developing linkages to management decision-making bodies for the Lake. Fourthly, the Regional Component also provides for the forum and base for the Partnership Programme for the Lake – between Governments and Development Partners (including UNDP and GEF). Lastly, the Regional Programme provides the framework for coordination and management of the national GEF interventions into a single and cohesive whole. Regional staff has the mandate to provide such coordination and unified reporting.

Implementation Arrangements

The project pilot the implementation of the SAP in the four countries and support the development of the Lake Tanganyika Authority and Secretariat, based in Bujumbura, Burundi. SAP Priorities for GEF funding in DRC, Zambia and Tanzania include catchment management to reduce siltation which is adversely affecting lake processes, productivity and biodiversity. Priorities in Burundi, and in one site in Tanzania, include reducing waste water effluents which cause significant pollution in the lake. Co-Finance supports reduced sustainable fisheries, inputs to wastewater treatment and lake monitoring.
The project is being implemented through two major approaches: NEX execution in Tanzania and Zambia, with a long history of project execution, including areas around the Lake; and Agency Execution via UNOPS for Burundi, DRC and Regional Components. UNOPS provides regional contractual support to ICRAF for catchment management and IUCN for enhanced monitoring programmes.

3.3.2. Project to Support the Lake Tanganyika Integrated Regional Development Programme (PRODAP)

The PRODAP is being financed by the African Development Bank (AfDB), the Nordic Development Fund (NDF) and the four Lake Tanganyika riparian countries of Burundi, D.R. Congo, Tanzania and Zambia. PRODAP aims at rationalizing the exploitation of the fishery resources, protecting the lake environment in a sustainable manner, and reducing the poverty of the Lake Tanganyika Basin communities. The project’s activities are contributing to the implementation of the Convention on the Sustainable Management of Lake Tanganyika.

PRODAP consists of four components, namely: (A) Institutional Capacity Building, which aims at establishing an adequate intervention capacity at national and regional levels for the sustainable and integrated management of Lake Tanganyika and its natural resources; (B) Fisheries Development and Environmental Protection, which aims at ensuring sustainable and responsible management of fisheries and at contributing to the preservation of the quality of aquatic ecosystems in Lake Tanganyika; (C) Infrastructure Rehabilitation and Local Development, which consists of activities aimed at sustainably improving the livelihood of the riparian population of Lake Tanganyika; and (D) Project Management.

The major expected outputs of the project include: (i) providing technical supervision for operators in the fisheries sub-sector; (ii) training of operators and revitalization and/or creation of viable socio-professional groups; (iii) improvement of the living conditions of communities by establishing a suitable and sustainable financing system for community micro-projects; (iv) sustainable management of fishery resources through the introduction of joint fisheries management; (v) institutional capacity building at the regional, national and local levels for the sustainable management of the Lake; (vi) establishment of a system for lake surveillance and rational exploitation of fishery resources; and (vii) environmental and biodiversity protection through the treatment of waste water and protection of the catchment areas. The LTA Secretariat is an executing agency of PRODAP.

3.3.2 Coordination

The LTA Secretariat coordinates the implementation of LTRIMP at the regional level. The Secretariat is supported by two regional coordination units, one for interventions supported by UNDP/GEF and the other for interventions supported by the ADB and NDF. The LTA Management Committee serves as a regional steering committee and meets on a yearly basis to provide policy guidance and oversight in LTRIMP implementation.

At the national level, the UNDP/GEF Project is implemented through Management Units (PMUs) and the ADB/ND Project is implemented through National Coordinating Units (NCUs). A National Project Steering Committee (NPSC), which has a multi-sectoral membership, meets periodically to provide general oversight in the implementation of PMU and NCU activities.
4  The Framework for the SAP

The SAP defines a programme of priority actions that are based on a formal evaluation of challenges as well as opportunities for the conservation of biodiversity and sustainable management of the natural resources in the Lake Tanganyika basin. This process of evaluation involved the Transboundary Diagnostic Analysis carried out by the SAP Planning Group with support of the LTBP Special Studies, as well as integration of the outcomes of relevant scientific studies that have been published between 2000 and 2010.

The SAP is provided for in Article 13, paragraph 3 of the Convention on Sustainable Management of Lake Tanganyika (see above, section 1.2), including specific aims directed at achieving the objective of the Convention, strategies for achieving those aims, specific measures to be taken by the Contracting States separately or jointly to achieve them, and details of the means to be used to monitor progress towards their achievement. The Convention also requires the Contracting States to monitor the effectiveness of the SAP and revise it as necessary.

As such, the SAP is intended a flexible planning framework to be revised in response to changes in opportunities from, and threats to biodiversity and natural resources of Lake Tanganyika and its basin, as well as to changing needs and aspirations of lakeshore communities and overall regional development.

4.1  The Analytical Framework

The process of formulating and updating the SAP follows an analytical approach to identify immediate management objectives within the overall goal of conserving biodiversity and promoting sustainable use of natural resources. This approach includes a three level framework that facilitates prioritization of the most urgent interventions to enable the development of detailed proposals and/or measures to address identified priorities (Figure 4). After analysis of the main threats and the specific problems involved, priorities are established for possible interventions, and a sequence of management interventions is proposed to counteract each identified problem.

Figure 4: Analytical framework for formulation and updating of the Strategic Action Programme.

The main threats to biodiversity and sustainable use of the natural resources in the Lake Tanganyika basin were described as Climate Change, Excessive Sedimentation, Habitat Destruction, Increasing Pollution, Invasive Species, and Unsustainable Fisheries. These identified threats reflect the concerns raised at the first international lake conference held in 1991, and those of the stakeholder consultations that were conducted from 1998-2000 and in 2010. The LTBP Special Studies as well as subsequent scientific research has confirmed the significance of these threats, and the relevance of the proposed general action areas.

After describing the main threats, specific problems were identified within each general action area, and a list of actions was proposed to counteract each problem. Each specific problem was defined in terms of site and impact, relevant stakeholders were identified, and uncertainties were listed where further research and/or monitoring are required to define the need for action or to develop solutions. For each group of interventions, the sequence of actions needed to counteract the specific problem within this group was prioritised. These actions are presented in matrices in the order of their priority.
Subsequently, the key agencies that would be responsible for leading the intervention and in some cases for the further development of detailed project proposals were added in front of each proposed action, and a timeframe were assigned (could start now given adequate resources, or needs to take place after a given action has been completed).

4.2 The Basis for Prioritisation

The evaluation used to establish priorities for the SAP is based on several criteria. The first two criteria are directly related to the objective of biodiversity conservation and the sustainable use of natural resources, whereas the third criterion is related to indirect benefits:

1. The severity of the problem threatening biodiversity or sustainable use of lake resources.
2. The feasibility of the solution.
3. Additional benefits to local communities.

To prioritise for the SAP, an assessment was made of benefits that could be expected from addressing a particular problem in terms of both conserving biodiversity and promoting sustainable use of natural resources. To the extent possible, this assessment is based on scientific diagnosis of the impact of the problems, supported by the knowledge and experience of stakeholders using and managing the Lake resources. However, given the complexity of many of the issues being addressed, and the fact that conclusive information is not always readily available, the Precautionary Principle is recommended. The assessment of the severity of a problem is a combination of scientific diagnosis as well as more subjective and intuitive assessments, based on an empirical knowledge of the lake. It is here that the stakeholder consultations played a crucial role in the formulation and updating of the SAP.

The second consideration in setting priorities is the feasibility of the solution, since there is little point in addressing management or research concerns to problems that have no practicable management solutions. The feasibility of the solution is assessed after the identification of actions needed to address the problem. In some cases the problems are beyond local management control. Again, this evaluation relies largely on the knowledge and experience of stakeholders.

The primary objective of the Strategic Action Programme is defined as the protection and conservation of the biological diversity and the sustainable use of the natural resources in the Lake Tanganyika basin, with the aim to also have wider implications in terms of the promotion of sustainable livelihoods and development for the human populations in the riparian countries. It should be noted that although the conservation of biodiversity and sustainable use of natural resources has benefits at both global and local levels, the cost of conservation (in terms of constraints on natural resource exploitation) are met by local communities. Therefore, it is important that actions aimed at strengthening sustainable livelihoods and development are included as specific objectives.

Subsequent revisions of the SAP may include medium or even low priority interventions, should resources become available to extend a programme of actions beyond the immediate demands of the high priority problems.

The process of prioritisation was kept simple to ensure transparency. The current SAP reviewed all identified specific problems against the three criteria described above: severity of problem; feasibility of solution and additional benefits. A score of 1, 2 or 3 was then allocated to each of these criteria, with a high score allocated to addressing serious problems, a high score to readily implemented management interventions with a high probability of counteracting the threat, and a high score to...
high additional benefits to wider sustainable development. The final prioritisation was based on a simple addition of the three scores. High Priority was given to those that scored eight or nine, Medium Priority six or seven, while Low Priority was given to those that scored five or less.

4.3 National Actions within a Regional Framework

The rationale for the SAP and its updating is founded on the recognition, by the riparian countries, that the Lake is a shared resource, that they share a common interest in the conservation and sustainable utilisation of its resources, and on their expressed desire to manage the Lake as whole cooperatively and to optimize the benefits derived from it. The conservation and sustainable use of these resources requires a common set of actions to counteract threats to these resources, as they emerge, and make full use of opportunities offered by them. Since, virtually all actions, apart from the regional coordination of the programme, are site specific and fall within national territories, the implementation of these actions remains the responsibility of national governments, working separately and jointly, for common objectives.

The SAP therefore defines national priorities within a regional framework. The riparian countries accept this regional prioritisation of national interventions, but as there are incremental benefits to shared international water resources and global biodiversity, these national programmes remain within the regional framework, and become a priority for multilateral and bilateral support.

5 Programme of Priority Actions

The following sections give details of the high priority actions defined in the TDA and adopted as the immediate focus of attention for the SAP.

5.1 Integrated Management and Development

The proposed actions have been organised under six general action areas:

- Adaptation to the effects of Climate Change.
- Control and Prevention of Biological Invasions.
- Development of Sustainable Fisheries.
- Pollution Control.
- Sediment Management.
- Habitat Conservation.

Note that this sectoral classification is a convenience. For instance, while the main thrust of a proposed action may be to reduce the impact of fishing pressure, the identified actions may include the promotion of improved agriculture as a means of diversifying livelihoods and reducing pressure on fish stocks. Underlying all actions is the recognition of the need for an integrated approach to counteract what at first sight appear to be single sector problems.

In addition, while the geographical scope of these interventions includes the wider catchment, the focus of attention is on actions that impact on the lake. Priority is given to those activities with the greatest impact on the lake and on lakeshore communities, and indeed the majority of activities will be directed at improved and integrated management of the natural resources in the lake basin. To achieve improved and integrated management of the lake basin natural resources, the ecosystem management approach may have to be adopted. The advantage of the ecosystem approach is it integrates the scientific knowledge on ecological interrelationships and the complex socioeconomic and political frame of values, aiming at the long-term sustainability of a region. Furthermore, the
approach recognizes the interrelated nature of terrestrial and aquatic resources, air and land and seeks to address management challenges associated with sector-based approaches which are insufficiently adequate in meeting the needs for sustaining goods and services that flow from healthy ecosystems. An ecosystem approach to fisheries is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by the ecosystems (FAO Tech. Guidelines, No. 4, Suppl. 2, 2003). This approach addresses a number of concepts (or principles) that generally underpin the high-level policy goals assigned to fishery management at a national or regional scale, recognising that fisheries have the potential to alter the structure, biodiversity and productivity of ecosystems, and that natural resources should not be allowed to decrease below their level of maximum productivity. Fisheries management under the ecosystem approach will respect the following principles:

- Fisheries should be managed to limit their impact on the ecosystem to the extent possible;
- Ecological relationships between harvested, dependent and associated species should be maintained;
- Management measures should be compatible across the entire distribution of the resource (across jurisdictions and management plans);
- The precautionary approach should be applied because the knowledge on ecosystems in incomplete; and
- Governance should ensure both human and ecosystem well-being and equity.

5.2 Crosscutting Themes

Crosscutting themes are sets of activities that are common to many of the proposed national actions. As such it is possible that components that are common to different proposed actions could be combined into a project that deals with these as a common theme. This will have the added benefits of helping to identify synergies between activities, promoting the exchange of information between countries and ensuring consistency with other sectoral policies. In many cases cross-cutting actions are of interest at the national and regional levels, and for many other national/regional social and economic policies.

5.2.1 Information Management

The effective management of the lake will depend on the timely provision of key information to planners and decision makers. Many of the proposed interventions include further research and monitoring as an action to support management decisions, however, much of this information will have wider relevance and should be used to support other interventions. There is therefore a clear need to continue to provide resources to a central information service, responsible for maintaining a GIS database, a literature reference system and other shared data sources.

