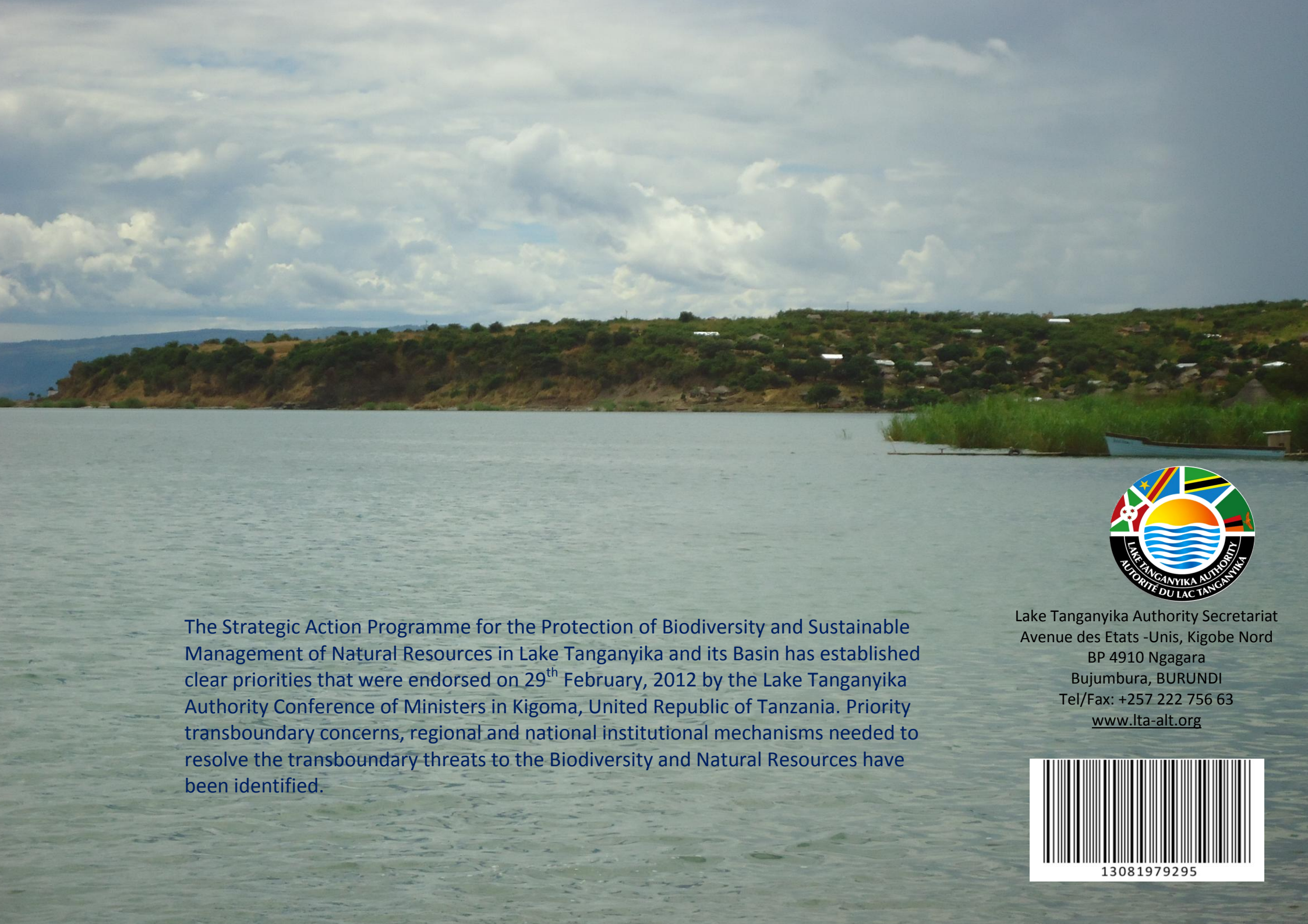




Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of Natural Resources in Lake Tanganyika and its Basin





The Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of Natural Resources in Lake Tanganyika and its Basin has established clear priorities that were endorsed on 29th February, 2012 by the Lake Tanganyika Authority Conference of Ministers in Kigoma, United Republic of Tanzania. Priority transboundary concerns, regional and national institutional mechanisms needed to resolve the transboundary threats to the Biodiversity and Natural Resources have been identified.



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UNOPS

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Since the start of the initial process in 2000, almost 500 stakeholders and experts have participated in the drafting and updating of the Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) for the Protection of Biodiversity and Sustainable Management of the Natural Resources in Lake Tanganyika and its Basin. The Lake Tanganyika Authority (LTA) Secretariat is grateful to everyone who contributed to this process, as well as to those who are currently working on the implementation of the SAP and who are supporting efforts for continued updating and implementation in the future.

This updated Strategic Action Programme (SAP) for the Protection of Biodiversity and Sustainable Management of the Natural Resources of Lake Tanganyika and its Basin, is a result of the joint efforts of a large number of stakeholders in the four Lake Tanganyika riparian countries: the Republic of Burundi, the Democratic Republic of Congo, the United Republic of Tanzania and the Republic of Zambia.

The LTA Secretariat through its Executive Director, Dr. Henry Mwima, would like to express profound gratitude towards the four governments and the delegates of these countries for the efforts that they made to update this important document. The LTA Secretariat would like to take this opportunity to recognize the contribution of the United Nations Development Programme / Global Environment Facility (UNDP/GEF) supported projects on Lake Tanganyika through which the initial development and implementation as well as the current update of the Strategic Action Programme were facilitated.

The LTA Secretariat would also like to express its gratitude for the valuable contributions of the various scientific stakeholders and experts who made their knowledge available for updating this document. Finally, our thanks are addressed to all of you who contributed or will contribute

in one way or another to the implementation and updating of the Strategic Action Programme.

This programme was duly adopted by the four Contracting States of The Convention on the Sustainable Management of Lake Tanganyika at the fifth Ordinary Meeting of the Lake Tanganyika Authority Conference of Ministers held in Kigoma, United Republic of Tanzania, 29th February 2012

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H.E. Juma-Alfani MPANGO	Ambassador Extraordinary and Plenipotentiary	Democratic Republic of Congo	
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ABBREVIATIONS AND ACRONYMS

ACVE	Green Belt Action for the Environment, Burundi NGO	DVDA	Directorate of Agricultural Pathways, DRC
ADEP	Association for the Development and Support of Fishermen, Burundi	D-WASHE	District Water Supply, Sanitation and Health Education, Zambia
ADF	African Development Fund	ECZ	Environmental Council of Zambia
AfDB	African Development Bank	EIA	Environmental Impact Assessment
AVEPOMABU	Association of Fish Salesmen of the Bujumbura Market, Burundi	EPB	Bujumbura Port Management Society, Burundi
BBN	Burundian Office for Standardization and Quality Control	EQO	Environmental Quality Objective
CADIC	Centre for Action and Sustainable Community-Based Development, DRC	FAO	Food and Agriculture Organization of the United Nations
CBD	Convention on Biological Diversity	FBP	Federation of Fishermen and Protection of the Aquatic Environment, Burundi
CBO	Community-Based Organisation	FFMP	Framework Fisheries Management Plan
CCIB	Chamber of Commerce and Industry of Burundi	FINNIDA	Finnish International Development Agency
CENADEP	Centre for Support to Development and Stakeholder Participation, DRC	GEF	Global Environment Facility
CIFA	Committee for Inland Fisheries of Africa	GIS	Geographic/Geospatial Information System
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	GWP	Global Water Partnership
CGIAR	Consultative Group on International Agriculture Research	ICCN	Congolese Institute for Nature Conservation
CRGM	Centre for Geological and Mining Research, DRC	ICRAF	World Agroforestry Centre
CRH	Hydrobiological Research Centre, DRC	IGEBU	Geographic Institute, Burundi
CRSN	Natural Sciences Research Centre, DRC	IGO	Intergovernmental Organisation
CZM	Coastal Zone Management (CZM)	IML	International Marketing Limits
DDT	Dichloro-Diphenyl-Trichloroethane	INECN	National Institute for Environment and Nature Conservation, Burundi
DGFE	General Directorate for Forestry, Tourism and Environment, Burundi	INERA	National Institute for Agronomic Studies and Researches, DRC
DISS	Department of Infrastructure and Support Services, Zambia	INSP	National Institute for Public Health, Burundi
DMMU	Disaster Management and Mitigation Unit, Zambia	IPCC	Intergovernmental Panel on Climate Change
DOF	Department of Fisheries, Zambia	ISABU	Burundi Institute of Agronomic Sciences
DRC	Democratic Republic of Congo	IUCN	International Union for Conservation of Nature
		ISDR	Higher Institute for Rural Development, DRC
		IWRM	Integrated Water Resources Management
		KUWASA	Kigoma Ujiji Urban Water Supply and Sanitation Authority, Tanzania

LTA	Lake Tanganyika Authority	MINATTE	Ministry of Territory Management Public Works and Environment, Burundi (now MEEATU)
LTBP	Lake Tanganyika Biodiversity Project	MITM	Ministry of Industry, Trade and Marketing, Tanzania
LTFMP	Lake Tanganyika Framework Fisheries Management Plan	MITPR	Ministry of Infrastructure, Public Works and Reconstruction, DRC
LTR	Lake Tanganyika Research Project for the Management of the Fisheries	MLFD	Ministry of Livestock and Fisheries Development, Tanzania
LTRIMDP	Lake Tanganyika Regional Integrated Management and Development Programme	MLGH	Ministry of Local Government and Housing, Zambia
MACO	Ministry of Agriculture and Cooperatives, Zambia	MLHSD	Ministry of Lands, Housing and Human Settlements Development, Tanzania
MAE	Ministry of Agriculture and Livestock, Burundi	MMMD	Ministry of Mines and Minerals Development, Zambia
MAFSC	Ministry of Agriculture, Food Security and Cooperatives, Tanzania	MNRT	Ministry of Natural Resources and Tourism, Tanzania
MCDSS	Ministry of Community Development and Social Services, Zambia	MOH	Ministry of Health, Zambia
MCIPT	Ministry of Commerce, Industry, Posts and Tourism, Burundi	MPDR	Ministry of Development Planning and Reconstruction, Burundi
MCT	Ministry of Communication and Transport, Zambia	MSP	Ministry of Public Health, DRC
MDNS	Ministry of Defence and National Service, Tanzania	MSPLCS	Ministry of Public Health and Fight Against AIDS, Burundi
MEA	Multilateral Environmental Agreement	MTENR	Ministry of Tourism, Environment and Natural Resources, Zambia
MECNT	Ministry of Environment, Nature Conservation and Tourism, DRC	MTTPE	Ministry Transports, Public Works and Equipment, Burundi
MEEATU	Ministry of Water, Environment, Land Planning and Urban Planning, Burundi	MTVC	Ministry of Transport and Communication, DRC
MEH	Ministry of Energy and Hydrolics, DRC	MUH	Ministry of Urbanisation and Habitat, DRC
MEM	Ministry of Energy and Mines, Burundi	NCU	National Coordination Unit
MEMTZ	Ministry of Energy and Minerals, Tanzania	NDF	Nordic Development Fund
MEWD	Ministry of Energy and Water Development, Zambia	NEMC	National Environment Management Council, Tanzania
MFNP	Ministry of Finance and National Planning, Zambia	NGO	Non Governmental Organisation
MHSW	Ministry of Health and Social Welfare, Tanzania	NIGLAS	Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences
MIDS	Ministry of Interior, Decentralisation and Security, DRC	NISIR	National Institute for Industrial and Scientific Research, Zambia
MINAGRI	Ministry of Agriculture, DRC	NLUPC	National Land Use Planning Commission, Tanzania
MINATE	Ministry of Territory Management and Environment, Burundi (now MEEATU)	OCC	Congolese Bureau of Standards
MINATET	Ministry of Territory Management, Environment and Tourism, Burundi (now MEEATU)	ONATRA	National Bureau of Transport, DRC
		OVD	Pathways and Drainage Bureau, DRC