5.2.2 Socio-economic Development and Governance

There is invariably a need for socio-economic development and appropriate governance as components of sustainable development initiatives. In large parts of the lake’s watershed, demographic growth and population dynamic is higher than resources production.

As a result, many of the proposed actions include common socio-economic inputs such as the review of alternative livelihoods and food security, cultural opportunities and patterns of resource use, gender issues and participatory approaches to management, leading to proposals for appropriate interventions.
Where a decision is to be made for a number of separate national or regional simultaneous actions, these recurring socio-economic actions should be managed as a single supporting component.

5.2.3 **Institutional and legal aspects, Capacity Building and Funding**

The over-riding institutional problems have been identified in the first level of the TDA: lack of resources, poor enforcement of regulations, lack of appropriate regulations and lack of institutional coordination. The last component is currently addressed by the LTA.

More generally, these cross-cutting themes could combine aspects of different actions that relate to training and physical infrastructural development, as well as aspects such as legal review, revision and harmonisation.

5.2.4 **Environmental policy**

Integration of the proposed actions into the framework of environmental policy including biodiversity strategies, environmental assessment and ecosystem services valuation, is another important crosscutting issue. Tools of environmental policies include law and environmental education as well as economic instruments and support to local initiatives.

5.2.5 **Environmental Education**

Many of the proposed activities will depend for their success on awareness creation both at the community, administrative and political levels. In the region, there is serious need for education on environment issues from schools to the active society. Environmental education need to be a key component of many separate activities, but could be combined in a cross-cutting project managed in support of a number of regional and national actions.

5.3 **Environmental Monitoring**

To ensure sustainable long-term management of the biodiversity and natural resources of Lake Tanganyika and its basin, national and regional environmental monitoring is of key importance. Monitoring allows an assessment of changes in biodiversity as a function of environmental parameters. Long-term data on the state, pressures and responses of ecosystems to environmental threats are indispensable for enabling informed management decisions.

In recognising the importance of monitoring data for the future sustainable management of Lake Tanganyika’s natural resources, the LTA with support from the UNDP/GEF Project aims to establish a Regional Integrated Environmental Monitoring Programme (RIEMP). This programme will take lessons learnt from previous research and monitoring activities, including those implemented by the LTBP and LTR, and use these as a basis for a new programme.

All four riparian countries of Lake Tanganyika have national research institutes and regulatory organisations with a mandate to collect information on the lake and its natural resources. These include specialised fisheries, hydrobiology, water, agricultural and land use, as well as health agencies. There is tremendous existing potential for establishing a programme that integrates national monitoring efforts at a regional level.

In March 2010, a workshop was organized with stakeholders from relevant research and monitoring institutions in order to share knowledge and ideas on the implementation of Lake Tanganyika
monitoring programme\textsuperscript{2}. 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 was identified as important to allow for analyses of biodiversity as a function of these different threats.

To ensure sustainability, the RIEMP will focus on low-cost multidisciplinary monitoring activities using appropriate technologies that fall within the (enhanced) capacities and resources of the institutions involved. To guide and evaluate the impacts of priority actions that are implemented under the SAP, continued low-cost monitoring activities could be supplemented by specific short-term projects.

To accomplish a meaningful monitoring programme, national data collection should adhere to regionally agreed formats and criteria, so that the results can successfully feed into the planning and implementation processes of the LTA. Furthermore, a regular flow of information will need to be maintained between the LTA and its monitoring partners so that the monitoring system can continue to respond to changing threats and preventive measures can be put in place.

5.4 Adaptation to Climate Change Effects

It has been established that, if greenhouse gas emissions continue to rise, the mean global temperatures is likely to increase by between 1.4 and 5.8°C by the end of the 21\textsuperscript{st} century (IPCC, 2007). The average global surface temperature has warmed 0.8°C in the past century and 0.6°C in the past three decades (Hansen \textit{et al.}, 2006). In Lake Tanganyika region, available data show an elevation of the mean temperature of 0.7 at the northern end (Bujumbura) between 1964 and 1994 and of 0.9°C at the southern end (Mbala, Zambia) between 1956 and 1994 (Plisnier, 1997, Verburg \textit{et al}, 1998).

The trend for rainfall is more complex and not as clear. Research suggests that warming sea surface temperatures, especially in the southwest Indian Ocean, in addition to inter-annual climate variability, play a key role in East African rainfall (Plisnier \textit{et al.}, 2000). Warm sea surface temperatures are thought to be responsible for the recent droughts during the 1980s to the 2000s (Funk \textit{et al.}, 2005) and that El Nino/Southern Oscillation (ENSO) is the most important factor in inter-annual variability, but local geographic factors complicate the impact of large-scale factors. ENSO comprises two opposite extremes, El Nino and La Nina. El Nino is associated with anomalously wet conditions during the Short Rains resulting in extreme flooding while La Nina conditions are associated with unusually dry conditions during the same period.

During the recent decades, it has been observed that, in the bimodal East African annual rainfall cycle, much of the inter-annual variability comes from short rains (October to December) compared the long rains (March to May) (WWF, 2006), with increasing rainfall over the northern sector and declining amounts over the southern sector (Schreck and Semazzi, 2004).

This comes to explain why extreme climatic events such as floods and droughts have been observed on the Lake Tanganyika and its basin in recent decades as a result of excessive and deficient rainfall periods. It is thought that the frequency and the amplitude of these events may increase with the driving regional climate change.

Climate is rather a cross cutting issue, as sectors like water resources, energy, landscapes, terrestrial and aquatic natural ecosystems, agriculture, livestock, forestry and human health are identified to

\footnote{SM: Include references report}
being impacted by its variability and change. Adapting to climate change is therefore a development issue that helps address problems in all these socioeconomic sectors. Focusing on Lake Tanganyika, impacts are to be observed on the pelagic and the littoral zones.

5.4.1 Impacts of Increasing Temperatures

It is thought that warming is reinforcing water stratification in pelagic zone, with a reduction in the thickness of the oxygenated layer and a limitation in the upwelling of nutrient rich waters from deep to upper layers. There are some indications that there is a trend for a reduction of the overall primary and secondary production in the water column and therefore a decrease in potential fish catch (O’Reilly & al, 2003, Verburg & al. 2003).

Table 1: National Actions for Adaptation to Increasing Temperatures

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi – Warming leading to increased water stratification leading to reduced nutrients, productivity and fish yields</td>
<td>1. Research and awareness raising – MEEATU, Research Institutions - Now 2. Promotion of activities for revenues generation alternative to fisheries – MPDC - Now</td>
</tr>
<tr>
<td>Stakeholders: MAE, MEEATU, MPDC, ONGs, Research institutions, Uncertainties: Extent of the phenomena and the impact</td>
<td></td>
</tr>
<tr>
<td>DR Congo – Warming leading to increased water stratification leading to reduced nutrients, productivity and fish yields</td>
<td>1. Research and awareness raising – Ministry of Environment, Research Institutions - Now 2. Promotion of activities for revenues generation alternative to fisheries - Ministry of Planning - Now</td>
</tr>
<tr>
<td>Stakeholders: Minagri, Ministry Environment, CRH, INERA, Ministry of Planning, ONGs Uncertainties: Extent of the phenomena and the impact</td>
<td></td>
</tr>
<tr>
<td>Tanzania – Increasing water temperature</td>
<td>1. Establish and implement climate change awareness programme – VPO, Ministry of Water, TMA - Now</td>
</tr>
<tr>
<td>Stakeholders: VPO, Ministry of Water, TMA, TAFIRI Uncertainties: Extent of the impact</td>
<td></td>
</tr>
<tr>
<td>Stakeholders: Ministry of Environment, MACO, MACO, DMMU Uncertainties: Extent of the impact</td>
<td></td>
</tr>
</tbody>
</table>

5.4.2 Impacts of Decreased Precipitations

In the littoral zone, annual and inter-annual water level fluctuations will continue to be observed and even magnified during as a consequence of changing in rainfall regime.

During deficient rainfall periods, the lake level will drop and the floodplain will dry out. This is unfavourable for the reproduction and the growth of many lacustrine fish species. A related risk is
the destruction the floodplain ecosystems consecutive to human exploitation of this land then accessible.

5.4.3 Impacts of Increased Precipitations

During increased precipitation periods, lake water level will raise and the shoreline will extend in the coastal plain and river deltas. A positive impact is an enrichment of water in nutrients and an extension of the reproduction and growth grounds for many fish species. The negative impact is the flooding of infrastructure installed in the flood plain.

It will be noticed that actions to adapt to effects of climate change, for Lake Tanganyika’s point of view, are in phase with those proposed to address destruction of sensitive habitats and to control excessive sedimentation through sustainable agriculture promotion and forest restoration.

Table 2: National Action in Response to Impacts of Excessive Rainfall

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi – Floods and inundations in the floodplain and increased erosion on the</td>
<td>1. Undertake an overall and integrated management of the flood plain around Lake Tanganyika - MEEATU - Now</td>
</tr>
<tr>
<td>watershed</td>
<td>2. Channel streaming water in Bujumbura Town - SETEMU - Now</td>
</tr>
<tr>
<td>Stakeholders: MEEATU, SETEMU, MAE, Territorial Administration, INECN,</td>
<td>3. Set up an early warning system - MEEATU - Now</td>
</tr>
<tr>
<td>Uncertainties: Level and Duration of the rainfalls</td>
<td>4. Management of water drainage and river courses, especially in high slope zones, for water and soil</td>
</tr>
<tr>
<td></td>
<td>conservation – MEEATU - Now</td>
</tr>
<tr>
<td></td>
<td>5. Construction of contour level lines to control erosion - MEEATU - Now</td>
</tr>
<tr>
<td></td>
<td>6. Fight against bush fires in natural ecosystems - Territorial Administration - Now</td>
</tr>
<tr>
<td>DR Congo – Floods and inundations in the floodplain and</td>
<td>1. Undertake an overall and integrated management of the flood plain - Now</td>
</tr>
<tr>
<td>the floodplain and increased erosion on the watersheds</td>
<td>2. Management of water drainage and river courses, especially in high slope zones, for water and soil</td>
</tr>
<tr>
<td>Stakeholders: Minagri, CRH and NGOS</td>
<td>conservation - Now</td>
</tr>
<tr>
<td>Uncertainties: Level and duration of the rainfalls</td>
<td>3. Construction of contour level lines for erosion control - Now</td>
</tr>
<tr>
<td>Tanzania – Floods and inundations in</td>
<td>1. Implement flood control measures – Ministry of Agriculture. - Now</td>
</tr>
<tr>
<td>floodplains</td>
<td>2. Undertake an overall and integrated management of the flood plain – Ministry of Agric. - Now</td>
</tr>
<tr>
<td>TMA</td>
<td>4. Set up an early warning system - TMA - Now</td>
</tr>
<tr>
<td>Uncertainties: Extent of the problem</td>
<td></td>
</tr>
<tr>
<td>Zambia – Floods</td>
<td>1. Implement flood control measures - MLGH - Now</td>
</tr>
<tr>
<td>Stakeholders: Ministry of Environment/MACO/MLFD/DMMU, MLGH, Local communities;</td>
<td>2. Discourage settlements in flood-prone areas - MLGH - Now</td>
</tr>
<tr>
<td>Local Authorities; Water Affairs; Ministry of Health; DOF; MOH; NGOs, Local</td>
<td>3. Enhance early warning systems - MLGH - Now</td>
</tr>
<tr>
<td>leaders</td>
<td>4. Promote rainwater harvesting - Water Affairs - Now</td>
</tr>
</tbody>
</table>
Table 3: National Action in Response to Impacts of Deficient Rainfall