PCU	Project Coordination Unit	UNEP	United Nations Environment Programme
PMU	Project Management Unit	UNFCC	United Nations Framework Convention on Climate Change
PNLAE	National Programme for Erosion Control, Burundi	UN-HABITAT	United Nations Human Settlements Programme
PRODAP	Project to Support the Lake Tanganyika Regional Integrated Development Programme	UNIDO	United Nations Industrial Development Organisation
REDD	Reducing Emissions from Deforestation and forest Degradation	UNICEF	United Nations Children's Fund
REGIDESO	National Company for Electricity and water Distribution, Burundi	VPO	Vice President's Office, Tanzania
RWSSU	Rural Water Supply and Sanitation Unit, Zambia	WB	World Bank
SADC	Southern African Development Community	WBO	Water Basin Office, Tanzania
SAP	Strategic Action Programme	WCST	Wildlife Conservation Society of Tanzania
SENADEP	National Service for Fisheries Development, DRC	WFC	World Fish Centre
SENAFIC	National Service of Fertilizer and related Inputs, DRC	WHO	World Health Organisation
SENAQUA	National Service of Aquaculture, DRC	WWF	World Wide Fund for Nature
SETEMU	Municipal Technical Services, Burundi	ZAWA	Zambia Wildlife Authority
TACARE	Tanganyika Catchment Reforestation and Education Programme, Tanzania	ZBS	Zambia Bureau of Standards
TAF	Tanzania Association of Foresters	ZCCM	Zambia Consolidated Copper Mines Ltd (parastatal company)
TAFIRI	Tanzania Fisheries Research Institute	ZNFU	Zambia National Farmers Union
TAFORI	Tanzania Forest Research Institute	ZRA	Zambia Revenue Authority
TANAPA	Tanzania National Parks Authority		
TANESCO	Tanzania Electrical Supply Company		
TAWIRI	Tanzania Wildlife Research Institute		
TBS	Tanzania Bureau of Standards		
TDA	Transboundary Diagnostic Analysis		
TNC	The Nature Conservancy		
TMA	Tanzania Meteorological Agency		
TPA	Tanzania Ports Authority		
TRA	Tanzania Revenue Authority		
TRC	Tanzania Railways Corporation		
UB	University of Burundi		
UCB	Catholic University of Bukavu		
UNDP	United Nations Development Programme		

GLOSSARY OF TERMS

Agenda 21: United Nations Conference on Environment and Development (Earth Summit) agreement on actions 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 part of the aquatic environment where organisms are attached to, or rest on, the substrate.

Biodiversity: 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.

Convention on Biological Diversity: The principal objectives of the Convention on Biological Diversity, which entered into force in 1993, 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: A convention is a set of agreed, stipulated or generally accepted standards, norms, or criteria.

Critical habitats: Habitats that are of key importance to the conservation of biodiversity, including aquatic and terrestrial habitats that harbour high species diversity, as well as habitats that harbour rare or endangered species.

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

Economic Instruments: Government policy tools for environmental protection that make use of fiscal incentives (subsidies) and deterrents (taxes), as well as market measures (e.g. tradeable emissions permits), rather than regulating specific outcomes. Economic instruments also facilitate the implementation of Principle 16 of the Rio Declaration (commonly known as the Polluter Pays Principle).

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

Eutrophication: A process of increasing nutrient load. In rivers or lakes, eutrophication can trigger algal blooms which in turn result in lack of oxygen.

Gastropod: The class Gastropoda or gastropods form a major part of the phylum Mollusca. Gastropods are more commonly known as snails and slugs.

Gazetted: A legally established protected area, with boundaries published in the Government Gazette or some other formal record of government procedures (e.g. Gazetted Forest Reserve).

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: 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.

Global Water Partnership: Partnership founded in 1996 by the World Bank, the United Nations Development Programme, and the Swedish International Development Cooperation Agency to foster integrated water resource management¹.

Invasive species: Species of animals, plants and micro-organisms that are introduced to an ecosystem, become established and naturalized and subsequently spread causing damage to both wild as well as utilised biodiversity (e.g. in production ecosystems of fisheries, aquaculture, agriculture, horticulture, and forestry).

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.

Littoral: The near-shore environment.

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

Ostracod: A class of the crustacean, 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: Localized discharge of pollutants (e.g. from an industrial plant).

Private funding: Funding that is raised by the private sector without government involvement, support or guarantee.

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 Reserves.

Public funding: Funding that is raised by the government (e.g. through the levy of taxes).

¹ See Global Water Partnership: www.gwp.org

Ramsar: The Ramsar Convention on Wetlands of International Importance² is an international treaty for the conservation and sustainable utilization of wetlands, 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.

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 and 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 or action, 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.

FOREWORD



Lake Tanganyika and its catchment basin are endowed with an exceptionally diverse flora and fauna. The lake is a global hotspot of biodiversity, harbouring at least 1,500 aquatic species out of which approximately 600 are found nowhere else in the world.

The basin is also renowned for its terrestrial biodiversity and scenic beauty. It contains several reserves and national parks, which provide important refuges for wildlife, including endangered or threatened species such as chimpanzees, elephants, lions and sitatunga. Furthermore, Lake Tanganyika contains almost 17% of the global available surface freshwater supply and supports some of the largest freshwater fisheries on the African continent.

The update of the Strategic Action Programme (SAP), which was first drafted in 2000, comes at a time when the global human population is quickly approaching a staggering total of 7 billion. The results of rapidly expanding human population are very tangible in the Lake Tanganyika basin, where poverty is rampant and many people have no other choice than to rely on natural resource exploitation for their livelihoods. Environmental degradation resulting from unsustainable fisheries, deforestation and unsustainable agricultural practices, as well as invasive species, pollution and the impacts of climate change are posing increasing

threats to biodiversity and the integrity of aquatic and terrestrial ecosystems in the Lake Tanganyika basin.

I welcome the updated SAP as an important framework that will contribute to achieving the objectives of the Convention on the Sustainable Management of Lake Tanganyika, and to the overall vision in which people of the region are prospering from a healthy environment in the Lake Tanganyika basin that continues to harbour high levels of biodiversity and provide sufficient natural resources to sustain future generations. The SAP describes tremendous opportunities for co-managed sustainable fisheries, erosion control through sustainable agriculture, agroforestry, reforestation, protection of critical habitats and control of pollution. By fostering the implementation of the SAP, the four riparian countries: Burundi, Democratic Republic of Congo, Tanzania and Zambia can counteract environmental threats, promote sustainability and protect their unique heritage, Lake Tanganyika.

On behalf of the Lake Tanganyika Authority, I would like to thank the UNDP/GEF Project on Lake Tanganyika for supporting the process of updating the SAP. I would also like to thank everyone else who contributed to the updating of the SAP, including all participants of the national consultation workshops and the regional forum. 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 in the Lake Tanganyika and its Basin.

Dr. Henry Kankomba MWIMA,
Executive Director of the Lake Tanganyika Authority



Photo courtesy of Pacifique Ndoricimpa: Mvugo fish landing site, Burundi

EXECUTIVE SUMMARY

Lake Tanganyika is situated in the Albertine Rift Valley, and is shared by the Republic of Burundi, the Democratic Republic of Congo, the United Republic of Tanzania and the Republic of Zambia. The Lake Tanganyika basin is recognised globally for its unique richness of aquatic and terrestrial biodiversity, exceptional scenic beauty and high overall ecological and socio-economic value. The lake harbours over 1,500 species, out of which approximately 600 occur nowhere else in the world. Furthermore, the lake contains almost 17% of the world's available surface freshwater, providing a permanent source of drinking water, as well as water for domestic use, industrial and agricultural development. It supports one of the largest fisheries on the African continent. The annual fish production potential is estimated to vary in the range of 165,000 - 200,000 metric tonnes. Tourism is an important source of income that is directly linked to the lake and its basin, generating millions of dollars annually.

Lake Tanganyika ecosystem is relatively healthy in comparison with other Great Lakes of the world. However, human population growth rates are among the highest on the planet, ranging from 2.0-3.2% annually. The current population in the lake basin is estimated to be between 12.5 and 13 million, and it is expected that the number of people who either directly or indirectly depend on the natural resources in the lake will increase significantly in the near future. Unsustainable fisheries, degradation of habitats through unsustainable agricultural practices and deforestation, erosion and sedimentation, pollution and biological invasions cause major threats to the integrity of the aquatic and terrestrial ecosystems in the Lake Tanganyika basin. The magnitude of these threats is expected to be intensified by the impacts of climate change.

Recognizing that the Lake Tanganyika basin is a global heritage that is under threat, a number of important initiatives have been undertaken over the past two decades. The first International Scientific Conference on the Conservation of Biodiversity of Lake Tanganyika that took place in 1991, acted as a catalyst for a number of partnerships and initiatives to further enhance knowledge relevant to sustainable management of biodiversity and natural resources in the lake basin. In the early 1990's two projects were implemented that were of key importance as a basis for the Strategic Action Programme: the Lake Tanganyika Biodiversity Project (LTBP) and the Lake Tanganyika Research Project (LTR). These projects contributed a wealth of knowledge on the status of biodiversity and fisheries in Lake Tanganyika and underscored the need for the riparian countries to find joint management solutions for transboundary environmental threats.

The participating countries recognized the need for joint actions and committed to implementing a Transboundary Diagnostic Analysis (TDA) and to drafting the Convention on the Sustainable Management of Lake Tanganyika³, which was signed on 12th June 2003, and ratified in November 2007. The Convention provides the legal framework for regional cooperation and implementation of harmonized laws and standards for protection of biodiversity and sustainable use of natural resources of Lake Tanganyika and its basin. It also provides the framework for establishing the Lake Tanganyika Authority (LTA), whose function it is to coordinate the implementation of the Convention.

³ The Convention implicitly addresses the three main objectives of the Convention on Biological Diversity: 1) Conservation of biological diversity; 2) Sustainable use of the components of biological diversity; 3) Fair and equitable sharing of the benefits arising out of the utilization of genetic resources. See: www.cbd.int

On 13th July 2000, the governments of Burundi, Democratic Republic Congo, Tanzania and Zambia approved the first Strategic Action Programme (SAP) for the Protection of Biodiversity and Sustainable Management of the Natural Resources in the Lake Tanganyika and its Basin. The original SAP, developed as part of an initial Global Environment Facility (GEF) supported intervention, formed the basis for new and continuing support from a range of international donors and organisations including the GEF, the United Nations Development Programme (UNDP), the African Development Bank (AfDB), the Nordic Development Fund (NDF), the International Union for Conservation of Nature (IUCN) and the Food and Agriculture Organisation of the United Nations (FAO). This new and continued support continues to make possible implementation of activities under the Lake Tanganyika Regional Integrated Management and Development Programme (LTRIMDP).

The implementation of the first SAP started in 2008 with two projects under the LTRIMDP: i) the UNDP/GEF Project on Partnership Interventions for the Implementation of the SAP for Lake Tanganyika, and ii) the AfDB and NDF funded Project to Support the Lake Tanganyika Integrated Regional Development Programme.

To adequately reflect the changes in magnitude and nature of threats to the biodiversity and natural resources in the lake basin over the past decade, the SAP requires regular updating. The LTA Secretariat initiated the updating process in 2010, with support from the UNDP/GEF Project. Both the drafting and updating of the SAP was done through an extensive process of stakeholder consultations, including representatives from local communities, commercial enterprises, national and international non-governmental organisations, research institutions and universities, parastatal institutions and government ministries. Using data and

knowledge derived from scientific studies and field experiences, these stakeholders identified and prioritised threats as well as solutions for the conservation of biodiversity and sustainable management of natural resources in the Lake Tanganyika basin.

The SAP incorporates strategies for the riparian countries of Lake Tanganyika to achieve the overall vision:

People of the region prospering from a healthy environment in the Lake Tanganyika basin that continues to harbour high levels of biodiversity and provides sufficient natural resources to sustain future generations

This vision is supported by six main environmental quality objectives intended to be achieved by 2035. For each objective, the SAP presents a set of specific targets that are subsequently broken down into a set of strategic actions.

Successful future implementation of the SAP will depend on a number of general approaches and conditions. The ecosystem approach is recommended as a way to sustainably integrate management interventions focusing on water, land as well as human aspects. Conditions that will need to be met to enhance the efficacy of SAP implementation include:

- Environmental education at all levels of society
- Socioeconomic development and appropriate governance
- Capacity building and institutional reform
- Effective information management

Environmental Quality Objective	Targets
<i>Aquatic and terrestrial ecosystems, as well as human societies are sufficiently resilient to adapt to the impacts of climate change and variability</i>	• Enhanced resilience of aquatic and terrestrial ecosystems • Increased preparedness and capacity to adapt to impacts of climate change • Improved knowledge-base, monitoring and information-management mechanisms
<i>Fish stocks are healthy and adequately managed to sustain future exploitation</i>	• Reduced fishing pressure in the pelagic zone • Reduced fishing pressure in the littoral zone • Ornamental fisheries controlled and managed
<i>Erosion and sedimentation rates are reduced through sustainable land management practises</i>	• Sustainable agriculture activities increased • Deforestation rates decreased • Sustainable land management strategies in place
<i>Critical habitats are protected, restored and managed for conservation of biodiversity and sustainable use</i>	• Protected area resource management improved • Critical aquatic and terrestrial habitats protected, restored and managed
<i>Biological invasions are controlled and future invasions are prevented</i>	• Existing biological invasions controlled and prevented from further spreading • Future invasions prevented
<i>Pollution is reduced and water quality is improved to meet regionally agreed standards</i>	• Urban and industrial pollution reduced • Agricultural pollution reduced • Harbour and lacustrine traffic pollution reduced • Pollution from mining activities reduced • Risks related to petroleum exploration and production reduced

Furthermore, the establishment and implementation of a regional integrated environmental monitoring programme will be of key importance to allow an assessment of changes in biodiversity as a function of environmental parameters. In recognising the value of monitoring data for the future protection of biodiversity and sustainable management of Lake Tanganyika's natural resources, the LTA with support from the UNDP/GEF Project and Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences (NIGLAS) is establishing a Regional Integrated Environmental Monitoring Programme (RIEMP).

Future implementation of the SAP will require that a substantial amount of financial and human resources is mobilised under coordination of the LTA Secretariat, and strong partnerships continue to be built with a range of international and national organisations. The governments of the riparian countries are expected to generate a substantial part of the funding for future SAP implementation, partly through innovative financing arrangements (e.g. use of economic instruments and incentives), and allocation of core government budgets.

An important priority will be the development of National Action Plans in order to mainstream the SAP into national policy and legal frameworks, development plans and budgets.



Photo courtesy of Gabriel Hakizimana: Lake Tanganyika

PART 1: BACKGROUND AND INTRODUCTION

1.1 The Lake Tanganyika Basin: Hotspot of Biodiversity

Lake Tanganyika is internationally recognised as a global hotspot of biodiversity, representing some of the most diverse aquatic ecosystems in the world (Groombridge and Jenkins, 1998). The many natural resources found in the Lake Tanganyika basin provide essential sources of livelihood and income for over 10 million people and contribute to the growing economies of the riparian countries of Burundi, Democratic Republic of Congo (DR Congo), Tanzania and Zambia.

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

Estimates suggest that Lake Tanganyika harbours at least 1,500 species (Coulter, 1991), although species numbers vary according to taxonomic authority. Approximately 600 species are endemic to the lake, including 245 morphologically diverse and colourful cichlid fish species (Snoeks, 2000; Genner *et al.*, 2004).

Lake Tanganyika is unique in harbouring endemic species clusters of bagrids, cyprinids, mastacembelids and mochokids (Coulter, 1991; Vreven, 2005; Day and 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.

Box 1: Lake Tanganyika Facts

Lake Tanganyika is situated in the Albertine Rift Valley between Burundi, Democratic Republic of Congo, Tanzania and Zambia. With an estimated age of 9-12 million years and a maximum depth of 1,470 meters, Lake Tanganyika is the oldest and deepest lake in Africa. It has a length of 673 km, total shoreline of 1,828 km, average width of 50 km, surface area of 32,600 km², and an estimated volume of 18,900 km³ (Cohen *et al.*, 1997; Tiercelin and Mondeguer, 1991).



Figure 1: Lake Tanganyika and its basin



Photo courtesy of Martin Van der Knaap: Aquatic biodiversity of Lake Tanganyika.

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, harbouring a wide diversity of birdlife as well as crocodiles and hippopotamus.

The basin contains several forest reserves and national parks including Kigwena Forest Reserve in Burundi, Gombe Stream, Katavi and Mahale Mountains National Parks in Tanzania and Nsumbu National Park in Zambia. Gombe and Mahale have become famed as some of the few remaining habitats for chimpanzees, whereas Nsumbu is known for its rare blue duiker and the swamp dwelling sitatunga.

Other wildlife that can be found in some of the parks and protected areas in the basin include a range of antelopes, buffalo, zebra, bushbuck, warthog, hyena, jackal, serval and occasionally elephant, lion and leopard.

1.2 People and their Livelihoods

Lake Tanganyika, its biodiversity and the ecosystem services it provides are of inestimable value for economic development for the millions of people that live in its basin and beyond. The lake contains an estimated 17% of the world's available surface freshwater supply (Bootsma and Hecky, 2003), providing a permanent source of drinking water, and water for domestic use, industrial and agricultural development. Tourism is an important source of income that is linked to the lake and its basin and is estimated to have generated more than US\$3billion in the Lake Tanganyika region during 2008-2009 (The Courier, 2010).

Majority of the people in the Lake Tanganyika basin rely on small-scale agriculture and/or fishing for food and income. As the Lake Tanganyika basin consists of many mountainous areas with steep slopes, settlements are typically small and concentrated on areas of relatively flat topography. Most of these small settlements along the shoreline are relatively underdeveloped due to lack of infrastructure (access, electricity, running water) and remoteness from international airports, seaports and economic centres.

Box 2: Population Statistics

Life expectancy in the riparian nations averages 46-57 years. Population growth rates in the basin are among the highest in the world, ranging from 2.0-3.2% per year, and it is expected that the number of people who either directly or indirectly depend on the natural resources in the basin will increase significantly in the near future. The population in the Lake Tanganyika basin is estimated to be between 12.5 and 13 million.

Literacy rates range from 45-76%. Per capita income ranges from US\$ 300-1,500 per year. Proportions of the population earning less than US\$1 per day and living below national poverty lines range from 36-71% (ADB, 2004)

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 provides one of the largest freshwater fisheries on the African continent, and presently hosts almost 95,000 active fishers (LTA Secretariat, 2011a). The annual fish production potential of the four countries is estimated to vary in the range of 165,000 - 200,000 metric tonnes (O'Reilly, C. M. *et al.*, 2003). Lake Tanganyika fish is transported to markets hundreds of kilometres away, including Dar es Salaam, Lubumbashi and Lusaka.

Industrial activity in the Lake Tanganyika basin is mainly concentrated in the most densely populated and urbanized areas:

- Bujumbura, Burundi (population: more than 400,000), is a capital city with an international airport and more than eighty industries (paint, brewery, textile, soap, battery production).
- Kalemie and Uvira, DR Congo (population: 100,000). Kalemie has some industries and a rail link to other centres in DR Congo. Uvira has cotton processing and sugar production industries but depends heavily on nearby Bujumbura for goods and services.
- Kigoma, Tanzania (population: 135,000) is the largest transit point for goods and people entering/exiting the lake region, with a rail link to other centres in Tanzania.
- Mpulungu, Zambia (population: 70,000), harboured a large fleet of industrial fishing vessels, which decreased in size gradually and ceased to exist around 2010. The industrial vessels have been replaced by powerful artisanal fishing vessels, operating ringnets and targeting the same fish species as the earlier industrial fleet.

Economic activities in these urban settlements also often involve administration and aspects of international trade between the four

countries. The lake provides key transport links, connecting Bujumbura, Kigoma, Kalemie and Mpulungu as important shipping centres for commercial trade between the riparian countries and the Central/Southern African region.

Imports passing through the lake were estimated at US\$ 4.8billion and exports at US\$1billion in 2008-2009 (The Courier, 2010). Despite various economic shortcomings, trade traffic on Lake Tanganyika has shown an exponential increase over the past years.

1.3 Threats to Biodiversity and Natural Resources

Although a recent study categorized Lake Tanganyika as relatively healthy (Dobiesz *et al.*, 2009), the health of aquatic and terrestrial ecosystems in the basin is increasingly threatened. Scientific evidence collected over the past two decades demonstrates that the basin has become vulnerable to the effects of climate change as well as a variety of non-sustainable human activities (LTBP, 2000; Darwall *et al.*, 2011).

The main threats to the biological richness and sustainable use of the resources in the lake basin result from *high rates of human population growth, extreme poverty, and lack of overall sustainable development*.

For many local communities there are few alternative resources available other than fisheries and agriculture, and as a result, the rates of natural resource extraction have become unsustainable. Increased conversion of forests to agricultural land is causing significant losses to biodiversity in the Lake Tanganyika basin. Vital habitat for wildlife has disappeared in large parts of the basin and few relatively pristine areas remain.

Deforestation has greatly accelerated erosion rates in the basin, leading to losses of nutrient-rich topsoil and sedimentation. Eroded sediments accumulate in the near-shore areas of the lake where habitats are altered and primary production is disturbed, negatively affecting aquatic species richness and densities.

Agricultural expansion has also been accompanied by an increase in the use of agrochemicals such as artificial fertilisers, pesticides and herbicides. In addition, domestic and industrial waste is increasingly causing pollution of ground and surface water in urbanized areas. Aquatic pollution causes loss of biodiversity, reduced fish catches and human health problems.

Both commercial offshore fisheries and artisanal nearshore fisheries are threatened by over-exploitation and reduced primary production resulting from climate change. Nearshore fisheries are also threatened by unsustainable fishing methods such as beach-seining and use of mosquito nets, as well as by habitat destruction and decreased production resulting from sedimentation.

Biological invasions form a serious threat to biodiversity and productivity of natural resources in the basin. Several invasive plants and fish have already been identified, and there is real concern for the introduction of additional invasive species in the basin, either as a result of lack of awareness or deliberate introduction (e.g. through aquaculture).

Climate change adds an additional pressure on the terrestrial and aquatic ecosystems in the lake basin, which has the potential to cause significant degradation to the environment. If no actions are taken to address the growing negative effects of climate change, it is expected that socio-economic development will stall or reverse, and problems associated with poverty and food-shortages will increase. Ultimately, this could lead to increased conflicts over natural resources, resulting in further compromise of the social stability and security in the region.

1.4 What Has Been Achieved So Far?

The Lake Tanganyika basin has a long history of research activities starting with the first explorations of the region in the 1800's, and followed by

numerous subsequent scientific research expeditions⁴. The International Scientific Conference on the Conservation of Biodiversity of Lake Tanganyika⁵ that took place in 1991 acted as a catalyst for a number of partnerships and initiatives to further enhance knowledge relevant to sustainable management of biodiversity and natural resources in the lake basin.

From 1992 to 2001, the Lake Tanganyika Research Project (LTR)⁶ was implemented by the Food and Agriculture Organisation of the United Nations (FAO)⁷ in close collaboration with research institutions in the riparian countries of Burundi, Democratic Republic of Congo, Tanzania and Zambia. The LTR investigated the production and fisheries potential of the lake, and developed modalities for regional management of fisheries resources. The LTR major output was the establishment of a Lake Tanganyika Framework Fisheries Management Plan (FFMP), which is based on the FAO Code of Conduct for Responsible Fisheries (CCRF). The FFMP was adopted by the Lake Tanganyika Subcommittee of the Committee for Inland Fisheries of Africa (CIFA) at its eighth session in 1999.

In parallel with the LTR, the project on pollution control and other measures to protect biodiversity in Lake Tanganyika (LTBP)⁸ took place from 1995 to 2000. The LTBP was funded by the Global Environment Facility (GEF) and was implemented in partnership with the United Nations Development Programme (UNDP), the governments and relevant national research institutions of the four riparian countries as well as non-

governmental organisations (NGOs) including the International Union for the Conservation of Nature (IUCN).