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
</table>
| **Burundi** – Lake water level drop and drought in the floodplain  
**Stakeholders:** MEEATU, INECN, MAE, NGOs  
**Uncertainties:** Level of water body recession Duration of the rainfall downturn | 1. Promote the conservatory management of the biological resources in the flood plain and Rusizi delta - INECN - Now  
2. Reinforce the conservation capacity for protected area conservation in and around the lake - INECN – Now |
| **DR Congo** – Lake water level drop and drought in the floodplain  
**Stakeholders:** Minagri, NGOs  
**Uncertainties:** Level and Duration of the rainfalls | 1. Promote the conservatory management of the biological resources in the flood plain and Rusizi delta - CRH Uvira - Now  
2. Reinforce the conservation capacity for protected area conservation in and around the lake- ICCN Bukavu - Now |
| **Tanzania** – Decline in water levels and water quality  
**Stakeholders:** VPO, Ministry of Water, Ministry of Natural Resources, TMA  
**Uncertainties:** Extent of the phenomena | 1. Establish effective early warning communication and response system - TMA - Now  
2. Promote the conservatory management of the biological resources in the flood plain and Malagarasi delta – Ministry of Nat. Res., Ministry of Water - Now  
3. Reinforce the conservation capacity for protected area conservation in and around the lake – Ministry of Nat. Res. - Now |
| **Tanzania** – Loss of biodiversity  
**Stakeholders:** VPO, Ministry of Natural Resources, NEMC, TAFIRI  
**Uncertainties:** Extent of the phenomena | 1. Establish protected areas – Ministry of Natural Resources, NEMC - Now |
| **Tanzania** – Ecosystem shift  
**Stakeholders:** VPO, Ministry of Natural Resources, NEMC, TAFIRI  
**Uncertainties:** Extent of the phenomena | 1. Promote participatory land use planning and management – Ministry of Agriculture - Now  
2. Integrate climate change issues in national policy and plans – VPO - Now |
| **Zambia** – Decreased Precipitation leading to low water for domestic and industrial  
**Stakeholders:** Ministry of Environment/MACO/MLFD/DMMU, Local communities; Local Authorities; Water Affairs; Ministry of Health; DOF; MOH; NGOs; Local leaders; MET Department  
**Uncertainties:** Extent of the phenomena | 1. Promote rainwater harvesting - Water Affairs - Now  
2. Promote cultivation of drought-resistant crops - MACO - Now  
3. Enhance early warning systems - Water Affairs - Now  
4. Water Budgeting - Water Affairs - Now  
5. Conservation Farming - MACO - Now  
6. Improved Extension Services - MACO - Now |

5.5 **Control and Prevention of Biological Invasions**

A number of exotic species have been introduced and have settled in Lake Tanganyika system, and some of them have expanded to the level of becoming invasive.
The most concerning one is the water hyacinth, *Eichornia crassipes*, native to tropical America and which have been introduced in River Congo and Lake Victoria some decades ago. It entered in Lake Tanganyika in 2000 from cultivated flower plots in the basin and is now spreading in shallow bays of northern end of the lake.

Other exotic plants species are observed in the lake, but have a more localized extension. The most visible are the water lettuce, *Pistia stratiotes*, the red water fern, *Azolla filiculoides*, *Potomogeton* sp, probably *P. crispus*, and *Hydrilla verticillata*. Two possible invading alien freshwater crayfish are already in neighboring watersheds; these are *Procambarus clarkii* from USA in the Nile River system including Lake Edward and smaller lakes in Rwanda and *Cherax quadricarinatus* from Australia in the Zambezi system.

Monitoring for the presence and impact of alien species that are actively or likely to be invasive, develop a management programme using biological control, monitor the effects of management in order to adapt according to experience, and coordinate with other national and regional lake management programmes.

5.5.1 Reduction of ecosystem productivity, biodiversity and resources

Water hyacinth is known to completely dominate the invaded ecosystem excluding all other competing species and having deleterious effects such as reduced light beneath and dissolved oxygen in water, increased evapo-transpiration and accumulation of sediment. The consequence of this is a reduced diversity of aquatic biota and fish catches, but also the loss the aesthetic and recreational value of the invaded bays.

This applies to any other invasive floating or submerged plant. Invasive animals lead also to loss of biodiversity and resources.

The proposed actions consist mainly to awareness creation, mechanical and biological control of the invasive species, assess the invasion extent and the impact, and capacity building

<table>
<thead>
<tr>
<th>Table 4: National action to address the reduction of ecosystem productivity, biodiversity and resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific Problem</strong></td>
</tr>
</tbody>
</table>
| Burundi – Water hyacinth colonising the Lake | 1. Create awareness – MEEATU, NGOs - Now  
2. Control water hyacinth by mechanical and biological methods – MEEATU, NGOs - Now  
3. Assess scale of invasions - MEEATU-Research Institutes - Now |
| Stakeholders: MEEATU; MAE; Territorial Administration; NGOs; Local associations and communities | Uncertainties: the effective methods to control the weed |
| DR Congo – Water hyacinth colonising the Lake | 1. Create awareness – Ministry of Environment, NGOs - Now  
2. Control water hyacinth by mechanical and biological methods – Ministry of Environment NGOs - Now  
3. Assess scale of invasions - Ministry of Environment CRH - Now |
| Stakeholders: ICCN; Ministry of Environment, CRH; CRSN; NGOs, Local Communities | Uncertainties: the effective methods to control the weed |
| Tanzania – Habitat destruction | 1. Create awareness - Fisheries Division - Now  
2. Enforce existing laws - Fisheries Division - Now  
3. Assess scale of invasions - Fisheries Division - Now |
| Stakeholders: Fisheries Department; Communities; LGAs; TAFIRI |
### 5.5.2 Alteration of the lake water budget and the economic use of the invaded surfaces

The over-expansion of weed like the water hyacinth on large surface of the lake result in an increased evapotranspiration, one of the component responsible of the lake water level drop, but also exclude the affected bay for fishery activities, boat transport, canoeing and swimming, and globally degrade the aesthetic and recreational value of the lake. The proposed actions consist mainly in controlling the weed in the most sensitive sites and in awareness creation.

#### Table 5: National actions to address alteration of water budget and the economic use of the invaded bays

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
</table>
| Burundi – Degradation of the aesthetic and recreational value of the lake | 1. Create awareness – MEEATU, NGO’s - Now  
2. Control water hyacinth by mechanical and biological methods in the most sensitive sites - MEEATU, NGO’S - Now |
| Stakeholders: MEEATU; MAE; Territorial Administration; NGOs; Local associations and communities |
| Uncertainties: the effective methods to control the weed |
| DR Congo – Perturbation of fishing and water transport activities | 1. Create awareness – Ministry of Environment, NGO’S - Now  
2. Control water hyacinth by mechanical and biological methods in the most sensitive sites – Ministry of Environment, NGO’S - Now |
| Stakeholders: ICCN; Ministry of Environment, CRH; CRSN; NGOs, Local Communities |
| Uncertainties: the effective methods to control the weed |
| Zambia: Negative effect on Hydropower Generation and water transport | 1. Capacity Building to institutions dealing with EIA - Ministry of Environment - Now  
| Stakeholders: Ministry of Environment, MACO, MLFD, NISIR, Academia |
| Uncertainties: Extent of the impact |

### 5.6 Development of Sustainable Fisheries
There are two distinct but overlapping fisheries in the lake, the near-shore fisheries and the offshore fisheries – the littoral zone and the pelagic zone. The overlap is both ecological and economic, and both fisheries are linked to shore communities and interrelate with their other economic activities.

The management of both inshore and offshore fisheries, and the management of activities affecting the lake basin, has to take place within an integrated planning framework that takes accounts of the physical, social and economic links between basin based activities and the lake resources.

While the biodiversity focus is on the rich littoral zone, interventions need to address fisheries issues in both zones. If the pelagic fisheries collapse, then this will place additional pressure on the littoral fisheries.

Within any lake shore community, there are groups who concentrate their fishing activities in the offshore zone, and other groups who focus on the littoral zone for both subsistence and commercial activities. Meanwhile, other family members and the fishermen themselves are usually also engaged in farming. The balance between these activities depends on the moon cycle, the season, the fluctuation in fish stocks, labour availability and changes in markets.

The LTBP Fishing Practice Special Study recorded, in 1997-1998, over 50 different fishing gears were recorded in Lake Tanganyika fisheries. Of these, twelve were considered to be of key significance, and there was some overlap between the pelagic gears and the littoral gears. The problem was not only one particular type of fishing gear but of the cumulative fishing pressure of all gears combined both for the littoral and the pelagic fisheries. In 2010, this pressure has not likely to lower if it is not even higher; an updated monitoring is needed.

The development of sustainable fisheries addresses both pelagic and littoral fisheries, and the activities of communities dependent on them.

Figure 6: Main Fish Trade Routes

5.6.1 Excessive Fishing Effort in the Littoral Zone

The littoral fisheries are complex. They are multi-species, multi-gear, and involve both artisanal and subsistence fishermen. Many of the inshore fishing grounds (0-40m Depth) adjacent to areas of high population settlement are already under heavy pressure from a range of gears and there are indications of reduced catch, changing catch composition and in some areas collapse.

Previous management interventions to control these fisheries have depended on state legislation limiting fishing effort through licensing or banning a particular gear. This approach has not been successful, partly as a result of lack of enforcement capacity and partly as a result of fishermen switching gear without reducing overall effort.

An alternative approach, increasingly adopted in the management of fisheries worldwide is to look toward partnership arrangements, or co-management amongst groups of people with a stake in the fishery (e.g. fisher communities, NGO’s and governments). This approach will require a major change in perspective towards increasing participation of local stakeholders and a changing role for the institutions formally charged with fisheries management.

Table 6: National Actions in Response to Excessive Fishing Pressure in the Littoral Zone

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi: Excessive fishing pressure</td>
<td>1. Raise awareness and train (fishermen, boat owners, administration) – MAE, NGO's - Now</td>
</tr>
<tr>
<td>Stakeholders: Fisheries administration</td>
<td></td>
</tr>
</tbody>
</table>
(including MAE– Fisheries Department and Territorial Administration); Fishermen; Owners of fishing units; MEEATU (INECN); NGOs; Local associations and communities; UB

**Uncertainties:** Potential of resources

1. Strengthen regulations and control : introduce licence system (according to type of FU) with recording of existing fishermen; regional harmonisation – Minagri - Now
2. Improvement of statistics – CRH, Minagri - Now
3. Feasibility study of tax raising system aiming to regulate fishing effort (feeding at the same time a lake management fund) – CRH, Minagri - Now
4. Identify reasons for catches increase in the South – CRH, Minagri - Now
5. Identify actions to develop fish farming – CRH - Now
6. Research aiming at establishing how better fish conservation could decrease pressure on stock and favour transfer of demand towards bigger fish – CRH - Now

**DR Congo:** Excessive fishing pressure in the northern part of the lake

**Stakeholders:** Ministry of Environment; Fishermen and associations of fishermen; Local authorities; CRH; Fish sellers; NGOs and local communities; MINAGRI

**Uncertainties:** Maximal exploitable Production

1. Strengthen potential, fishing standards and acceptable licensing quotas – MAE - Now
2. Support income generating activities alternative to fisheries – MPDC - Now
3. Strengthen capacities for Fisheries Department to control and supervise – MAE - Now
4. Update and issue draft law and by–laws on fisheries and aquaculture, as well as ordinances – MAE - Now
5. Create a fund for aquatic resources development fed by taxes from fisheries products - MAE - Now
6. Translation in Kirundi and extension – MAE – After 6

**Tanzania:** Lack of quota on fishing licences

**Stakeholders:** Fisheries; Communities; Local Authorities; TAFIRI

**Uncertainties:** Optimal quota; Available Stock; Impact on Biodiversity

1. Review LTR conclusions – TAFIRI - Now
2. Assess relevance to fish biodiversity issues – TAFIRI - Now
3. Assess trend in expansion of licensing – Fisheries Division - Now
4. Review licensing procedures – Fisheries Division.

**Zambia:** Excessive coastal fishing

**Stakeholders:** Artisanal Fishermen; Subsistence Fishermen; Dep. Of Fisheries; MTENR; Local Leaders; Community Based Organisations, LTA

**Uncertainties:** Optimal level of extraction; Impact of fishing gear on fisheries and biodiversity

1. Promotion of alternative livelihoods – Community Development - Now
2. Assess impact of fishing gear – Dep. of Fisheries - Now
3. Raise awareness – Dep. of Fisheries - Now
4. Strengthen capacity to implement activities – Dep. of Fisheries - Now
5. Negotiate co–management with identified communities in specific fishing zones – Dep. of Fisheries - Now

**5.6.2 Excessive Fishing Effort in the Pelagic Zone**

Although the pelagic zone is less rich in biodiversity than the littoral zone, any collapse in the pelagic fisheries would have a dramatic knock-on effect on the littoral zone, both through increased fishing
pressure in the diverse littoral zone and indirectly through intensified farming practices. The improved management of the pelagic fisheries is essential for the economic well-being of the region. The pelagic fishery supports large numbers of fishermen throughout the lake. The most ‘visible’ practices are the purse seine fleet, the light assisted beach seines and the lift net fleet. However, the pelagic species fishery is also an important livelihood option for many smaller scale artisanal fishermen who paddle some distance from the shore and use jigged lines to target the Perch *Lates stappersi*.

The LTR project main outputs has been a Lake Tanganyika Framework Fisheries Management Plan (LTFFMP) and a Lake Tanganyika FFMP Implementation Programme, which both address the pelagic fisheries.