Apart from the special studies programme on biodiversity, fishing practices, pollution, sedimentation and socio-economic to provide supportive scientific and technical reports, the Transboundary Diagnostic Analysis (TDA) and the Strategic Action Programme (SAP) were finalised in 2000 and a draft Convention on sustainable management of the lake was developed to provide a formal framework for the joint management of Lake Tanganyika.

Box 3: Transboundary Diagnostic Analysis and Strategic Action Programme

Transboundary Diagnostic Analysis (TDA): A scientific and technical fact-finding analysis of the relative importance of sources causes and impacts of transboundary waters problems.

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

Many other important initiatives and partnerships between governments and NGOs exist in the Lake Tanganyika basin. International NGOs such as the Jane Goodall Institute and the Frankfurt Zoological Society have established innovative programmes and projects to protect habitats and wildlife in the Tanzanian catchment, working closely together with the Tanzania National Parks Authority (TANAPA). The World Wide Fund for Nature (WWF) established a partnership with the Congolese Institute for the Conservation of Nature (ICCN) for environmental protection in the eastern DRC.

⁴ A significant amount of research on the geology, limnology, species diversity and fisheries was synthesized in the book "Lake Tanganyika and its Life" (Coulter, 1991).

⁵ The International Scientific Conference on the Conservation of Biodiversity of Lake Tanganyika was made possible with funding from USAID and the WWF.

⁶ <http://www.fao.org/fi/oldsite/ltr/index.htm>

⁷ Principal funding was provided through the Department for International Development Cooperation of the Finnish Ministry of Foreign Affairs (FINNIDA).

⁸ <http://www.ltbp.org>

French NGO Pays de la Loire established a partnership with the Burundi National Institute for Environment and Nature Conservation (INECN) to support the protection of biodiversity and river catchment management. Numerous local NGOs are active in the region, which are often instrumental to the success of community-based natural resource management and environmental education activities. Furthermore, recent initiatives of privately-owned ecotourism ventures in Burundi, Tanzania and Zambia are playing an increasingly important role in conservation and environmental awareness-raising.

There is clear potential for community-based environmental management, sustainable agriculture and agroforestry and fisheries management in the Lake Tanganyika basin. With the launching of the Lake Tanganyika Authority, an important milestone has been taken in order to further promote national and international partnerships as well as regional collaboration to build on the success of previous activities and stimulate further innovation. This Strategic Action Programme sets out the goals and priorities for such action.

1.5 Regional Commitments to Future Actions

Based on the outcomes of the LTBP and LTR, other projects and research activities in the Lake Tanganyika basin, stakeholders in the riparian countries of Lake Tanganyika came to the fundamental conclusion that most of the threats to biodiversity and management of the natural resources are transboundary and therefore require regional cooperation.

The governments of Burundi, Democratic Republic of Congo, Tanzania and Zambia subsequently committed to undertaking joint actions and supporting national and regional initiatives to ensure long-term conservation of biodiversity and sustainable management of the natural

resources in the Lake Tanganyika basin. In response, two main instruments were established to ensure a solid foundation for regional cooperation: the Convention on the Sustainable Management of Lake Tanganyika and the Lake Tanganyika Authority.

1.5.1 The Convention on the Sustainable Management of Lake Tanganyika

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

Box 4: The Convention on the Sustainable Management of Lake Tanganyika

The Contracting States: Burundi, Democratic Republic of Congo, Tanzania and Zambia signed the Convention on 12 June 2003 in Dar es Salaam, Tanzania. On 30 July 2004, the Convention was formally registered with the Commission of the African Union and in September 2005 the Convention entered into force. By November 2007, all the four Contracting States had ratified the Convention.

The Convention provides the necessary rights, responsibilities, institutions and framework in international law that compels Contracting States to cooperate in the management of Lake Tanganyika and its catchment basin. The Convention 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 natural resources. Specifically, the Convention establishes:

- A binding legal framework ensuring certain standards of protection;
- Institutions for implementing the Convention at the national and regional levels;
- Mechanisms for implementing the Strategic Action Programme; and not the least
- Procedures for settling disputes.

The Convention unites the countries in recognizing that Lake Tanganyika is a shared heritage with unique biological and other diversity. It implicitly addresses the three main objectives of the Convention on Biological Diversity (CBD)⁹: 1) Conservation of biological diversity; 2) Sustainable use of the components of biological diversity; and 3) Fair and equitable sharing of the benefits arising out of the utilization of genetic resources. The Convention furthermore recognizes the significance of the lake for the development of the riparian countries and the necessity of cooperative management of natural resources.

1.5.2 The Lake Tanganyika Authority

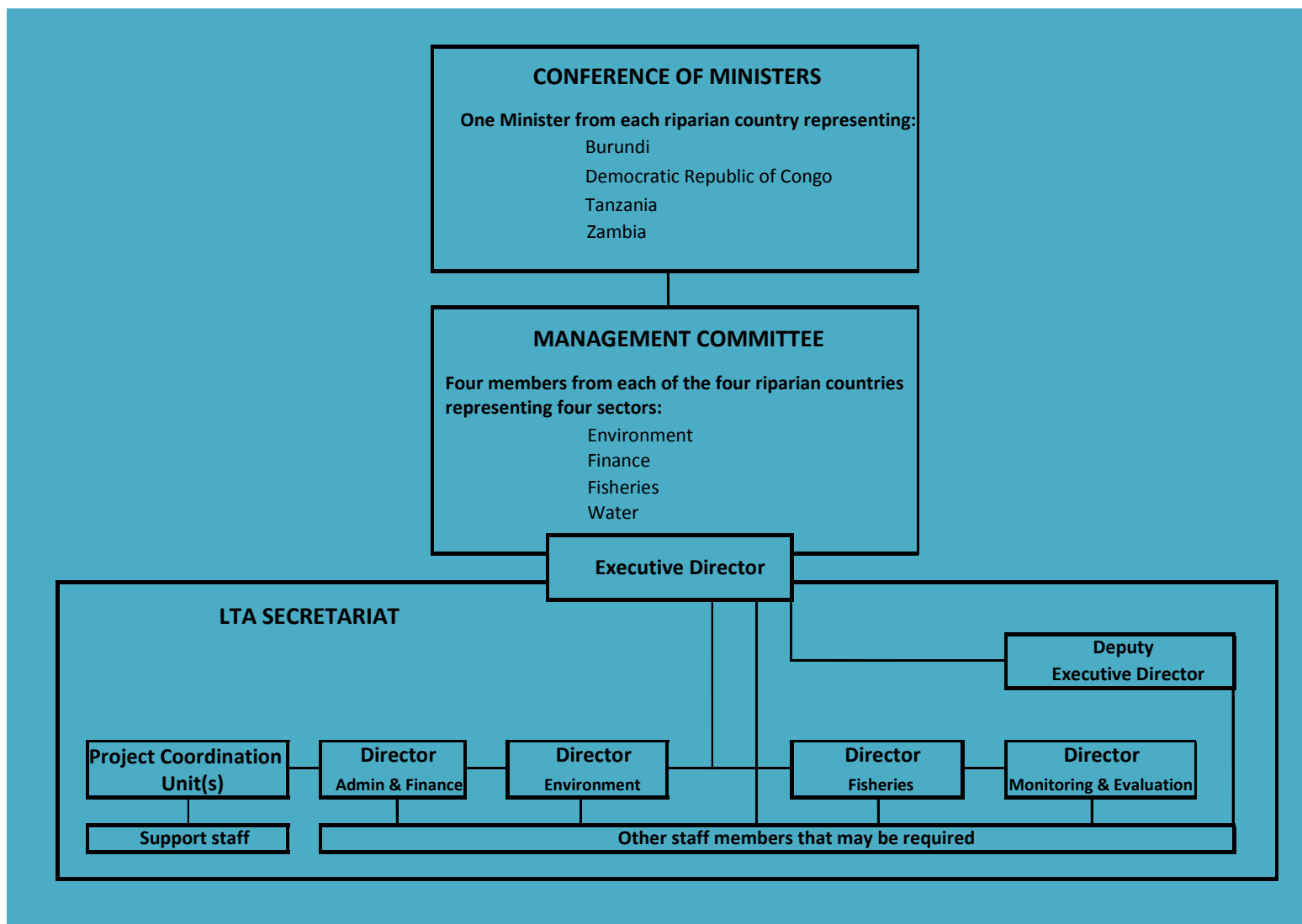
Article 23 of the Convention on the Sustainable Management of Lake Tanganyika provides for the establishment of the Lake Tanganyika Authority (LTA), whose function is to coordinate the implementation of the Convention by the Contracting States. Furthermore, the LTA has the mandate of advancing and representing the common interests of the Contracting States in matters concerning the management of Lake Tanganyika and its catchment basin.

⁹ Each of the four Lake Tanganyika riparian countries has ratified the CBD. In doing so, they also agreed to cooperate with other Contracting Parties, directly or, where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity. See: www.cbd.int

Box 5: Key functions and capacities of the Lake Tanganyika Authority as stated in Article 23, paragraphs 3, 4 and 7 of the Convention on the Sustainable Management of Lake Tanganyika

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

There are three organs of the LTA: the Conference of Ministers, the Management Committee and the Secretariat.



Lake Tanganyika Authority and its Organs

Conference of Ministers

The Conference of Ministers is the supreme organ of the LTA (see article 24 of the Convention). It consists of one Minister from each of the Contracting States. Ordinary meetings of the Conference of Ministers are typically held once a year and chaired by the host Cabinet Minister. The Convention provides for extraordinary meetings to be held at any other time decided by the Conference of Ministers.

The major function of the Conference of Ministers is to regularly evaluate the implementation of the Convention. Other functions of the Conference of Ministers are listed in Box 6.

Box 6: Functions of the Conference of Ministers as stated in Article 24, paragraph 5 of the Convention on the Sustainable Management of Lake Tanganyika

5. The Conference of Ministers shall regularly evaluate the implementation of this Convention, and, for this purpose, shall:
 - a. Consider and adopt protocols to be concluded in accordance with Article 34.
 - b. Consider and adopt in accordance with Article 35 additional annexes to this Convention.
 - c. Consider and adopt in accordance with Article 36 amendments to this Convention and its annexes.
 - d. Consider amendments to any protocol as well as to annexes to a protocol and, if so decided,
 - e. Recommend their adoption to the parties to the protocol concerned.
 - f. Establish whatever subsidiary bodies may be considered necessary for the effective implementation of this Convention.

The first ordinary meeting of the Conference of Ministers took place 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. The second ordinary meeting was held in April 2008 in Bujumbura, Burundi, while an extraordinary meeting was organised in December that same year with the main purpose to launch LTA activities. The third ordinary meeting of the Conference of Ministers was held in August 2009 in Uvira, Democratic Republic of Congo. The fourth ordinary meeting was held in November 2010 in Lusaka, Zambia. The fifth ordinary meeting of the Conference of Ministers took place in February 2012 in Kigoma, Tanzania¹⁰. At the end of the fifth ordinary meeting, the ministers appended their signatures to the updated SAP document to confirm their respective governments' endorsement of the programme.

¹⁰ Reports of the meetings can be downloaded from the website www.lta-alt.org; or www.lta.iwlearn.org

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 for 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 organs as prescribed by the Convention have put into place.

Do hereby pronounce that the Lake Tanganyika Authority, established by the Convention, is now made operational, with the Headquarters to be hosted by the Republic of Burundi in Bujumbura, and the staff to be appointed by the Conference 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:

For the United Republic of Tanzania



Hon. Prof M.J Mwandosya
Minister of State, Vice President's Office (Environment)
Chairman, 1st Conference of Ministers Meeting

For the Republic of Burundi



Hon. Odette Kayitesi
Minister of Land Management, Tourism and
Environment

For the Republic of Zambia:



Hon. Kabinga J. Pande
Minister of Tourism, Environment & Natural Resources

For the Republic of Congo



S.E.M Juma-Alfani Mpango
Ambassador of Democratic Republic of Congo
in United Republic of Tanzania



Third Ordinary Meeting of the Conference of Ministers held in August 2009, Uvira, DR Congo

Management Committee

The second organ of the LTA is the Management Committee, it consists of four¹¹ members from each of the Contracting States representing fisheries, environment, water and finance sectors. The Management Committee meets on a yearly basis to provide guidance and oversight. The LTA Executive Director is an ex-officio member of the Management Committee and serves as the Secretary. The functions of the Management Committee, as stated in Article 25 of the Convention on the Sustainable Management of Lake Tanganyika, are to co-ordinate and monitor the implementation of the Convention, including:

- Implementing the policies and decisions of the Conference of Ministers and undertake tasks assigned to it by the Conference of Ministers.
- Providing scientific and technical advice to the Conference of Ministers.
- Preparing and proposing for approval of the Conference of Ministers a strategic action programme for Lake Tanganyika in accordance with Article 13, review, and revise the strategic action programme and propose any new or amended program for approval by the Conference of Ministers.

¹¹ 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 in 2008.

LTA Secretariat

The LTA Secretariat is the executive organ of the LTA. It is managed by the Executive Director, and composed of the following four directorates: Administration and Finance; Fisheries; Environment and Monitoring and Evaluation.

The LTA Secretariat became fully functional in January 2009 after recruitment of key staff. For purposes of efficiency, availability of infrastructure and accessibility, the first ordinary meeting of the Conference of Ministers held in April 2007 resolved that the LTA Secretariat office should be based in Bujumbura, Burundi. On 4th November, 2009, the LTA Secretariat Headquarters Agreement was signed with the host government of the Republic of Burundi.

The LTA Secretariat is responsible for the coordination of actions aimed at implementing the Convention and the Strategic Action Programme. It formulates the annual workplans and budgets for the Authority and prepares projects, assessments and reports. It regularly obtains and updates information relevant to the implementation of the Convention and disseminates it to the Contracting States.



The official signing of the LTA Secretariat Headquarters Agreement in November 2009, Bujumbura, Burundi

1.5.3 The Lake Tanganyika Regional Integrated Management and Development Programme

The Lake Tanganyika Regional Integrated Management and Development Programme (LTRIMDP) was developed to facilitate the implementation of the Convention on the Sustainable Management of Lake Tanganyika, the SAP and the Framework Fisheries Management Plan (FFMP). The development of the LTRIMDP took place during LTR and LTBP implementation, as well as under the GEF-funded Lake Tanganyika Management Planning Project (2002-2003).

The LTRIMDP was drafted in collaboration with the governments of the riparian countries and a range of international partners. Implementation of the LTRIMDP started in 2008 through engagement of the participating countries in concerted action toward finalization and ratification of the draft Convention.

The LTA Secretariat coordinates the implementation of the LTRIMDP at the regional level. 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 programme falls within the policies of the national Poverty Reduction Strategy Papers (PRSPs) that were developed by each of the four governments to provide sustainable economic growth for poverty reduction. The LTRIMDP has two immediate objectives:

- To achieve sustainable management of the natural resources of Lake Tanganyika through implementation of activities prioritized in the SAP
- To improve livelihoods through physical and social infrastructure development

The first objective of the LTRIMDP is supported by UNDP/GEF funding through its project on *Partnership Interventions for the Implementation of the SAP for Lake Tanganyika*. Both the first and second objectives are supported through the African Development Bank (AfDB) and Nordic

Development Fund (NDF) funded *Project to Support the Lake Tanganyika Integrated Regional Development Programme* (PRODAP). The two projects are complementary in scope, and aim to take collaborative action at both national and regional levels. The LTA will encourage the development of additional projects that can contribute to the achievement of the objectives of the LTRIMDP.

UNDP/GEF Project

The GEF-funded UNDP Project on Partnership Interventions for the Implementation of the SAP for Lake Tanganyika supports the LTA and pilots the implementation of the SAP in the riparian countries in collaboration with a range of partners including ICRAF, IUCN, UNEP, WWF, NIGLAS and other international and national NGOs.

Implementation of the UNDP/GEF Project is driven by Project Management Units (PMUs) through national execution in Tanzania and Zambia, and execution via the United Nations Office for Project Services (UNOPS) in Burundi and Democratic Republic of Congo. Regional activities also take place under UNOPS execution by the Regional Project Coordination Unit (PCU) based at the LTA Secretariat.

SAP priorities for GEF funding in Democratic Republic of Congo, Zambia and Tanzania include catchment management to reduce sedimentation, which is adversely affecting productivity and biodiversity in the Lake Tanganyika basin. Priorities in Burundi and Tanzania include reduction of polluting wastewater effluents.

The project also provides for the development of a Regional Integrated Environmental Monitoring Programme to enable informed decision making on the protection of biodiversity and sustainable environmental management. Furthermore, the UNDP/GEF Project supports the

development of protocols to the Convention on the Sustainable Management of Lake Tanganyika. In addition, the project facilitates the process of updating the SAP and its implementation at the national level through the development of National Action Plans .

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

The Project to Support the Lake Tanganyika Integrated Regional Development Programme (PRODAP¹²) is funded by AfDB, NDF and the four participating countries. PRODAP aims to rationalize the exploitation of the fishery resources, protect the lake environment in a sustainable manner and reduce poverty of local communities. PRODAP is executed by National Coordination Units (NCUs) in the four countries, under coordination of the LTA Secretariat. Furthermore, the PRODAP makes provisions for the LTA Secretariat to execute regional activities aimed at supporting national level programmes.

PRODAP consists of four components:

- Institutional capacity building by establishing an adequate intervention capacity at national and regional levels for sustainable, integrated management of the lake
- Sustainable and responsible fisheries development and environmental protection
- Infrastructure rehabilitation and local development
- Project management

Expected outputs of PRODAP include:

- Institutional capacity built at regional, national and local levels for the sustainable management of the lake
- Revitalization and/or creation of viable socio-professional groups

- Sustainable management of fishery resources through introduction of joint fisheries management
- Establishment of sustainable financing systems for community micro-projects
- Establishment of a system for lake surveillance and rational exploitation of fisheries resources
- Environmental and biodiversity protection through treatment of waste water and protection of catchment areas.

¹² PRODAP is the French acronym for the project, which is also used by Anglophone stakeholders.



Photo courtesy of WIKIPEDIA: Hippopotamus

PART 2: PROCESS OF CONSULTATION FOR THE SAP

The Strategic Action Programme (SAP) for the Protection of Biodiversity and Sustainable Management of the Natural Resources in Lake Tanganyika and its Basin defines a programme of priority actions that are based on formal evaluation of challenges as well as opportunities for the conservation of biodiversity and sustainable management of natural resources. This process of evaluation involved the Transboundary Diagnostic Analysis (TDA) carried out by the SAP Planning Group in 2000 with support of the LTBP Special Studies.

The process of updating the SAP started in 2010 through national and regional consultations of stakeholders from the riparian countries, analysis and integration of the outcomes of relevant scientific studies published after the TDA. The updating of the SAP is provided for in Article 13 of the Convention on the Sustainable Management of Lake Tanganyika (see 1.5.1.) which requires that the Contracting States monitor the effectiveness of the SAP and revise it as necessary.

As such, the SAP is intended to be 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, and to changing needs and aspirations of lakeshore communities and overall regional development.

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 often have impacts that extend across national boundaries.

Box 7: Definition of the SAP

“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.

The SAP provides a regional framework for actions to achieve the objective of the Convention to 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 cooperative management* (Article 2, paragraph 1).

2.2 Scope of the SAP

The SAP addresses a shared regional concern, defines the framework for a programme of actions and includes immediate regional actions to address constraints to conserve biodiversity and achieving sustainable use of natural resources. As the problems and opportunities the SAP addresses all relate to activities carried out within the national waters or national

territories of the riparian 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.

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, but with particular focus on the lake catchment.

2.3 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 worked together to establish a common baseline of facts and analysis of the problem in the form of a Transboundary Diagnostic Analysis, which was then used to set priorities for national actions to address threats to international waters in the form of the SAP.

The process of formulating and updating the SAP followed an analytical approach to identify immediate management objectives within the overall goal of conserving biodiversity and promoting sustainable use of natural resources. This approach included a three level framework that facilitated prioritization of the most urgent interventions to enable the development of detailed proposals and/or measures to address identified priorities.

After analysis of the main threats and specific problems involved, priorities were established for possible interventions and a sequence of management interventions were proposed to counteract each identified problem. Each specific problem was defined in terms of site and impact, time frames were assigned, relevant stakeholders and key agencies for implementation were identified. Furthermore, uncertainties where further research and/or monitoring would be required to define the need for action or to develop solutions were listed.

2.3.1 Prioritisation of Actions

Throughout the region, government and private resources are stretched by existing demands. The resources that can be directed towards biodiversity conservation and sustainable development 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), in order 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 sustainable management of natural resources within a regional framework. This prioritisation guides national interventions, within the context of the accepted regional programme.

The evaluation used to establish priorities for the SAP was 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 SAP¹³, 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, objective scientific diagnosis of the impact of the problems was used as a basis, supported by intuitive assessments based on knowledge and experiences of stakeholders and experts in the field. The Precautionary Principle was followed where appropriate, given the complexity of many of the issues being addressed, and the fact that conclusive information is not always readily available.

2.3.2 Stakeholder Consultations

The initial process of consultation for the SAP was led by National Working Groups and a regional Technical Advisory Committee 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 and to bring national information into the regional planning process, two

¹³ A score of 1, 2 or 3 was allocated to each of the 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. Final prioritisation was based on addition of the 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.

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:

- The main biodiversity problems of Lake Tanganyika
- Causal chains from perceived problems to their societal root causes
- 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 reflected agreement on an overall priority for the sequence of proposed actions.

The drafting process was supervised by a Steering Committee, which 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 Working Groups prepared the TDA, defining regional priorities for management interventions as well as the Programme of Priority Actions described in this document.

In 2010, National Stakeholder Consultations were conducted in each of the four riparian countries¹⁴ with the purpose of updating the SAP.

¹⁴ 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 through the Lake Tanganyika Authority Secretariat.

Participants in these consultation workshops included 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 (see Annex V). Using the results of the consultations from 1998¹⁵ as a basis, stakeholders focused on identifying gaps and deficiencies and proposed updates and additions to the SAP. The strategy of the stakeholders followed a similar common analytical framework as previously adopted by the riparian countries. This approach allowed for the conclusions of the national stakeholder consultations to be brought together in coherent and comparable national frameworks (see Annex III).

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 findings¹⁶, the participants in the forum were able to assess and integrate the national contributions, regional concerns and interventions that form the basis of the current SAP.

One of the most important outcomes of the 2010 stakeholder consultations was the unanimous recognition of the fact that both the effects of climate change and 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.

¹⁵ 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

¹⁶ See Annex V for list of background documents and scientific references. All scientific papers relevant to the conservation of biodiversity and sustainable management of natural resources in the Lake Tanganyika basin that were used as the basis for the TDA and SAP updating process are available through the Lake Tanganyika Authority Secretariat: info@lta-alt.org



Participants in the regional stakeholder consultation workshop on updating of SAP held in September 2010.

2.4 Lake Tanganyika Transboundary Diagnostic Analysis

The Transboundary Diagnostic Analysis (TDA) is a planning framework 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 natural resources for local communities and other users into the foreseeable future. The TDA approach is based on the concept of strategic joint-fact finding as a means of arriving at a consensus on what actions are needed to address threats.

The first stage of the Lake Tanganyika TDA process started with a regional meeting held in 1996, when representatives of the riparian countries of Lake Tanganyika identified major transboundary threats related to the conservation of biodiversity and use of natural resources in the Lake Tanganyika basin. The participants in this meeting ranked perceived threats in order of priority and this was used as a basis of a preliminary consultation document that was drafted in 1997.

The second stage of the TDA process took place from 1998 until 2000, with support from a SAP Planning Group and Special Studies teams from the Lake Tanganyika Biodiversity Project (LTBP¹⁷). Following the initial process, each country proceeded with national consultations.

National technical workshops¹⁸ were organised to include a wide range of stakeholders in the consultation process which served two main purposes:

- National consultation ensured that national representatives in the regional TDA and SAP process were in a position to reflect the concerns of their national constituents, following their review of national priority biodiversity and management concerns and priorities for intervention.
- The four countries developed a common analytical framework, allowing their conclusions to be brought together in a regional framework.