The LTFFMP consist of 8 main action areas: A) Overall policy matrix; B) Partnership and resource Access; C) Institutional modalities; D) Legal modalities; E. Monitoring, Control, and Surveillance (MCS); F) Possible technical measures to regulate fishing; G) Possible input controls to regulate fishing.

The **Overall policy matrix** consist of 2 sub components: 1) Implementation of the FAO Code of Conduct for Responsible Fisheries (CCRF) by competent authorities of respective States as the policy matrix for the shared fisheries of Lake Tanganyika; and 2) To Adopt and pursue management policy directions in support of a) Adaptive or interactive management practices; b) Multi-disciplinary monitoring capability for measurement of continuity and change across bio-physical and socioeconomic dimensions; c) Partnerships with local stakeholder groups in management decision-making and in fashioning modalities of enforcement and compliance; d) Allocation of access and fishing rights at local community levels; and e) Use of integrated development strategies and coastal area management models.

The **Partnership and Resource Access** is understood through the following sub-components; 1) Facilitate community-based management (co-management) structures and operational arrangements; 2) Provide for community outreach activities with a strong environmental education component; 3) Allocate control of access through community-based arrangements.

For **Institutional Modalities**, it is recommended to 1) Increase government budget allocations to fisheries research and administrative agencies and to 2) Encourage local community involvement in fisheries management decision-making and enforcement activities.

For **Legal Modalities**, there must be a follow up comprehensive programme for modification of existing and draft fisheries legislation, in order to correct current situation with respect to a) Generally outdated state of existing legislation; b) Inadequate/ non-existent regulations applying specifically to Lake Tanganyika; and c) Poor enforcement.

For **Monitoring, Control, and Surveillance (MCS)**, 1) LTMP must be implemented according to the defined workplan, 2) Promote compliance with FFMP measures, for example through legislative provisions for periodic frame surveys, participatory arrangements, alternative enforcement mechanisms, and access agreements between States. The **possible technical measures to regulate fishing** are the following: 3) Initiate gradual process leading to total retirement/phasing out of beach seining on the lake, 4) As a step towards this objective, establish and enforce ‘beach seining prohibited’ areas, 5) For purse seine fishery, encourage gradual reduction of effort to levels that prevailed ten years ago, either through unit retirement or transfer to other fishing zones, 6) As a step towards this objective, establish and enforce ‘off-limits’ areas for industrial units should be considered for both the extreme north and extreme south sub-basins.
The possible input controls to regulate fishing are the establishment and enforcement of licensing ceilings for both industrial units in the south and lift-net units in the north (waters north of Karonda).


All the actions are relevant for this SAP. It should be recalled that the LTA, functional since 2008 with, has the mandate to implement the LTRIMDP, including the implantation of Framework Fisheries Management Plan. All the regional aspects of fisheries in the pelagic zone are to be under LTA facilitation and supervisions.

Table 7: National Actions in Response to Excessive Fishing Pressure in the Pelagic Zone

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burundi</strong>: Excessive offshore fishing</td>
<td>1. Establish standards and quotas for acceptable fishing practices – MAE - Now</td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: Fisheries administration (including MAE– Fisheries Department and Territorial Administration); Fishermen; Owners of fishing units; MEEATU (INECN); NGOs; Local associations and communities; UB</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Acceptable catch</td>
<td>2. Put in place a sufficient capacity to control lake fisheries – MAE - Now</td>
</tr>
<tr>
<td></td>
<td>3. Review national and regional components of the Framework Fisheries Management Plan within the context of the SAP – MAE and LTA - After 1,2</td>
</tr>
<tr>
<td></td>
<td>4. Incorporate additional activities into national programmes within the framework of the SAP – MAE and LTA - After 1,2</td>
</tr>
<tr>
<td><strong>DR Congo</strong>: Uncontrolled offshore fisheries</td>
<td>5. Education and awareness raising – Minagri, NGOs - Now</td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: Ministry of Environment; LTA; Fishermen; Local Authorities; Fish traders; Net manufacturers; CRH; NGOs; Local Communities</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Optimal mesh size and net type; Impact on biodiversity</td>
<td>2. Legislation distinguishing three levels of activity, banning excessively fine nets, limited permits for appropriate net types and banning destructive fishing practices – Minagri - Now</td>
</tr>
<tr>
<td></td>
<td>3. Research into best mesh sizes and fishing methods – CRH - Now</td>
</tr>
<tr>
<td></td>
<td>4. Support to control capacity – Minagri - Now</td>
</tr>
<tr>
<td></td>
<td>5. Review national and regional components of the Framework Fisheries Management Plan within the context of the SAP and LTA – Minagri - After 1,2,3</td>
</tr>
<tr>
<td></td>
<td>6. Incorporate additional activities into national programmes within the framework of the SAP – Minagri and LTA – After 1,2,3</td>
</tr>
<tr>
<td><strong>Tanzania</strong>: Inadequate control of offshore fisheries</td>
<td>1. Build district statistics capacity– Fisheries Division - Now</td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: Fisheries Division; TAFIRI; Ministry of Regional Administration and Local Govt.; Fisheries investors; Communities; NGOs</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: scale of problem</td>
<td>2. Establish the existing fishing pressure, differentiate between industrial and artisanal – Fisheries Division - Now</td>
</tr>
<tr>
<td></td>
<td>3. Establish optimal fishing pressure– Fisheries Division - Now</td>
</tr>
<tr>
<td></td>
<td>4. Set up appropriate monitoring, control and surveillance – Fisheries Division - Now</td>
</tr>
</tbody>
</table>

Comment [N37]: This is an excellent proposed action and we should actually have somewhere in the introductory text a paragraph showing how important it is that the SAP is in fact reflected in national action programmes and environmental policies in all the 4 riparian countries.

GNT: It’s done
5. Implement education and awareness programmes for fishing communities – Fisheries Division - Now
6. Enforce regulations – Fisheries Division - Now
7. Review national and regional components of the Framework Fisheries Management Plan within the context of the SAP – Fisheries Division, LTA - After 1,2,3
8. Incorporate additional activities into national programmes within the framework of the SAP – Fisheries Division, LTA - After 1,2,3

Zambia: Excessive Industrial and Artisanal Fishing

**Stakeholders:** Commercial Fisheries; Artisanal Fishermen; Local Authority; Dep. Of Fisheries; MTENR; Community Based Organisations; Local Leaders; Licensing Committee, LTA

**Uncertainties:** Optimal fishing levels; Market Distribution

1. Raise national and Local Political Awareness – Department of Fisheries - Now
2. Negotiate interim acceptable fleet and means of reducing fleet – Department of Fisheries - Now
3. Establish optimal fleet composition – Department of Fisheries - Now
4. Review licensing procedures – Department of Fisheries - Now
5. Strengthen local capacity to monitor and enforce regulations – Department of Fisheries - Now
6. Review national and regional components of the Framework Fisheries Management Plan within the context of the SAP – Department of Fisheries and LTA - After 1,2,3,4
7. Incorporate additional activities into national programmes within the framework of the SAP – Department of Fisheries - After 1,2,3,4

5.6.3 Excessive or Uncontrolled Extraction of Ornamental Fish

The aquarium trade is focused primarily on the capture of cichlid and a few non-cichlid fish for export to overseas markets. While there is little precise information available, the trade is threatening the biodiversity as the targeted species are endemic, rare, localised and hence vulnerable. Although there are licensing systems in place, these are rarely enforced and have not been updated to reflect market values. Nevertheless, the export is a specialised trade and could also be monitored from the end market. In addition there are relatively few individuals within the countries who control and monitor the collection and marketing. The potential for improved management is quite high, and licensing for export could pay for the enforcement of legislation. Meanwhile the export of these species continues to draw attention to the lake biodiversity value, and can help direct donor attention to the lake management problems. There is the potential for promoting community involvement in the industry and hence promoting livelihood alternatives. Environmental education, and possibly the management of a few aquaria have been proposed as means of raising awareness.

**Table 8: National Actions to Control the Ornamental Fish Trade**

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi: Excessive or uncontrolled extraction of ornamental fish</td>
<td>1. Establish list of threatened species – MEEATU (INECN) - Now</td>
</tr>
<tr>
<td>Stakeholders: MEEATU (INECN); MAE (Fisheries dep.); Exporters; Sellers;</td>
<td>2. Raise awareness – MEEATU (INECN), NGO’s - Now</td>
</tr>
<tr>
<td></td>
<td>3. Regulations, control, monitoring – MEEATU (INECN) -</td>
</tr>
<tr>
<td><strong>Customs; BRB; NGOs; Local associations and communities</strong></td>
<td><strong>Now</strong></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Uncertainties:</strong> Scale of problem and impact</td>
<td>4. Encourage fish farming of those species – MAE - Now</td>
</tr>
<tr>
<td></td>
<td>5. Propose species lists for inclusion in CITES Appendices – INECN – After 1</td>
</tr>
<tr>
<td></td>
<td>6. Establish protected areas (demarcation, ecotourism development, management plans) – MEEATU (INECN) - After 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DR Congo: Excessive or uncontrolled extraction of ornamental fish</strong></th>
<th><strong>1.</strong> Improve and strengthen licence delivery (authorized species, quantities, extraction sites) – Minagri - Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholders:</strong> Local authorities; CRH; Customs; Exporters; Ministry of Environment; ICCN</td>
<td><strong>2.</strong> Strengthen extraction and exporting control – Minagri - Now</td>
</tr>
<tr>
<td><strong>Uncertainties:</strong> Vulnerability of the potential per species and per site</td>
<td><strong>3.</strong> Establish nature reserves: Luhanga, Pemba, Kalamba, Kiriza (Ubwari), Bangwe, Zongwe, Tumbwe, Luluvia basin and Kipuma – ICCN, Ministry of Environment - After 1 and 2</td>
</tr>
<tr>
<td></td>
<td><strong>4.</strong> Additional prospecting in order to expand the network of protected areas – CRH, ICCN - After 1 and 2</td>
</tr>
<tr>
<td></td>
<td><strong>5.</strong> Inclusion of relevant cichlid species on CITES appendices – Ministry of Environment - After 1 and 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tanzania: Excessive or uncontrolled extraction of ornamental fish</strong></th>
<th><strong>1.</strong> Identify threatened species – TAFIRI - Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholders:</strong> Licensed Traders; Fisheries; TAFIRI; LTA, Foreign Affairs; Home Affairs; Customs</td>
<td><strong>2.</strong> Monitor numbers and species exported – Fisheries Division / Customs - Now</td>
</tr>
<tr>
<td><strong>Uncertainties:</strong> Endangered species; Extent of threat</td>
<td><strong>3.</strong> Raise senior level awareness of problems – Fisheries Division - Now</td>
</tr>
<tr>
<td></td>
<td><strong>4.</strong> Establish species quotas – TAFIRI - After 1</td>
</tr>
<tr>
<td></td>
<td><strong>5.</strong> Review number of licensees – Fisheries Division - After 1</td>
</tr>
<tr>
<td></td>
<td><strong>6.</strong> Regional agreement on exportable species by country of origin – Fisheries Division and LTA - After 1</td>
</tr>
<tr>
<td></td>
<td><strong>7.</strong> Examine possibility of inclusion in CITES list – Fisheries Division - After 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Zambia: Excessive or uncontrolled extraction of ornamental fish</strong></th>
<th><strong>1.</strong> Ascertain Scale and Impact – Fisheries Department MTENR - Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholders:</strong> Ornamental fishers; International aquarium traders; Local Authorities; ZAWA; Parks; Communities and Local leaders; Fisheries Department; Museums; Revenue Authority; LTA; Tourists; Hotel/Hospitality industry</td>
<td><strong>2.</strong> Raise Public Awareness; Establish Aquarium – Fisheries Department, MTENR - Now</td>
</tr>
<tr>
<td><strong>Uncertainties:</strong> Scale / Impact of Extraction</td>
<td><strong>3.</strong> Define Levels of Extraction – Fisheries Department, MTENR - Now</td>
</tr>
<tr>
<td></td>
<td><strong>4.</strong> Review License / Export Fees – Fisheries Department, MTENR - After 1</td>
</tr>
<tr>
<td></td>
<td><strong>5.</strong> Establish Local Regulations – Fisheries Department, MTENR - Now - After 1</td>
</tr>
<tr>
<td></td>
<td><strong>6.</strong> Evaluate Potential for Captive Breeding – Fisheries Department, MTENR - Now</td>
</tr>
<tr>
<td></td>
<td><strong>7.</strong> Review Inclusion of Species in CITES – ZAWA - After 1</td>
</tr>
</tbody>
</table>

### 5.7 Pollution Control

The potential impact of pollution on Lake Tanganyika is a major concern. It is the result of human activities within the catchment and is predominantly linked to settlements, ranging from villages to
capital cities. These settlements are scattered throughout the catchment and are centres for a variety of potentially polluting industries and activities. Possible sources of damaging pollution include: domestic waste; farming with fertilisers and pesticides; ports, harbours and marine traffic; industrial factories and small-scale registered and unregistered industries; petroleum products depots and power stations; commercial fishing industries and slaughterhouses; mines and quarries.

Figure 6: Main Urban Settlements and Population Density

5.7.1 Urban and Industrial Pollution

Urban and industrial pollution are closely linked. Urban centres attract industries and form major market and transport hubs, which in turn attract more settlement. Urban population growth in all the riparian countries greatly exceeds rural population growth.

The largest city on the lake is Bujumbura with an urban and sub-urban population of around 600,000. With the other coastal towns in Burundi like Rumonge, and with Uvira in DR Congo with a population of around 300,000, the northern part of the lake is the major concentration of urban settlement on the lakeshore. In Tanzania, Kigoma with a population of 135,000, is the major settlement and port facility, and to the south of the lake, Mpulungu in Zambia with a population of 70,000 is also a major port.
Bujumbura has major industries like the brewery that discharge significant quantities of waste water that passes into the lake. There are, in addition, many other potentially polluting industries. These include the production of batteries, paints, tannery, soap, pharmaceuticals, slaughterhouses, textiles and chemicals, but also oil depots and garages. In Uvira, the main concerns are petroleum products, cotton processing and sugar production and chemicals.

In addition, the increasing volume of domestic waste and effluents linked to growing urban settlements is an issue in all countries around the lake. Even where the settlements were originally planned to incorporate sewage and solid waste management, their growth has outstripped the planned capacity of their waste disposal systems. New quarters of towns are built in the coastal plain where wastewaters ends up untreated in the lake.

In Kigoma bay, where water circulation is restricted, there are already signs of eutrophication. The water intake for the town is located very close to the discharge points for sewage from a number of institutions and the waste entering the lake from the town’s power station.

While the problem is fairly localised, it requires the commitment of local government and the communities involved, as well as major financial investments. The benefits to public health are immediate and direct, with improved water quality benefiting many direct users. The long-term benefits to fisheries and biodiversity relate to a reduction of excess nutrient load and leachates from solid waste disposal in the floodplain.

On the whole watershed, agriculture is evolving from extensive to intensive production system, with the use of more pesticides and chemical fertilizers. This likely to lead to a non source pollution as this is observed in Lake Victoria if preventive actions are not taken long in advance.

### Table 9: National Actions to Control Urban, Industrial and Agricultural Pollution

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
</table>
| **Burundi**: Pollution from urban waste, particularly from Bujumbura and Rumonge | 1. Raise awareness and train – MICPT MEEATU (INECN) - Now  
2. Expansion of treatment capacity in Bujumbura and construction of new ones in other littoral towns like Rumonge and Nyanza- City Council (SETEMU); MEEATU - Now  
3. Set up controlled site disposal and collect waste in littoral towns – City Council (SETEMU) MEEATU - Now  
4. Enforce regulations for marketing of dangerous products for environment (notably batteries) – MEEATU (DGFE) - Now  
5. Strengthen capacities to develop standards for enforcement of legislation relating to waste – MEEATU (DGFE) - Now  
6. Implement land use plans in the framework of planning schemes – MTTPE - Now  
7. Strengthen capacities for INECN to monitor and control – MEEATU (INECN) - Now  
8. Surveying pollution and impact levels, monitor and follow up – MEEATU (INECN) - Now |
| **Stakeholders**: MEEATU (DGFE; INECN); City Council (SETEMU); MICPT, CCIB; Regideso; MTTPE; MSP; BBN; NGOs; Local associations and communities |
| **Uncertainties**: Nature and quantity of effluents; Impact of pollutants on biodiversity and human health, State of Governance |

**Burundi** – Industrial Pollution from Bujumbura town (with particular concern) | 1. Raise awareness and train – MEEATU (INECN) - Now  
2. Set up controlled disposal site and collect waste – |
<table>
<thead>
<tr>
<th>DR Congo: Pollution by domestic effluents and waste</th>
<th>City Council (SETEMU)</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholders:</strong> Ministry of Environment; Local Authorities; Population; NGOs and Local communities; Urban services; INERA; Ministry of Energy</td>
<td><strong>Uncertainties:</strong> Nature and quantity of pollutants and impact on the Lake biodiversity</td>
<td>** Comment [N38]:** What is this? See Acronym list GNT</td>
</tr>
<tr>
<td><strong>1.</strong> Identification of pollutants, evaluation of impact – CRH - Now</td>
<td><strong>2.</strong> Sanitation (construction of latrines, installation of controlled disposal sites and waste collecting, setting up waste and sewage network connected to a treatment plant) – Ministry of Environment - Now</td>
<td><strong>Comment [N39]:</strong> Idem?</td>
</tr>
<tr>
<td><strong>3.</strong> Health education – Health Services- Now</td>
<td><strong>4.</strong> Develop appropriate legislation and support enforcement capacity – Ministry of Environment, Minagri - Now</td>
<td><strong>Comment [N40]:</strong> I hope all of those abbreviations will be explained on the relevant page without missing any of them. It’s done GNT</td>
</tr>
<tr>
<td><strong>5.</strong> Research focused on recycling through agricultural and energy good practices – CRH, Minagri - Now</td>
<td><strong>6.</strong> Control – Ministry of Environment - Now</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DR Congo – Industrial Pollution Kiliba Sugar Factory</th>
<th>City Council (SETEMU)</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholders:</strong> Kiliba sugar factory; CRH; CRSN; INERA; ISDR; NGOs and Local Communities; Ministry of Energy; Ministry of Environment</td>
<td><strong>Uncertainties:</strong> Impact of pesticides / lime on biodiversity; Alternatives</td>
<td>** Comment [N38]:** What is this? See Acronym list GNT</td>
</tr>
<tr>
<td><strong>1.</strong> Promote recycling of by-products (treacle, lime) – Ministry of Environment, Minagri - Now</td>
<td><strong>2.</strong> Assessment of the impact of herbicides on the Lake waters and the biodiversity – CRH - Now</td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Research for more appropriate fertilising modalities – INERA - Now</td>
<td><strong>4.</strong> Update legislation – Ministry of Environment - Now</td>
<td><strong>5.</strong> Control – Ministry of Environment - Now</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DR Congo – Pollution from Kabimba cement factory</th>
<th>City Council (SETEMU)</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholders:</strong> Ciment–Lac; CRH; CRSN; INERA; ISDR; NGOs and local Communities; Ministry of Environment</td>
<td><strong>Uncertainties:</strong> Impact of ashes and dust on lake biodiversity</td>
<td>** Comment [N38]:** What is this? See Acronym list GNT</td>
</tr>
<tr>
<td><strong>1.</strong> Assessment of the impact and identification of the measures to be taken – CRH/Uvira - Now</td>
<td><strong>2.</strong> Update legislation – Ministry of Environment, Minagri - Now</td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Implement recommendations – Ministry of Environment, Minagri – After 1</td>
<td><strong>4.</strong> Control – Ministry of Environment, Minagri - Now</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Issue</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>--------------</td>
</tr>
<tr>
<td>Tanzania: Discharge of untreated domestic waste, Kigoma Municipality</td>
<td>Feasibility study of agricultural recovering of ashes</td>
<td>INERA - Now</td>
</tr>
<tr>
<td>Stakeholders: Local Council; Regional Authority; Ministry of Water; Ministry of Health; Ministry of Lands</td>
<td>Uncertainties: Impact on biodiversity; Quantity and type of effluents</td>
<td>1. Propose developments &amp; promote awareness to counteract existing situation of open drains etc. – Ministry of Lands - Now</td>
</tr>
<tr>
<td>Tanzania: Discharge of untreated waste from institutions (Police, Prisons, Railway Station, Docks) Kigoma Municipality</td>
<td>Stakeholders: Police; Prisons; TRC; Local Council; Ministry of Water; Ministry of Health; Ministry of Infrastructure; Regional Authorities</td>
<td>Uncertainties: Impact on biodiversity; Quantity and type of effluents</td>
</tr>
<tr>
<td>Tanzania – Industrial Pollution Kigoma TANESCO Power Station</td>
<td>Stakeholders: TANESCO; Local Council; Ministry of Water; Ministry of Energy;</td>
<td>Uncertainties: Extent of Pollution</td>
</tr>
</tbody>
</table>
5.7.2 Harbour Pollution

Harbours are a significant source of pollution, through accidental contamination from spillage during transfer of cargo, through waste dumped from boats and in some cases, waste dumped from shoreline factories.

Harbour management systems are designed to avoid accidental pollution but the majorities of harbour facilities are designed for low volumes of marine traffic and become over-stretched by high traffic volumes. While dumping waste from boats may be acceptable at low levels, pollution problems will occur with increasing traffic such as the transport of oil and agrochemicals.

The benefits of addressing harbour pollution are again immediate, with direct public health impacts as well as more general benefits to water quality, fisheries and biodiversity.

Table 10: National Actions to Control Harbour Pollution

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burundi:</strong></td>
<td><strong>Pollution in harbours</strong></td>
</tr>
<tr>
<td><strong>Stakeholders:</strong></td>
<td>MTTPE (Lake transport), Ship owners, EPB, MEEATU (INECN), MICPT, LTA, Lake Guard</td>
</tr>
<tr>
<td><strong>Uncertainties:</strong></td>
<td>Scale of threats</td>
</tr>
<tr>
<td></td>
<td>1. Promulgation and enforcement of Lake Traffic Act, and extension – MTTPE - Now</td>
</tr>
<tr>
<td></td>
<td>2. Control enforcement of Act, and continue technical checking of ships – MTTPE - Now</td>
</tr>
<tr>
<td></td>
<td>3. Monitor and evaluate scale of the problem of lake pollution – MEEATU (INECN) - Now</td>
</tr>
<tr>
<td></td>
<td>4. Harmonise regulations and supervising activities and control with the other riparian states – MTTPE and LTA - Now</td>
</tr>
<tr>
<td></td>
<td>5. Set up an intervention plan in case of hazard, and acquisition of the necessary equipment (in cooperation between the four countries) - MTTPE and LTA - Now</td>
</tr>
<tr>
<td></td>
<td>6. Establish a shipyard for maintenance of ships – MTTPE - Now</td>
</tr>
<tr>
<td><strong>DR Congo:</strong></td>
<td><strong>Harbour Pollution (Kalemie, Kabimba, Kalundu, Moba, Kivovo, Gerki, Thomas, Moliro, Mushimbaki, Kazimia)</strong></td>
</tr>
<tr>
<td></td>
<td>1. Raise awareness – Ministry of Environment, NGOs - Now</td>
</tr>
<tr>
<td></td>
<td>2. Update regulations (eco tax combined system</td>
</tr>
</tbody>
</table>

Note: The table content is extracted and formatted for readability. The full table content includes additional details and information.
<table>
<thead>
<tr>
<th>Stakeholders: Ministry of Environment; Transport and Communication; CRH; Ship owners</th>
<th>dissuading from legal pollution and penalising illicit pollution) – Ministry of Environment - Now</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4. Installation of controlled land disposal sites– Ministry of Environment - Now</td>
</tr>
<tr>
<td></td>
<td>5. Identification of pollutants and assessment of their impact on the lake biodiversity – CRH - Now</td>
</tr>
</tbody>
</table>

**Tanzania: Pollution in harbours (particular concern over storage and handling of oil)**

<table>
<thead>
<tr>
<th>Stakeholders: TRC; Ship Owners/ Operators; Local Council; Oil companies; Shipping Department; NEMC; SUMATRA; Ministry of Infrastructure</th>
<th>1. Identify specific causes of leaks and spillage – Ministry of Infrastructure, Ministry of Water, NEMC - Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainties: Information on specific handling problems; Impact on biodiversity</td>
<td>2. Check and review regulations and recommended procedures – Ministry of Water - Now</td>
</tr>
<tr>
<td></td>
<td>3. Review reasons for non-enforcement of regulations – Ministry of Infrastructure, Ministry of Water - Now</td>
</tr>
<tr>
<td></td>
<td>4. Implement short term and long term remedial actions – Ministry of Infrastructure, Ministry of Water – After 1, 2 and 3</td>
</tr>
</tbody>
</table>

**Zambia: Pollution in harbours (particular concern over storage and handling of oil and other cargoes)**

<table>
<thead>
<tr>
<th>Stakeholders: Communities; Water Affairs; Maritime Department; Harbours Authorities; Barge Owners; Fisheries Department; Local Authorities; Police Service; Defence; ECZ; Disaster Management Unit</th>
<th>1. Carry Out Risk Assessment – Maritime Department - Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainties: Impact on Biodiversity of Different Cargoes and Scenarios</td>
<td>2. Mitigate impacts and put in place emergency response capacity – Harbours Authorities - After 1</td>
</tr>
<tr>
<td></td>
<td>3. Review Potential Impact on Biodiversity – Fisheries Department - Now</td>
</tr>
</tbody>
</table>

### 5.7.3 Pollution from Mining Activities

At present there is relatively little mineral exploitation in the catchment. However, the mineral potential of the basin has not been fully explored and there are indications that there may be economically viable gold and other minerals.