After several regional workshops, a preliminary TDA was endorsed by the Project Steering Committee in 1999, and the TDA was finalised in 2000. An implicit update of the TDA was subsequently conducted through stakeholder consultations and extensive literature studies as part of updating the SAP in 2010-2011. The update made use of an extensive body of relevant literature, including numerous reports, policy papers and scientific papers generated through scientific studies and regional processes that took place between 2000 and 2011¹⁹.

¹⁷ All Special Studies reports that were used as a basis for the TDA can be downloaded from the LTBP website: <http://www.ltbp.org/eindex.htm>

¹⁸ Two workshops were held in each country: National Sectoral Problem Review and National Environmental Priorities and Strategies Review workshops.

¹⁹ See Annex V for list of background documents and scientific references. All scientific papers relevant to the conservation of biodiversity and sustainable management of natural resources in the Lake Tanganyika basin that were used as the basis for the TDA and SAP updating process are available through the Lake Tanganyika Authority Secretariat: info@lta-alt.org

Over 500 experts and stakeholders have been consulted in total, drawn from government agencies, academic and research institutions, as well as national and international NGOs. As a result of the comprehensive region-wide analyses conducted between 1996 and 2011, it has become clear that there are six main clusters of transboundary pressures on the ecosystems in the Lake Tanganyika basin, with climate change being a cross-cutting challenge.

A short description of the transboundary pressures, proximate causes, specific threats, governance and development challenges for protection of biodiversity and sustainable management of natural resources in the Lake Tanganyika basin is presented in Table 1.

For more detailed information, please refer to the TDA (2000) as well as the Strategic Components sections below.

Table 1. Generic Root Causes of Transboundary Threats and Challenges in the Lake Tanganyika Basin

Increasing Population Pressure	• Rapid population growth is leading to an increasing demand for ecosystem goods and services. • High urbanisation rates are leading to increased generation of pollutants.
Poverty and Inequality	• Large proportions of the population live below the poverty line and rely on exploitation of natural resources. • Large proportions of the population are insufficiently literate. • Large proportions of the population have lack of access to alternative livelihoods.
Inadequate Governance	• Weaknesses in policy, legal and institutional structures hamper good governance possibilities.
Insufficient Resources	• Resources of relevant government, management and research institutions are limited, either due to lack of financial means or due to inadequate priority setting.
Inadequate Knowledge and Awareness	• Knowledge on the value and importance of services and goods provided by healthy aquatic and terrestrial ecosystems is limited. • Large proportions of stakeholders are insufficiently informed about causes and possible solutions to environmental challenges.
Economic Drivers	• Demand for services and goods exceeds availability and regeneration capacity of elements of aquatic and terrestrial ecosystems in the region.

Table 2. Overview of Transboundary Threats and Challenges in the Lake Tanganyika Basin

Main Threat	Proximate Causes	Specific Threats	Governance and Development Challenges
Insufficient Resilience to Impacts of Climate Change	- Decreased and/or unpredictable precipitation - Increase in extreme weather events - Increasing surface water temperature - Cross-cutting impacts on aquatic and terrestrial ecosystems that are already stressed - Insufficient knowledge and socioeconomic capacity to adapt to impacts	- Droughts, fires, heavy rainstorms, flooding - Unpredictable lake levels - Increased erosion and sedimentation - Decrease in fisheries yields - Loss of agricultural productivity - Loss of biodiversity - Lack of adaptation preparedness	- Lack of sustainable livelihood alternatives - Insufficient resources and financial mechanisms for adequately dealing with integrated water resources management (IWRM) issues - Inadequate updating, implementation, enforcement and monitoring of legislation - Lack of sufficient mechanisms for institutional coordination and inter-sectoral governance - Lack of human resources and technical capacity in institutions dealing with IWRM issues
Unsustainable Fisheries	- Increasing demand for protein - Excessive fishing efforts in the pelagic zone - Excessive fishing efforts in the littoral zone - Use of inappropriate gear and mesh sizes - Excessive extraction of ornamental fish	- Lack of adequate regulations - Insufficient capacity for monitoring and control - Loss of pelagic fisheries resources - Loss of littoral fisheries resources - Loss of aquatic biodiversity	
Unsustainable Land Management	- Unsustainable agricultural practices (e.g. slash & burn) - Deforestation to meet timber and fuelwood needs - Encroachment on lake shore (e.g. settlements, agriculture) - Expansion of badly designed/uncontrolled human settlements - Extraction of sand and rocks - Poorly designed road development	- Habitat degradation - Excessive erosion and sedimentation - Loss of agricultural productivity - Loss of biodiversity - Loss of ecosystem services	
Destruction and Alteration of Critical Habitats	- Expansion of human settlements - Encroachment (e.g. settlements, agriculture) - Environmental degradation resulting from climate change, unsustainable fisheries, sedimentation, invasions and pollution	- Habitat degradation - Loss of biodiversity - Loss of ecosystem services	
Biological Invasions	- Accidental introduction of invasive species by natural dispersal - Introduction of invasive species through aquaculture - Introduction of invasive species by humans (e.g. planting seeds)	- Decrease of ecosystem productivity - Alteration of economic use of invaded areas - Loss of biodiversity	
Increasing Pollution	- Increased urbanisation and industrial activity - Lack of adequate wastewater treatment - Inadequate collection, treatment and disposal of solid waste - Waste from boats (e.g. oil, garbage, etc.) - Mining activities - Waste from petroleum exploration and exploitation - Agricultural runoff (fertiliser, pesticides) - Atmospheric emissions (e.g. bush fires, charcoal burning, industrial emissions)	- Decline in water quality - Decline in air quality - Risks for human health - Loss of biodiversity	



Photo courtesy of Alain Gashaka: Fishermen on Lake Tanganyika

PART 3: STRATEGIC ACTION PROGRAMME

3.1 Structure of the SAP

The Strategic Action Programme (SAP) for the Protection of Biodiversity and Sustainable Management of the Natural Resources in the Lake Tanganyika and its Basin is organised in several sections. The first section provides a definition of the vision, Environmental Quality Objectives (EQOs), and the principles underlying the SAP. Each EQO has a long-term objective, and a set of short-term management targets and actions which, taken together, form the Programme of Priority Actions. The next sections describe the various strategic components, each starting with a short introduction that demonstrates linkages with the Transboundary Diagnostic Analysis (TDA), followed by an overview of actions, key agencies for implementation of the actions, priority levels, timing, stakeholders and uncertainties.

3.2 Vision and Environmental Quality Objectives

3.2.1 Vision for Lake Tanganyika and its Basin

The vision of the SAP for the protection of biodiversity and sustainable management of the natural resources in the Lake Tanganyika and its basin is as follows:

People of the region are prospering from a healthy environment in the Lake Tanganyika basin that continues to harbour high levels of biodiversity and provide sufficient natural resources to sustain future generations

The vision is based on six key principles (see Box 8) that are embodied in existing Conventions to which the four countries are Parties or which they 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 8: Key Principles Underlying the SAP

Precautionary Principle: Preventive measures shall 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.

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 and its 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.

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

3.2.2 Objectives of the Strategic Action Programme

The SAP has six overall objectives relating to the desired environmental quality. These Environmental Quality Objectives (EQOs) describe the state or quality of the environment that the riparian countries hope to achieve by 2035 through the implementation of the SAP. The EQOs are intended to ensure that biodiversity is protected and natural resources in the lake basin are sustainably managed, and they should form the basis for sustainable socio-economic development in the region. The EQOs for the Lake Tanganyika basin are as follows:

- *Aquatic and terrestrial ecosystems and human societies are sufficiently resilient to adapt to the impacts of climate change and variability*
- *Fish stocks are healthy and adequately managed to sustain future exploitation*
- *Erosion and sedimentation rates are reduced through sustainable*

land management practises

- *Critical habitats are protected, restored and managed for conservation of biodiversity and sustainable use*
- *Biological invasions are controlled and future invasions are prevented*
- *Water quality is improved at pollution hotspots and meets regional standards*

These EQOs refer back to concerns raised at the International Scientific Conference on the Conservation of Biodiversity of Lake Tanganyika held in 1991, and those of the stakeholder consultations that were conducted in 1998, 2000 and 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.

The six EQOs above provide the basis for the main components of the SAP, which are presented in detail in the following sections (see Table 2 for overview). Note that environmental education and increased awareness of stakeholders about the various threats and possible solutions and actions to address these threats is a general and recurring objective throughout the SAP (also see 4.1.2).

Table 3. Environmental Quality Objectives and Main Targets of the Strategic Action Programme

Strategic Component	Environmental Quality Objective	Targets
A	<i>Aquatic and terrestrial ecosystems and human societies are sufficiently resilient to adapt to the impacts of climate change and variability</i>	- Enhanced resilience of aquatic and terrestrial ecosystems - Increased preparedness and capacity to adapt to climate change impact - Improved knowledge-base, monitoring and information-management mechanisms
B	<i>Fish stocks are healthy and adequately managed to sustain future exploitation</i>	- Reduced fishing pressure in the pelagic zone - Reduced fishing pressure in the littoral zone - Ornamental fisheries controlled and managed
C	<i>Erosion and sedimentation rates are reduced through sustainable land management practises</i>	- Sustainable agriculture activities increased - Deforestation rates decreased - Sustainable land management strategies in place
D	<i>Critical habitats are protected, restored and managed for conservation of biodiversity and sustainable use</i>	- Awareness of the importance of critical habitat protection raised - Protected area resource management improved - Critical aquatic and terrestrial habitats protected, restored and managed
E	<i>Biological invasions are controlled and future invasions are prevented</i>	- Existing biological invasions controlled and prevented from further spreading - Future invasions prevented
F	<i>Pollution is reduced and water quality is improved to meet regionally agreed standards</i>	- Urban and industrial pollution reduced - Agricultural pollution reduced - Harbour and lacustrine traffic pollution reduced - Pollution from mining activities reduced - Risks related to petroleum exploration and production reduced

3.3 Strategic Component A: Adaptation to Climate Change Impacts

Environmental Quality Objective: Aquatic and terrestrial ecosystems and human societies are sufficiently resilient to adapt to the impacts of climate change and variability

Climate change is a crosscutting theme, which impacts all components of the SAP. There is mounting evidence that changes in surface water temperature and increased spatial-temporal variability of rainfall and storms is associated with climate change. These changes are expected to have an increasing impact on the already stressed aquatic and terrestrial ecosystems in the Lake Tanganyika basin (see box 9).

By impacting multiple sectors such as water resources, energy, landscapes, agriculture, livestock, forestry and human health, climate change is a critical development issue. By affecting the ecosystem goods and services that communities depend upon for their livelihoods, socio-economic stability in the Lake Tanganyika region can be threatened. The impacts are projected to worsen in the future as temperatures continue to rise and precipitation becomes more unpredictable. African nations are among the most vulnerable, their responses hampered by limited human capacity, political instability and lack of resources for undertaking sufficient actions to mitigate and adapt to climate change effects (IPCC, 2007).

The average temperatures in Africa have increased with 0.7°C over the 20th century and climate change models predict further warming across the continent. According to the intermediate scenario of the IPCC, the mean surface air temperature in Africa is expected to increase 3-4°C compared with the 1980-1999 period, although less warming is expected in equatorial and coastal areas (IPCC, 2007).

Box 9: Environmental impacts of climate change in the Lake Tanganyika basin

- **Changes in water availability.** Increased surface temperatures in the southwest Indian Ocean could lead to decreased precipitation in equatorial and subtropical Eastern Africa (Plisnier *et al.*, 2000; Schreck and Semazzi, 2004; Funk *et al.*, 2005; WWF, 2006).
- **Extreme weather events.** More frequent and intense extreme weather events such as heavy rainstorms, flooding, fires, hurricanes, tropical storms and El Niño events are expected to take place (WWF, 2006; IPCC, 2007). Both fires and events such as rainstorms and flooding could lead to increased erosion and sedimentation rates in the Lake Tanganyika basin.
- **Changes in lake water level.** In combination with the tectonic movements in the Rift, persistent droughts and floods can have a profound effect on the Lake Tanganyika water level (see Annex VI). This can affect the availability and structure of shallow aquatic habitats and wetland areas as well as harbour infrastructure.
- **Increase of surface water temperatures.** An increase of mean water temperature of 0.7-0.9°C was found in Lake Tanganyika between 1956 -1994, while at the same time the stratification of water layers changed, nutrient availability reduced and productivity of primary producers in the oxygenated layer decreased (Plisnier, 1997; O'Reilly *et al.* 2003; Verburg *et al.*, 2003; Tierney *et al.*, 2010). If this trend persists, it can be predicted that the fisheries in Lake Tanganyika will decline significantly.
- **Biodiversity decline.** Due to a combination of factors, aquatic as well as terrestrial species richness, densities and composition are expected to change significantly as a result of climate change (e.g. Lovett *et al.*, 2005).

The scope of this SAP predetermines an initial focus on improving the resilience of ecosystems and communities to the impacts of increased climate variability and long-term climatic changes.

The SAP offers several building blocks for adaptation to climate change through the following cross-cutting objectives:

1) Enhanced resilience of aquatic and terrestrial ecosystems to the impacts of climate change and variability.

As part of SAP implementation, countries will adopt measures to reduce vulnerabilities and increase ecosystem resilience, including: i) sustainable fisheries management; ii) sustainable catchment management, and iii) protection and management of critical habitats.

2) Improved knowledge-base, monitoring and information-management mechanisms

To allow appropriate management actions for adaptation to impacts of climate change, an improved knowledge-base, monitoring and information-management mechanisms are needed for the Lake Tanganyika basin. The environmental monitoring activities undertaken as part of the SAP (section 4.1.6), should feed into information management systems at the national and regional level, so that data on environmental change can subsequently be translated into adaptation actions. SAP activities geared towards strengthening legal, policy and institutional frameworks for ecosystem-based management will allow more appropriate measures to be taken against climate change impacts, based on a cross-sectoral and regionally harmonized approach.

An overview of actions to adapt to the impacts of climate change is presented in the following table.

Table 4. Strategic Actions for Adaptation to Climate Change Impacts

Main Threat	Target	Priority	Strategic Actions	Specific Threat Addressed
<i>Insufficient resilience to impacts of climate change</i>	Enhanced resilience of aquatic and terrestrial ecosystems	Vey high	• See Strategic Components on Unustainable Fisheries, Excessive Sedimentation, Critical Habitat Destruction, Biological Invasions, and Pollution	• Cross-cutting
	Increased preparedness and capacity to adapt to climate change impacts	Very high	• Establish sustainable livelihood alternatives	• Cross-cutting
			• Increase resources and financial mechanisms for adequately dealing with integrated water resources management (IWRM) issues	• Cross-cutting
			• Improve mechanisms for institutional coordination and inter-sectoral governance	• Cross-cutting
			• Establish emergency funds for climate change adaptations	• Cross-cutting • Lack of adaptation preparedness
			• Improve management of urban and rural water drainage systems as well as river courses	• Flooding • Increased erosion and sedimentation
			• Review and enforce laws relevant to construction and settlements near lakeshore, and flood-prone areas	• Flooding • Unpredictable lake levels • Lack of adaptation preparedness
	Improved knowledge-base, monitoring and information-management mechanisms	High	• Research and modelling of climate change impacts	• Lack of adaptation preparedness
			• Establish monitoring programmes linked to early warning and response systems	• Lack of adaptation preparedness

3.4 Strategic Component B: Sustainable Fisheries

Environmental Quality Objective: *Healthy fish stocks, which are adequately managed to sustain future exploitation*

Lake Tanganyika provides one of the largest freshwater fisheries on the African continent and the annual fish production potential of the four countries is estimated to vary in the range of 165,000 - 200,000 metric tonnes (O'Reilly *et al.*, 2003). Fishing activities in Lake Tanganyika are complex; to adequately decide on aspects of future fishery development it is necessary to understand the socio-economic and physical environments of local fishing communities (Coulter, 1991).

There are two distinct but overlapping fisheries in Lake Tanganyika: 1) Offshore fisheries (pelagic zone), which mainly target two species of sardine-like clupeids and four species of perch²⁰; and 2) nearshore (littoral zone) fisheries, which target a wide diversity of species. Within a single fishing community, there are often groups who fish near-shore and others that concentrate their fishing activities on the offshore zone, both for subsistence and commercial purposes. The vast majority of fishing communities are also engaged in small-scale farming. The balance between fishing and farming activities typically depends on the moon cycle, the season, the fluctuation in fish stocks, labour availability and changes in markets.

Over 50 different types of fishing gears are used in Lake Tanganyika, of which twelve are used most frequently (Lindley, 2000). The cumulative fishing pressure of all gears combined both for near-shore and offshore fisheries poses an increasing threat to the sustainability of fisheries resources in the lake.

²⁰ Clupeids: *Stolothrissa tanganicae* and *Limnothrissa miodon*; and Perch: *Lates angustifrons*, *L. mariae*, *L. microlepis*, and *L. stappersii*.

Box 10: Increase in fishing pressure from 1995 to 2011

- A total of **44,957** fishermen were counted in the lake basin in 1995, whereas in 2011 this number has more than doubled to a total of **94,886**.
- The number of canoes increased from **13,192** active fishing vessels to **28,212**
- The number of motorized canoes increased from **1264** to **3336**.
- The number of landing sites decreased from **786** to **683**.

Results from LTR (1995) and LTA (2011) lake wide frame surveys

Fisheries in Lake Tanganyika are characterized by open access and measures need to be taken to prevent further growth of the fleet and fishing population. Management of nearshore and offshore fisheries and activities affecting the lake basin should take place within a regional planning framework that integrates the physical, social and economic links among basin-based activities and lake resources. While the biodiversity focus is on the species-rich littoral zone, interventions need to address fisheries issues in both zones. If pelagic fish populations are overexploited, then this will place additional pressure on littoral fish populations.

As human populations continue to expand, the demand for protein continues to increase. Aquaculture has often been proposed as a solution, which can be implemented both on land (e.g. fish ponds) or in a water body (e.g. fish cage culture). There are often significant socioeconomic gains associated with aquaculture, but there are also clear risks, including eutrophication as well as introduction of invasive species that can shift the nature of the ecosystem through competition, predation and hybridisation (Kasulo, 2000; Diana, 2009).

To ensure environmental sustainability, the development of aquaculture in the Lake Tanganyika basin should focus on use of native species and follow regional protocols or guidelines for licensing.

3.4.1 Sustainable Nearshore (Littoral Zone) Fisheries

The nearshore fisheries involve both artisanal and subsistence fishermen and target a wide range of fish species using a variety of different fishing gears. Many of the inshore fishing grounds (0-40 meters depth) are near areas of high human population densities, where aquatic habitats are also under increased pressure from sedimentation and pollution.

There are indications of reduced catches, changes in catch composition and in some areas collapse of near-shore fisheries. Previous management interventions to control these fisheries have depended on state legislation that limits fishing activities through licensing or banning of particular fishing gears. This approach has not been successful, partly as a result of lack of enforcement capacity and partly as a result of fishermen switching gears without reducing overall effort.

An alternative approach that is increasingly adopted in management of fisheries is the development of partnership arrangements amongst groups of people with a stake in the fishery (e.g. fishing communities, NGOs, private sector and governments). This approach is known as “co-management” or “participatory management”, and refers to a partnership arrangement in which the community of resource users, government, and other stakeholders share responsibility and authority for the management of fisheries. Co-management raises the awareness of fishing communities and other stakeholders about the need for sustainable management of the fisheries resources and should strengthen efforts to improve the livelihoods of fishing communities.

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. Each riparian country is expected to establish and operationalize co-management units in the Lake Tanganyika basin. Note that these co-management units are intended to address fisheries as a whole (nearshore as well as offshore fisheries).

Short-term targets (within 5 years): Co-management plans adopted and implemented; and stakeholder involvement in co-management strengthened.

Medium-term targets (within 5 to 10 years): Regional institutional capacities in monitoring and surveillance strengthened; co-management legislations regionally harmonized; and co-management programmes promoted.

Long-term targets (15 to 25 years): Regional monitoring and surveillance programme and fisheries co-management practices successfully implemented.

3.4.2 Sustainable Offshore (Pelagic Zone) Fisheries

The improved management of offshore (pelagic) fisheries is essential for the socioeconomic well-being of the region. Offshore fisheries support large numbers of fishermen throughout the Lake Tanganyika basin. The most abundant practices are the night operated lift net fleet, the purse seine or ringnet fleet and beach seines with lights. Offshore fishing is also an important livelihood option for artisanal fishermen who use vertical, unbaited, multi-hook handlines to target the Perch *Lates stappersi*, particularly in the south of the lake.

Some of the challenges with sustainable offshore fisheries include the fact that there is a lack of comprehensive qualitative and quantitative economic indicators, which hampers the implementation or development of bio-economic fisheries models and the assessment of markets dynamics (Munyandorero, 2002). These issues are partly addressed

through the Lake Tanganyika Framework Fisheries Management Plan (FFMP), which was drafted as a result of the LTR. The FFMP includes an implementation programme that focuses on pelagic fisheries and consists of seven main action areas:

- Overall policy matrix
- Partnership and resource access
- Institutional modalities
- Legal modalities
- Monitoring, Control and Surveillance (MCS)
- Possible technical measures to regulate fishing
- Possible input controls to regulate fishing

The **Overall policy matrix** consists of two 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
2. Adoption and pursuit of 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
 - e) Use of integrated development strategies and coastal area management models

The **Partnership and Resource Access** is understood through the following sub-components:

1. Facilitation of community-based management (co-management) structures and operational arrangements
2. Provision for community outreach activities with a strong environmental education component
3. Allocation of control of access through community-based arrangements

For **Institutional Modalities**, it is recommended that there be:

1. An Increase in government budget allocations to fisheries research and administrative agencies
2. Encouragement of 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:

1. Generally outdated state of existing legislation
2. Inadequate/non-existent regulations applying specifically to Lake Tanganyika
3. Poor enforcement

For **Monitoring, Control and Surveillance (MCS)** it is recommended that:

1. LTRIMDP be implemented according to the defined workplan, which will be drawn up by PRODAP in the course of 2012
2. Action be taken to 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:

1. Initiate gradual process leading to total retirement/phasing out of beach seining on the lake
2. In the near future, establish and enforce 'beach seining prohibited' areas
3. Encourage gradual reduction of purse seine fishery to levels that prevailed in 2000, either through unit retirement or transfer to other fishing zones

The **possible input controls to regulate fishing** are the establishment and enforcement of registration and licensing ceilings for fishing units.

The Framework Fisheries Management Plan identifies five critical components requiring further investment to develop sustainable fisheries. These include:

1. Fisheries Policy, Planning and Management
2. Fisheries Statistics and Information Systems
3. Monitoring, Control and Surveillance
4. Promotion of Responsible Fishing Operations and Fishing Fleet Restructuring
5. Post Harvest Practices and Trade

Short-term targets (within 5 years): Co-management plans adopted and implemented; stakeholder involvement in co-management strengthened; standards for acceptable fishing practices established and fishing quotas promoted; and fisheries legislation regionally harmonized.

Medium-term targets (within 5 to 10 years): Regional cost-effective monitoring, control and surveillance capacities strengthened; co-management legislations regionally harmonized; and co-management programmes promoted.

Long-term targets (15 to 25 years): Sustainable national and regional Fisheries Management Plan applied in all riparian countries with successful co-management.

Throughout the region, fishermen typically operate their fishing gears where they expect fish to occur, and frequently cross national boundaries. As such, Monitoring, Control and Surveillance (MCS) measures that are taken strictly at national levels may give rise to transboundary conflicts if fishermen are denied access to fisheries resources. Therefore, it is important that MCS activities are coordinated and implemented at the regional level, in order to negotiate access to fishing grounds, for which spatial or temporal licences may be the solution. Access to the fishing grounds could be based on historical rights or practices. The regional approach to access fishing grounds will form an important component of LTA's Framework Fisheries Management Plan. The implementation of a regionally accepted MCS programme is subsequently expected to facilitate increased security on the lake.