“Smallholder” gold mining is carried out in the upper catchment of the Malagarasi in Tanzania, and involves the use of mercury in processing and there are companies that have looked into commercial operations in the same area. Preliminary studies indicate a trend to mercury concentration in some lake’s food chain, but more data collection and analysis are still needed.

There are also already signed agreements for the exploitation of a nickel resource in the Burundi part of the Malagarasi basin. The processing factory will constitute a potential source of pollution for the lake.

The level of control on industrial mineral exploitation varies from country to country, although all have some legislation that could be used to support sound industrial development and to a lesser degree smallholder mining operations. In practice there is little control of smallholder systems and little experience of environmentally sound management of major industrial operations.
These limitations are recognised but if appropriate actions are taken now, there is the potential to implement preventive measures and avoid future problems associated with any significant expansion of mining.

### Table 11: National Actions to Manage Mining Operations

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burundi</strong>: Potential pollution from mining exploitation activities</td>
<td></td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: MEM (DMC); MEEATU; LTA, mining companies; oil companies</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Scale of pollution and effects on lake</td>
<td></td>
</tr>
<tr>
<td>1. Enforce EIA prior to mining – MEEATU (INECN) - Now</td>
<td></td>
</tr>
<tr>
<td>2. Review and update Mines Act in order to take into account environmental impacts – MEM - Now</td>
<td></td>
</tr>
<tr>
<td>3. Strengthen capacity of DMC to manage and control mining activities – MEM - Now</td>
<td></td>
</tr>
<tr>
<td>4. Sensitize local administrations and organize mine workers in associations to support best mining practices– MEM - Now</td>
<td></td>
</tr>
<tr>
<td>5. Negotiate agreements with other riparian countries – MEM and LTA - Now</td>
<td></td>
</tr>
<tr>
<td>6. Support the existing chemical and biological laboratories – MEEATU (INECN) - Now</td>
<td></td>
</tr>
<tr>
<td><strong>DR Congo</strong>: Potential pollution from mining exploration and production activities</td>
<td></td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: Ministry of Environment; CRH; CRGM; CRSN; GEE; Ministry of Oil; Ministry of Energy</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Probability and site of works</td>
<td></td>
</tr>
<tr>
<td>2. Environment follow up of activities – Ministry of Environment - Now</td>
<td></td>
</tr>
<tr>
<td><strong>Tanzania</strong>: Discharge of toxic substances from mine workings</td>
<td></td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: “Smallholder miners”; Energy and Mines; Ministry of Water; Regional / Local Authorities; NLUPE; NEMC; Ministry of Health</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Scale of problem</td>
<td></td>
</tr>
<tr>
<td>1. Quantify scale and processes used different mining areas – Ministry of Minerals, NEMC - Now</td>
<td></td>
</tr>
<tr>
<td>2. Enforce existing regulations – Energy and Minerals - Now</td>
<td></td>
</tr>
<tr>
<td>3. Promote appropriate technology – Ministry of Minerals, NEMC - Now</td>
<td></td>
</tr>
<tr>
<td>4. Review the status of EIA legislation – Ministry of Minerals, NEMC - Now</td>
<td></td>
</tr>
</tbody>
</table>

#### 5.7.4 Risks of Major Marine Accidents

So far there have been no major environmentally damaging marine accidents recorded on the lake. However there are hazardous cargoes transported regularly across the lake with little control of storage or handling. The volume of traffic is variable and at present increasing. However, oil continues to be one of the main potentially hazardous cargoes and is transported in towed barges. As the riparian countries continue to develop their industrial potential, the volume of traffic will increase as will the range of cargoes. Again there is existing legislation in all countries that deals both with design of vessels and cargo handling, but this needs to be reviewed in the light of increasing traffic and range of hazardous cargoes.

Table 12: National Actions in Response to Major Marine Accidents
<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
</table>
| Burundi: Pollution from major marine accidents | 1. Promulgation of Lake Traffic Act, and extension – MTTPE - Now  
2. Control enforcement of Act, and continued technical checking of ships – MTTPE - Now  
3. Monitor and evaluate scale of the problem of lake pollution – MEEATU (INECN) - Now  
4. Harmonize regulations and supervising activities in riparian states – MTTPE - Now |
| Stakeholders: MTTPE (Lake transport), Ship owners, EPB; MEEATU (INECN), MICPT, Lake Guard; MAE (Fisheries) | **Uncertainties:** Scale of threats |
| DR Congo: Pollution from lake transport | 1. Raise awareness (ship operators and other stakeholders) – Ministry of Transport - Now  
2. Review regulations (navigation rules; pollution and security standards, transport of hazardous cargo) – Ministry of Transport, NGO’s - Now  
3. Strengthen control – Ministry of Transport  
4. Technical control of ships (with anti-pollution and security standards) – Transport and Communication - Now  
5. Pollution monitoring – CRSN - Now  
6. Evaluate impact (scale of problem, frequency of discharge, risks, harmfulness of pollutants) – CRH - Now |
| Stakeholders: Ministry of Environment; Transport and Communication service; CRH; Ship owners; CRSN; External Commerce; Congolese Office for Control | **Uncertainties:** Nature and quantities of pollutants and impact on lake biodiversity |
| Tanzania: Pollution from major marine accidents | 1. Risk analysis – Ministry of Infrastructure, NEMC - Now  
2. Develop contingency plan – Ministry of Infrastructure, NEMC - Now |
| Stakeholders: Ship Owners / Barge Operators; Regional Authorities; Shipping Department; NEMC; Ministry of Transport; Ministry of Water; NEMC; Insurance Companies; TAFIRI | **Uncertainties:** Level of Risk |
| Zambia: Pollution from major marine accidents | 1. Carry out risk assessment – Maritime Department - Now  
2. Put in place emergency response capacity – Maritime Department - Now  
3. Review a need for a regional response and emergencies disaster management unit – ECZ - Now  
4. Review potential impacts on biodiversity – Fisheries Department - Now |
| Stakeholders: Large Transporters; Passengers; Maritime Department; Harbours Authorities; Insurance Companies; Fisheries Department; Local Authorities; ZRA; Police Service; Defence; Disaster Management Unit; ZAWA; ECZ | **Uncertainties:** Impact on Biodiversity of Different Cargoes and Scenarios |

5.7.5 Petroleum exploration and production

The petroleum potential of the basin has not been fully explored, but there are indications that there may be economically viable oil fields. Licences for inshore and even off shore explorations have been issued in some the riparian countries.

It is clear that precaution must be taken before any action, because there a risk a serious pollution for the lake and its resources (water, biodiversity, ..) from the exploration phase and more during the production stage. Beyond the environmental assessment that must take place before exploration, an intervention plan with the necessary resources must be set up for emergency action in case of spill and other oil related hazards.
### Table 13: National Actions to Prevent risk related to Oil exploration and Operations

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burundi</strong>: Potential pollution from oil exploitation and production activities</td>
<td></td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: MEM (DMC); MEEATU; oil companies</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Scale of pollution and effects on lake</td>
<td></td>
</tr>
<tr>
<td>1. Enforce EIA prior to exploration and exploitation – MEEATU (INECN) - Now</td>
<td></td>
</tr>
<tr>
<td>2. Review and update Oil and Mines Act in order to take into account environmental impacts – MEM - Now</td>
<td></td>
</tr>
<tr>
<td>3. Set up an intervention plan for emergency action in case of oil related hazards - MEM - Now</td>
<td></td>
</tr>
<tr>
<td>4. Strengthen capacity of DMC to manage and control oil activities - MEM - Now</td>
<td></td>
</tr>
<tr>
<td>5. Negotiate agreements with other riparian countries – LTA, MEM - Now</td>
<td></td>
</tr>
<tr>
<td>6. Support the existing chemical and biological laboratories – MEEATU (INECN) - Now</td>
<td></td>
</tr>
<tr>
<td><strong>DR Congo</strong>: Potential pollution from mining and oil exploration and exploitation activities</td>
<td></td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: Ministry of Environment; CRH; CRGM; CRSN; GEE; Ministry of Oil; Ministry of Energy</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Probability and site of works</td>
<td></td>
</tr>
<tr>
<td>2. Environment follow up of activities – Ministry of Environment - Now</td>
<td></td>
</tr>
<tr>
<td><strong>Tanzania</strong>: Discharge of toxic substances from mine workings</td>
<td></td>
</tr>
<tr>
<td><strong>Stakeholders</strong>: “Smallholder miners”; Ministry of Energy and Mines; Ministry of Water; Regional / Local Authorities; NLUPC; NEMC; Ministry of Health</td>
<td></td>
</tr>
<tr>
<td><strong>Uncertainties</strong>: Scale of problem</td>
<td></td>
</tr>
<tr>
<td>1. Quantify scale and processes used different mining areas – Ministry of Minerals, NEMC - Now</td>
<td></td>
</tr>
<tr>
<td>2. Enforce existing regulations – Energy and Minerals</td>
<td></td>
</tr>
<tr>
<td>3. Promote appropriate technology – Ministry of Minerals, NEMC - Now</td>
<td></td>
</tr>
<tr>
<td>4. Review the status of EIA legislation – Ministry of Minerals, NEMC - Now</td>
<td></td>
</tr>
</tbody>
</table>

### 5.8 Sediment Management

The impact of sedimentation on Lake Biodiversity has two components. The first relates to the physical changes to habitats either through the attenuation of light by sediments suspended in the water column or the deposition of a sediment blanket over other substrata; the second impact relates to the nutrient load associated with sediments. Over the last 50 years or so, there have been major increases in sediment movement from the catchment to the lake, related to changing land use patterns within the catchment. The expansion of agriculture is the principal cause of this and follows deforestation, as farmers move into areas where tree cover has been reduced through felling for timber or fuel wood. However, while linked, these two aspects can be considered separately as they often fall under different institutional mandates, with agricultural expansion the responsibility of departments of agriculture and classified or demarcated forest areas the direct responsibility of the forest departments.

Figure 7: Erosion Hazard and Sediment Source Areas: Lake Tanganyika Basin Land degradation hotspots
The increased rate of transfer of sediments and nutrients to the lake equates to increased loss of soil and soil fertility in the catchment. The key management intervention is to promote sustainable agricultural practices within the catchment, that maintain soil structure and soil fertility and support increased agricultural and forestry production. Deforestation and inappropriate farming practices are the most widespread concerns in the coastal zone, as elsewhere in the catchment, but there are other sources of erosion, like inappropriate road and related infrastructure construction and maintenance, as well as human settlements poorly located and managed.

When all these forms of human pressure are located on steep slope reliefs or on river banks, they result in dramatic landslides with huge amounts of soil and mud transported downwards to the lake. However, inflow from smaller catchments (<50km²) tends not to be transported far enough to cause extensive impacts, but may result in significant local changes in littoral habitats. Erosion from larger catchments (>4000 km²) where large wetlands areas or extensive deltas have already developed tends to be less critical for the lake. It is the medium size catchments (50-4000 km²) where erosion is of most concern. The sediment load from these areas is generally discharged into the lake without the mitigating effects of major wetlands. The movement of sediments, transported by currents within the lake, can then affect areas up to 10 km from the mouth of the rivers.

5.8.1 Promotion of Sustainable Farming Practices

Sustainable farming is a major objective in all of the riparian countries. Interventions in support of this goal include the promotion of physical conservation structures and improved methods of maintaining soil fertility. In addition there is the potential for promoting alternative crops or adding value to production and hence intensifying the value of production, limiting the need for farming expansion. While effective soil and water conservation techniques are well established in some areas, in other parts of the catchment, adoption of these approaches has been disappointing. Adoption is not just a function of knowledge but also of available capital and labour. The adoption of specific soil conservation initiatives generally comes as a part of a wider range of improved farming practices, often linked to new opportunities for crops and markets. As critical sediment sources can be related to identify sites on the coast or within the middle sized catchments, the focus of the proposed national interventions is not one of a general extension programme but a targeted programme aimed at specific communities.

Around much of the lakeshore flat land suitable for farming is limited often to no more than a few hundred metres wide at the base of the steep slopes of the rift valley escarpment and is predominantly limited to a narrow range of subsistence crops. Where there is flat fertile land e.g., in the Rusizi floodplain, or at the mouth of the Lufubu, agriculture is much more diverse. Where fishing has declined the importance of agriculture has increased. This, coupled with population growth, has resulted in land shortages in the immediate lakeshore area with farmers forced to clear steep slopes to farm. In some areas fields are unusable after only two or three harvests, and new, even steeper slopes are cleared.

Both men and women are involved in farming and in coastal areas farming is more important to poorer families. A lack of appropriate hill farming traditions and a perception that farming is still not as important as fishing, particularly to the wealthier or more influential members of many communities, has meant that there have been few efforts to improve it. Poor access to markets also limits people’s attempts to increase or diversify production.
Nevertheless, in some areas the arrival of new practices such as the use of animal manure has had some impact. Tree planting programmes are also a common response, providing additional benefits including sustainable wood supply (mainly for firewood and building materials), shade, fruit production and the use of leguminous tree species that can act as an alternative to fertilisers.

Table 14: National Actions to Promote Sustainable Agriculture

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burundi</strong>: Erosion from agricultural practices Stakeholders: MAE, MEEATU (DGFE), Territorial Administration, Farmers, Research Institutes, MITPE, NGOs, Local associations and communities Uncertainties: Impact on biodiversity, scale of sedimentation, relation between erosion and fragile areas receiving sediments at lake level</td>
<td>1. Raise awareness, promote participative approach and Plan catchment (agro-forestry, anti-erosive practices like curve levels and terraces), – MEEATU (DGFE) - Now 2. Define special standards and prioritise interventions to identified areas – MEEATU (DGFE) - Now 3. Research – development and extension of suitable techniques – MAE - Now 4. Evaluate impact of problem, identify high risk erosion areas and study the extent of sedimentation in the lake – MEEATU (IGEBU) - Now 5. Planning focused on sediment deposits in the valleys, traps for sediments – MEEATU (DGFE) - Now</td>
</tr>
<tr>
<td><strong>DR Congo</strong>: Inappropriate farming practices and extensive agriculture Stakeholders: Minagri (SNV); Ministry of Environment; INERA; NGOs and local communities; CRH; Local authorities; AT; ISDR Uncertainties: Sensitive zones</td>
<td>1. Education and awareness – Minagri - Now 2. Identification of sensitive erosion zones – INERA - Now 3. Regulation of soil use in these zones – Minagri - After 1 and 2 4. Implement demonstration management (anti-erosive techniques, agro-zoo-technical, agro-forestry integration) – INERA - Now 5. Extension and support to enforcement capacity – Minagri - Now</td>
</tr>
<tr>
<td><strong>Zambia</strong>: Erosion from agricultural practices Stakeholders: Local communities; Chiefs; Local Authorities; Field Services; Forestry Department; Parks; LTA; MTENR; MACO Uncertainties: Scale of problem and trend; Scale and impact on the lake;</td>
<td>1. Identify Critical Erosion Sites and Remedial Measures – MACO - Now 2. Promote Appropriate Farming Practices – Field Services, MACO - Now 3. Monitor current practices – Water Affairs - Now Review Alternative Practices including Irrigation – MACO, Research - Now</td>
</tr>
</tbody>
</table>
Cultural and economic viability of alternative farming practices

4. Review Relevance of Existing Regulations – Water Affairs - Now
5. Monitor enforcement of regulations – Water Affairs - Now
6. Assess Scale, Impact and Risks – MACO - Now

5.8.2 Control of Deforestation

Deforestation characterises much of the catchment. While a general problem related to agricultural expansion and the demand for wood energy, it is an issue in its own right where it affects forests which have a high catchment protection value. In these areas encroachment is seen as being the fundamental problem as opposed to poor agricultural practices.

As a result of clearing woodland for agriculture and demands for timbers for construction and furniture, fuel wood for domestic use, brick and tiles stoves, smoking fish, processing palm oil, curing tobacco and producing traditional beer, there are fuel wood shortages in many lakeshore villages. Trade of fuel wood and charcoal occurs both within lakeshore villages and between lakeshore and inland villages, and in some cases is a cross-lake trade.

The immediate response by many forestry authorities is to try to enforce control in gazetted areas, however, the management of gazetted forests has broken down as a result of decreasing central government support and often in the face of political pressure to release land for settlement.

While there remains a clear need for managed forest areas, particularly those gazetted to protect critical catchments; the emphasis has to be on reducing pressure through the provision of alternatives and managed access, rather than exclusion.

Many of these interventions will be related and/or complimentary to, farming and alternative livelihood interventions and should be geared towards improving the diets and/or income levels of the farming households involved.

Table 15: National Actions to Counteract Deforestation

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi: Deforestation</td>
<td>1. Reinforce the capacity to supervise and control PAs and forests and INECN capacities – MEEATU - Now</td>
</tr>
<tr>
<td>Stakeholders: MEEATU, MAE; NGOs, Local Associations and communities</td>
<td>2. Compensate people expelled from PAs – MEEATU - Now</td>
</tr>
<tr>
<td>Uncertainties: Scale and distribution of clearings; State of resource</td>
<td>3. Strengthen and update legal basis for Protected Areas – MEEATU (INECN) - Now</td>
</tr>
<tr>
<td></td>
<td>4. Inventory of forests and evaluate damage – MEEATU (DGFE) - Now</td>
</tr>
<tr>
<td></td>
<td>5. Prepare participative management plans for woods and Pas and identify alternative resources – MEEATU - Now</td>
</tr>
<tr>
<td></td>
<td>6. Update and enforce the Land and the Forest Acts and harmonize them with the Environment Code (notably with regard to trade of forestry products) – MEEATU - Now</td>
</tr>
<tr>
<td></td>
<td>7. Demarcate Pas and national forests boundaries – MEEATU (INECN) - Now</td>
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<tr>
<td></td>
<td>8. Rehabilitation of destroyed parts of Pas and Forests Environmental education – MEEATU (INECN) - Now</td>
</tr>
<tr>
<td></td>
<td>9. Promote agro-forestry and private woods – MEEATU (DGFE) - Now</td>
</tr>
<tr>
<td>DR Congo: Deforestation</td>
<td>Tanzania: Deforestation</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>Stakeholders:</strong> Ministry of Environment; ICCN; Local authorities; NGOs (CADIC) and local communities; Population; Ministry of Energy; MINAGRI; CRH; Ministry of Land, town planning and Habitat</td>
<td><strong>Stakeholders:</strong> Local/Regional Authorities; Communities; Forestry Department; Ministry of Lands; TACARE; NLUPC</td>
</tr>
<tr>
<td><strong>Uncertainties:</strong> Scale and distribution of clearings; State of resource, Population awareness</td>
<td><strong>Uncertainties:</strong> Current scale and rate of deforestation</td>
</tr>
</tbody>
</table>

| 1. Education and awareness (including authorities) – Ministry of Environment, NGO’s - Now | 1. Identify critical encroachment and critical threatened zones – Department of Forestry, LGAs - Now | 1. Raise Awareness of issues, particularly at the Political Level – ECZ - Now |
| 5. Protection and restoring of forests along rivers – Ministry of Environment Identification of forestry areas to be protected – ICCN - Now | 5. Negotiate with communities to gazette sensitive areas – Local Authority - After 1 and 2 | 5. Promote sustainable forest management, agroforestry and promote alternative energy – MTENR - Now |
| 7. Creation of micro hydropower plants in order to supply substitution energy to protect the catchment – Ministry of Environment - Now | 7. Action towards improved stoves, improved process for smoking of fish and alternative energy (biogas, solar etc.) – Ministry of Environment - Now | 7. Promote afforestation – MTENR - Now |

5.8.3 **Other unsustainable land uses**

The most widespread concern about sediment production in the erosion generated from poorly managed roads during the rainy season; huge amounts of mud are transported from these pathways.
to the nearest river and from there to the lake. This is true for old earth roads, but also for new roads under construction.

New human settlements, generally as an extension of existing towns and villages, are installed on the lake shore, on river banks, or on very steep slopes reliefs. Besides the pollution generated by these settlements, intensive erosion occurs during the construction period and continues thereafter, producing important quantities of mud transported to the lake.

It is encouraged that appropriate actions be taken in the riparian countries to address these concerns.

5.9 Protection of Important Habitats for Biodiversity

While all proposed actions fall within the framework of protecting the biodiversity of the lake and promoting the sustainable use of lake resources, there are some actions that address the need for protection directly, through lake/wetlands habitat conservation.

There are two aspects that come within habitat conservation: the first is the protection of areas of high or representative biodiversity; the second deals with the protection of key spawning or nursery grounds essential for the productivity of the lake fisheries.

The highest biodiversity, in terms of number of species, is situated in the littoral zone (down to 40 m). This biodiversity is found throughout the lakes perimeter although many organisms have limited geographic ranges. The net effect is that species assemblages typically change over distances of tens of kilometres along the coastline.

This littoral zone is most threatened by poorly managed coastal development, leading to a loss of terrestrial vegetation and increased siltation. At present, over much of the lakeshore, this effect is relatively localised around fishing villages and major towns. It is more widespread around the north basin and along the Tanzanian coast.

There are three National Parks around the lake, Nsumbu in Zambia, Mahale Mountains and Gombe Stream in Tanzania, and the Natural Reserve of Rusizi in Burundi where the terrestrial coastal plain is formally protected but not the adjacent lacustrine waters. These formal “protected areas” have provided a focus for conservation activities around the lake. Although 73% of known fish species have been found in waters in and around these park areas, they cannot protect all species, nor do these parks and reserves protect all key habitats for the spawning and early development of the economic species.

There is, therefore, a need for a broader approach to protection ranging from parks to seasonally closed and restricted areas, where land and water based activities are limited to acceptable practices defined and agreed with the lake shore communities.

Figure 8: National Parks and Sites of High Conservation Interest

5.9.1 Threats to Protected Area Resources

Simply maintaining and extending existing terrestrial parks into adjacent waters, can protect a representative sample of the majority of littoral habitats in the lake.

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8 The term “protected areas” is used here to denote the formally designated parks or reserves, as opposed to areas that may be protected under other management arrangements.
Associating an aquatic zone with an existing terrestrial park is the most effective strategy as it minimises resources required for park management, reduces disruption to lake shore communities, and serves to ensure that the aquatic habitats are protected from developments in the adjacent coastal zone.

Increasing land pressure adjacent to national parks and the lack of alternative livelihood options is resulting in resource conflicts between parks and neighbouring communities. The problem is compounded by a decline in the resources available to parks from central government as part of policies promoting decentralized management.

Parks management is now adapting to changes in social and economic pressures and negotiating access rights and compensatory mechanisms with local communities.

The waters adjacent to three of the existing terrestrial national parks (Mahale Mountains, Gombe, Nsumbu) include relatively unimpacted sandy, rocky and mixed sand/rock/ habitats. The species assemblages associated with these habitats are representative, in terms of overall diversity and ecosystem structure, of communities in similar habitats elsewhere in the lake.

More specialised habitats, such as shell-beds, emergent macrophyte stands and stromatolite reefs are also represented in the areas adjacent to Lake-shore national parks. Shell beds are found in both Mahale Mountains (southern part) and Nsumbu (north-western part). Stromatolite reefs are also found in the northern part of Mahale Mountains National Park. The species associated with these habitats, including unique assemblages of shell-dwelling cichlids therefore benefit from a measure of protection from land-based threats and, in the case of Nsumbu and Mahale Mountains, from aquatic protection.

Rusizi Natural Reserve provides an area adjacent to a major river delta that includes emergent macrophyte stands, muddy substrates and the turbid, nutrient-rich waters associated with river-mouths. Non cichlids fish species, some of them being rare, are much more diverse here that in the other protected areas where the cichlids species overwhelmingly dominant. The major threats to its current diversity originate in the wider Rusizi basin and are unlikely to be mitigated by protecting a small area of the delta; however, the reed-bed areas provide important nursery grounds for fish of commercial importance, large concentrations of water birds of which migratory species, and is nearly the last refuge in Burundi for important populations of the hippopotamus and the Nile crocodile. It is also important in trapping some sediment. Extending formal protection into the lake to manage fishing, reed-cutting and other human activities is therefore desirable.

Table 16: National Actions for Protected Area Resources Management

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi: Encroachment in the Rusizi Nature Reserve Stakeholders: MAE (incl. Fisheries Department); MEEATU (INECN); Territorial Administration; Farmers; NGOs; Local associations and communities Uncertainties: Awareness of the population of the importance of Pas</td>
<td>1. Compensation for expulsion from sensitive zones – MEEATU (INECN) - Now 2. Raise awareness of local populations on importance of Pas, INECN, NGOs - Now 3. Plant hedge to demarcate the reserve in the Rusizi delta – MEEATU (INECN) - Now 4. Extend the reserve into the littoral zone of Lake Tanganyika to 1000 meters offshore of the 774</td>
</tr>
</tbody>
</table>

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9 Emergent macrophyte: aquatic plants rooted in the substratum with their vegetative shoots emerging above the water surface. Stromatolite Reef: medium to larger underwater rock like limestone structures formed by the action of microorganisms.
<table>
<thead>
<tr>
<th>Location</th>
<th>Problem</th>
<th>Stakeholders</th>
<th>Uncertainties</th>
<th>Proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR Congo</td>
<td>Lack of protection of the Congolese side of the Ruzizi delta</td>
<td>ICCN; Ministry of Environment, CRH; CRSN; NGOs, Local Communities</td>
<td>Awareness by the population of the importance of Pas</td>
<td>1. Raise awareness of local populations on importance of Pas, ICCN, NGOs</td>
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<td>- Now</td>
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<td>2. Establish a “protected area” in the Ruzizi delta, adjacent to the</td>
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<td>Burundi Natural Reserve – ICCN</td>
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<td></td>
<td></td>
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<td></td>
<td>- After 1</td>
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<tr>
<td>Tanzania</td>
<td>Exploitation of fisheries within parks</td>
<td>TANAPA; Fisheries Department; Local Communities</td>
<td>Compliance of local communities</td>
<td>1. Raise awareness of parks issues – TANAPA - Now</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>2. Involve local communities in parks management – TANAPA - Now</td>
</tr>
<tr>
<td>Zambia</td>
<td>Community pressure on Nsumbu National Park</td>
<td>ZAWA; Lodge Operators; Local Communities; Fisheries Department</td>
<td>Support from Local Communities</td>
<td>1. Involve communities in Parks Management – ZAWA - Now</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td>2. Train in Aquatic Parks Management – ZAWA - Now</td>
</tr>
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<td>3. Define and mark aquatic parks boundary – ZAWA - Now</td>
</tr>
</tbody>
</table>

5.9.2 Conservation of Sensitive Coastal Habitats

The following proposals deal with the protection of areas outside the formal protection systems of national parks or reserves. The areas under consideration include sites with high biodiversity interest, and critical spawning and nursery grounds for the major economic species.

At present these areas have not been protected under existing formal or informal agreements, and suffer from the same management constraints as other littoral areas. Management proposals will therefore have to take direct account of community interests and will rely on a process of negotiation to reach agreements on limited access and possible mitigatory or compensatory mechanisms.

In the long term, these negotiations may not be that different from those required for the wider management of the shore zone, and could be used to develop a framework applicable for many other lake shore areas and communities. However, it does provide a clearly defined focus on a few communities or sites to start this process of negotiation.

Previous surveys indicate that the Congolese territory hosts very high aquatic biodiversity. Three sites have been identified as key habitats meriting some protection status; these are Pemba, Luhanga and Bangwe. These sites are still relatively unaffected by human activities and have high biodiversity value. They are close to Uvira, and hence provide a valuable research/study area for the Centre de Recherche en Hydrobiologie. Currently, the major threat to their biodiversity is from sedimentation due to deforestation and farming of the slopes above them.

Additional key protected habitats could include a number of rocky sites in the area of Gitaza in Burundi, the waters next to the Kitwe Wildlife Sanctuary and south of Kigoma in Tanzania. From the perspective of fisheries and biodiversity protection, it is essential that some protection status be given to the coastal wetlands and the nursery and spawning grounds for economically important fish species. Key areas include the unprotected parts of the Rusizi, the Malagarasi delta, the Lukuga effluent, the Lufubu/Chisala river mouths, Chituba Bay, but many others may identified.
Table 17: National Actions to Conserve Sensitive Coastal Habitats

<table>
<thead>
<tr>
<th>Specific Problem</th>
<th>Proposed Actions, Key Agency, Priority and Timing</th>
</tr>
</thead>
</table>
| Burundi – Degradation of sensitive coastal areas | 1. Raise awareness of leaders and local communities – MEEATU (INECN) - Now  
2. Mapping supra littoral area and cultivated area – MEEATU (INECN) - Now  
3. Update and enforce the Act on delimitation of the buffer zone around lakes and rivers - MEEATU - Now  
4. Participative management and restoration of natural resources MEEATU (INECN) - Now  
5. Protect the rocky coastline through tree planting between Gitaza and Magara – MEEATU (INECN) - Now  
6. Control lake shore vegetation exploitation – MEEATU (INECN) - Now  
7. Declare sensitive areas as protected areas (Murembwe, Nyengwe, Rwaba) - MEEATU (INECN) - After 1, 2, 3. |
| Stakeholders: MAE (incl. Fisheries Department); MEEATU (INECN); Territorial Administration; Farmers; NGOs; Local associations and communities | Uncertainties: Extent of lake shore activities and impact on biodiversity |
| DR Congo – Risk of degradation of coastal zone; lack of protection of specific key zones (Rusizi, Lukuga, Luhanga, Pemba, Kalamba, Kiriza, Kazimia, Burton Bay) | 1. Participative preparation of a management plans – ICCN - Now  
2. Hydrologic monitoring (Lukuga, Mutambala and Ruzizi) – CRH - Now Establish a protected area – Lukuga – ICCN - Now  
3. Establish a protected area – Rusizi – ICCN - After 1  
4. Establish protection for sites of special scientific interest – Luhanga, Pemba, Kalamba, Kiriza, Kazimia, Burton Bay – ICCN - After 1 |
| Stakeholders: ICCN; CRH; CRSN; NGOs, Local Communities | Uncertainties: Extent of lake shore activities and impact on biodiversity |
| Tanzania – Degradation of wetland areas – in particular the Malagarasi | 1. Raise Awareness – Fisheries Division - Now  
2. Ban destructive fishing practices – Fisheries Division  
3. Evaluate stock – TAFIRI - Now  
5. Gazette areas – VPO, Ministry of Agriculture, Ministry of Lands - After 1 and 4 |
| Stakeholders: Communities; Fisheries Department; TAFIRI; Local Government; Tourism and Natural Resources | Impact on Biodiversity; Optimal size of protected areas; Community Compliance |
| Zambia – Damage to Sensitive Habitats Lufubu and Chituba Bay and Chisala River Mouth | 1. Evaluate destructive fishing practices – Fisheries Department - Now  
2. Ban specific destructive practices (poison, explosives...) – Fisheries - Now  
3. Negotiate designation of Chituba and Lufubu bays and Chisala river mouth as conservation areas – Fisheries Department - Now  
4. Negotiate with communities acceptable management practices – Community Development Agency - Now  
5. Develop procedures for capital empowerment of communities to alleviate impact of zone designation – Community Development Agency |
| Stakeholders: Ministry of Agriculture; MTENR; Ministry of Environment; Ministry of Tourism; Local Authorities; Local Communities; Traditional Leaders | Uncertainties: Extent of degradation and impact on biodiversity |
6. Negotiate designation of Lufuba mouth as Ramsar site – ECZ - Now
### Appendices

#### Appendix I  List of Stakeholders Involved in the Consultation Process

#### Countries representatives

<table>
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<tr>
<th>Country</th>
<th>Stakeholder Name</th>
<th>Position</th>
<th>Contact Information</th>
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<td>Country</td>
<td>Name</td>
<td>Position</td>
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**Zambia**

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<th>Country</th>
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<th>Contact Information</th>
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Appendix II  List of National institutions which have been consulted

**BURUNDI**

Public Institutions
- Ministry of Agriculture and Livestock, MAE
- Department Fisheries and Aquaculture, MAE
- Department of Fertilization, MAE
- Ministry of Water, Environment, Land and Urban Planning (MEEATU)
- Department Forestry and Environment (MEEATU)
- National Project fighting against erosion (PNLAE)
- Geographic Institute of Burundi (IGEBU)
- National Institute for Environment and Nature Conservation (INECN)
- University of Burundi
- Service Hygiene and Sanitation, Ministry of Health
- Department of Energy and Mining, MEM
- Regideso
- Roads Office,
- SETEMU
- Ministry of Home Affairs: Administrators of Communes: Bugarama, Kabezi, Muhuta, Mutimbuzi Nyanza Lac and Rumonge

**ONGs** : Pays de la Loire (ONG) ; ACVE ; FBP ; Amis de la Nature ; AVEPOMABU

Private firms: Provinciana; Fishes of Burundi; Huileries Artisanales

Meeting Organisers: PRODAP/UCN ; LTA ; PNUD/FEM Project

**DEMOCRATIC REPUBLIC CONGO**

Public Institutions
- President’s Cabinet
- Prime Minister’s Office
- Ministry of Agriculture’s Cabinet
- GENADEP Ministry of Agriculture
- Department of Fisheries, Ministry of Agriculture
- SENAQUA, Ministry of Agriculture
- SGAV, Ministry of Agriculture
- SENAPEP; Ministry of Agriculture
- Department of Environment, Ministry of Environment
- Department of Horticulture and Afforestation, Ministry of Environment
- Department of Water Resources, Ministry of Environment
- ICCN/MECNT
- Ministry of Finance
- CRH/Uvira, Ministry of Scientific Research
- Uvira Traditional Chief

**NGOs:** WWF/RDC, REDD-Congo, Environment ONGs

**Private Firms:** MIB'S SHIYARD & FISHERIES

**Meeting Organizers:** UCN/PRODAP/RDC; PNUD/GEF Project; UNOPS

**TANZANIA**

**Public Institutions**
- President's Office
- Vice President Office
- Ministry of Livestock, Development and Fisheries
- Directorate of Fisheries
- Commissioner of Mineral Water, Ministry of Energy and Minerals
- National Environment Management Council
- Water resources, Ministry of Water & Irrigation Dvpt
- Ministry of Constitutional Affairs and Justice (MOCAJ)
- TAFIRI
- TANESCO
- University of Dar es Salaam
- Open University
- Resource Assessment (IRA)
- Tanzania Bureau of Standards
- Tanzania Petroleum Development Company
- German Development Cooperation

**Meeting Organizers:** PMU, UNDP/GEF Project; LTA Secretariat; PCU, UNDP/GEF Project; NCU, PRODAP; UNDP Representative

**ZAMBIA**

**Public Institutions**
- MTENR
- Department of Water Affairs
- Ministry of Finance and National Planning (MoFNP)
- District Commissioner's Office
- Tourism Devt Research Officer, MTENR
- District Administrative Office
• Environment Management, MTENR
• Village Conservation Devt Committee
• Natural Resources Consultative Forum
• Forestry Department
• Min. Agriculture & Cooperatives
• Village Conservation Dept Committee
• Fisheries Department
• Community Based Natural Resources Management Forum
• Center for International Forestry Research (CIFOR)

Meeting Organisers: LTA Secretariat; UNDP/GEF Project PCU; LTIMP/ PMU; NCU / PRODAC; UNDP/GEF PMU; UNDP Representative; FAO Representative
Appendix III  Background Documents

Burundi Policy Documents

- Nations Unies, Convention sur la lutte contre la Désertification, 2001: Résumé des rapports soumis par les pays parties africains affectés (Burundi, RD Congo). ICCD/COP(4)/AHWG/1/Add.1
- République du Burundi, 2000: Loi N° 1/010 portant Code de l’Environnement de la république du Burundi, 30 juin 200, Bujumbura, Burundi,
- République du Burundi, 2001: Communication initiale sur l’impact des gaz à effet de serres sur les changements climatiques au Burundi; Bujumbura, Burundi.
- République du Burundi, 2006: Cadre stratégique de croissance et de lutte contre la pauvreté - CSLP
- République du Burundi, MINATET, 2002: Deuxième rapport National sur la mise en œuvre de la Convention de lutte Contre le Désertification, Bujumbura, Burundi
- République du Burundi, MINATTE, 2010: Deuxième communication nationale sur les changements climatiques

DR Congo Policy Documents

- Nations Unies, Convention sur la lutte contre la Désertification, 2001: Résumé des rapports soumis par les pays parties africains affectés (Burundi, RD Congo). ICCD/COP(4)/AHWG/1/Add.1
- République Démocratique du Congo, 2002: Communication Nationale initiale de la RDC sur les changements climatiques, RDC

Tanzania Policy Documents

- National Adaptation Programme of Action (NAPA), Vice President’s Office (January 2007)
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