3.4.3 Sustainable Ornamental Fisheries

Ornamental fisheries in Lake Tanganyika focus primarily on the capture of cichlid fish species for export. The majority of the targeted species are endemic, rare, localised and hence vulnerable to overexploitation. Although the exact scope of export to overseas markets is unknown, there is evidence that the trade is threatening biodiversity, as it targets vulnerable fish populations that are already under significant pressure from near-shore fisheries and increasing habitat degradation.

The need for improved management is quite high and licensing for export could pay for the enforcement of legislation. Although there are licensing systems in place, these are rarely enforced and have not been updated to reflect market values. At present, monitoring and control of the collection and marketing of ornamental fish is very limited. However, the export is a very specialised trade and could also be monitored from the end market.

Overseas fish breeding could jeopardize fair prices for export products. To guarantee acceptable prices, a solution would be to export only males²¹ after local propagation and domestication. Beside having an economical advantage, this strategy could also reduce pressure on wild stocks of ornamental fish species. Furthermore, a Code of Conduct for Responsible Fish Trading could be considered as a way to improve the current situation.

The export of Lake Tanganyika ornamental fish continues to draw attention to 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 some strategically situated aquaria have been proposed as means of raising awareness.

Short-term targets (within 5 years): List of threatened ornamental fish species established; relevant fish species included on CITES appendices; and regulations, control and monitoring of the ornamental fish trade promoted.

Medium-term targets (within 5 to 10 years): Institutional capacities strengthened to control catches and export of ornamental fish.

Long-term targets (15 to 25 years): Sustainable ornamental fish trade mechanisms applied in all riparian countries with involvement of local communities.

²¹ The males are more colourful and attractive than the females in most cichlid fish species.

Table 5. Strategic Actions to Establish Sustainable Fisheries

Main Threat	Target	Priority	Strategic Actions	Specific Threat Addressed
<i>Unsustainable fisheries</i>	Reduced fishing pressure in the pelagic zone	Very high	• Review and revise national and regional components of the Framework Fisheries Management Plan	• Lack of adequate regulations • Insufficient capacity for monitoring and control • Loss of pelagic fisheries resources • Loss of aquatic biodiversity
			• Establish standards for acceptable practices, including appropriate fishing gears, optimum mesh sizes and fishing quotas	
			• Review and update fisheries licencing procedures	
			• Update fisheries laws and bylaws	
			• Negotiate interim acceptable fleet, and establish plan to reduce future fleet	
			• Build capacity to implement regional, cost-effective monitoring and surveillance programmes	
			• Increase capacity for enforcement of fisheries regulations	
			• Establish general fund for aquatic resources management, fed by fisheries taxes	
			• Increase community involvement in fisheries management	
			• Promote sustainable livelihood alternatives	
	Reduced fishing pressure in the littoral zone	Very high	• Obtain baseline data on present and potential littoral fisheries	• Lack of adequate regulations • Insufficient capacity for monitoring and control • Loss of littoral fisheries resources • Loss of aquatic biodiversity
			• Establish standards for acceptable practices, including appropriate fishing gears, optimum mesh sizes and fishing quotas	
			• Review and update fisheries licencing procedures	
			• Build capacity to implement regional, cost-effective monitoring and surveillance programmes	
			• Increase capacity for enforcement of fisheries regulations	
			• Increase community involvement in fisheries management	
			• Establish protocols and regulations for aquaculture	
			• Promote sustainable livelihood alternatives	
			• Protect critical habitats (see Strategic Component D)	
	Ornamental fisheries controlled and managed	Medium	• Revise list of threatened species, and propose species for inclusion in CITES Appendices	• Lack of adequate regulations • Insufficient capacity for monitoring and control • Loss of aquatic biodiversity
			• Obtain baseline data on present and potential ornamental fishery exports	
			• Review and update ornamental fisheries licencing procedures (species, quantities, sites)	
			• Promote captive breeding of ornamental fish species	
			• Protect critical habitats (see Strategic Component D)	

3.5 Strategic Component C: Sustainable Land Management

Environmental Quality Objective: Erosion and sedimentation rates are reduced through sustainable land management practices

Population growth has led to major increases of land degradation in the Lake Tanganyika catchment basin. Expansion of unsustainable agricultural practices such as slash and burn²², deforestation and grazing are principal causes. Other land management practices that lead to environmental degradation include inadequate urban and infrastructure²³ planning, construction and maintenance. The combined impacts of these activities have three major impacts that ultimately affect the functioning and quality of ecosystem services in the Lake Tanganyika basin:

- *Loss of topsoil and fertility in the catchment.* As vegetative cover is removed, erosion due to weathering increases. With the transport of soil by streams and rivers, nutrients are transferred as well. This can lead to significant losses of soil fertility in the catchment.
- *Landslides.* Loss of topsoil in combination with tectonic activity in the Lake Tanganyika catchment can lead to landslides, often resulting in increased sedimentation, damage to buildings and infrastructure, and loss of lives.
- *Loss of biodiversity and species densities.* Deforestation leads to loss of diversity of plant and animal species, including many that could be useful to humans as a source of food, timber and medication.

²² Slash and burn is an agricultural technique that involves cutting of woodlands before the dry season, and subsequent burning of the remaining vegetation. The resulting ash fertilizes the soil, and burned field is then planted in the beginning of the next rainy season. The field is used until the soil is exhausted, after which a new field is slashed and burnt.

²³ This includes construction of unpaved and paved roads, which can become significant vectors of erosion and sediment transport, particularly during rainy seasons.

Transport of soil from the catchment leads to increased sedimentation into the lake – particularly in relatively shallow near-shore areas, which are most important for aquatic species diversity. As a result of a range of factors, including reduction of water transparency and decrease of habitat quality, this has a detrimental effect on aquatic species diversity as well as densities.

Sustainable land management offers great potential for minimizing land degradation, rehabilitating degraded areas and ensuring the preservation and enhancement of ecosystem services for the benefit of present and future generations. The SAP mainly focuses on two important, interlinked land management issues: agriculture and deforestation. Beside improved sustainable on-the-ground actions, the countries should be encouraged to develop harmonised land use guidelines throughout the basin, in order to avoid that land management objectives in one country negate land management practices in another.

3.5.1 Sustainable Agriculture

Sustainable farming is a major objective in all of the riparian countries. In the Lake Tanganyika basin, suitable land for farming is mostly limited to a few hundred metres at the base of the steep Rift Valley escarpment. Farming is predominantly limited to a narrow range of subsistence crops. 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 farm on steep slopes. In some areas, the fields are only usable for two or three harvests, after which even steeper slopes are cleared. Furthermore, poor access to markets has hampered attempts to increase or diversify production for many farmers.

The focus of strategic interventions to implement sedimentation control through sustainable agriculture should be a targeted programme aimed at specific communities, taking into account local physical, cultural and socio-economic conditions. In some areas in the Lake Tanganyika basin, new practices such as the use of animal manure have been successfully introduced. Tree planting programmes are increasingly common, 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. Other interventions include the promotion of physical conservation structures and improved methods of maintaining soil fertility.

There is also a potential for promoting alternative crops or adding value to production, limiting the need for farming expansion. Examples of value adding activities that are successfully being implemented in the region include bean canning, mango processing, bee-wax processing and crafting of products made from sustainably harvested reed and timber. Specific soil and water conservation initiatives could also be adopted as a part of a wider range of improved farming practices, linked to new opportunities for crops and markets.

Short-term targets (within 5 years): Sustainable agriculture and erosion control best-practice guidelines developed; and successful pilot activities ongoing in targeted, high sediment-load sub-catchment areas within the lake basin.

Medium-term targets (within 5 to 10 years): Institutional capacities strengthened; and sustainable agriculture and erosion control programmes expanded more widely to cover upstream and downstream catchment areas.

Long-term targets (15 to 25 years): Sustainable agriculture and erosion control applied widely and successfully throughout the Lake Tanganyika basin.

3.5.2 Control of Deforestation

Deforestation characterises much of the catchment, and has several causes. Firstly, woodlands are increasingly being cleared for agricultural purposes. Secondly, high timber demands exist for construction and furniture making, charcoal production and fuel wood (e.g. for domestic use, brick and tile-stoves, smoking of fish, processing of palm oil, curing of tobacco and production of traditional beer). Thirdly, there is increasing encroachment on forest areas, resulting from expanding human populations that are in need of places to live.

There is a range of possible interventions against deforestation. In the Lake Tanganyika basin, interventions against deforestation should take a cross-sectoral approach that includes both farming and fishing communities as well as government agencies and environmental NGO's. The immediate response by many forestry authorities has often been 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 adequately managed forest areas, particularly those gazetted to protect critical habitats (see section 3.6.2), the emphasis at the community level has to be on reducing pressure through the provision of alternatives and managed access.

Sustainable agricultural practices need to be introduced and expanded (section 3.5.1.). A wide diversity of fuel-efficient cooking stoves has been successfully piloted in Africa, but they are currently only being used at a small scale in the Lake Tanganyika basin. Furthermore, alternatives to fuel wood and charcoal exists, such as organic fuel briquettes, recycled trash briquettes and solar cooking. Large-scale introduction and promotion of fuel-efficient stoves and fuel alternatives could have a significant effect on deforestation rates.

Enhanced forest management, reforestation and afforestation needs to become a priority at the national and regional levels. There are many possibilities for community-based forest management and afforestation activities, for instance using agroforestry tree and shrub species. Another opportunity exists through the United Nations collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD), which uses direct monetary or other incentives to encourage developing countries to limit and/or roll back deforestation. At present, DR Congo, Tanzania and Zambia receive support to national programme activities through REDD, providing exciting opportunities for sharing of experiences and expansion of actions against deforestation.

Short-term targets (within 5 years): Reforestation and afforestation best-practice guidelines developed; landuse management plans adopted and implemented in targeted sub-catchment areas; and stakeholder involvement in landuse management strengthened.

Medium-term targets (within 5 to 10 years): Institutional capacities strengthened; landuse management legislation regionally harmonized; and reforestation as well as afforestation programmes expanded to cover upstream and downstream catchment areas.

Long-term targets (within 15 to 25 years): Sustainable land use plans and land use practices implemented throughout the Lake Tanganyika basin.

Long-term targets (15 to 25 years): Sustainable landuse management plans and land use practices implemented widely throughout the Lake Tanganyika basin.

Table 6. Strategic Actions to Increase Sustainable Land Management Practises

Main Threat	Target	Priority	Strategic Actions	Specific Threat Addressed
<i>Unsustainable land management</i>	Sustainable agriculture activities increased	Very high	• Review and update existing regulations and bylaws	• Terrestrial habitat degradation • Excessive erosion and sedimentation • Aquatic habitat degradation • Loss of biodiversity
			• Develop and implement sector-specific guidelines for best practice	
			• Implement demonstration activities to provide incentives for recognising good practice across levels of society and governance	
			• Promote soil conservation and anti-erosive agricultural practices, including establishment of sediment traps, and use of curve levels and terraces	
			• Review and promote alternative practises, including rainwater harvesting and irrigation	
			• Promote sustainable agroforestry practices	
	Deforestation rates decreased	Very high	• Review and update existing Land and Forest Acts, ensuring harmonization with Environmental Code	• Terrestrial habitat degradation • Excessive erosion and sedimentation • Aquatic habitat degradation • Loss of biodiversity
			• Strengthen capacity for control and enforcement of regulations	
			• Promote widescale reforestation and afforestation, particularly in erosion-sensitive sub-catchment areas	
			• Increase community involvement in forestry management activities that promote benefit-sharing and improve livelihoods (e.g. private woodlots, agroforestry)	
			• Promote energy-efficient cooking	
			• Promote alternatives for fuel wood and charcoal (e.g. recycled briquettes, solar energy, biogas, hydropower)	
			• Protect critical habitats (see Component D)	
	Sustainable land management strategies in place	Very high	• Facilitate and support government-driven processes to undertake spatial planning	• Habitat degradation • Excessive erosion and sedimentation • Loss of biodiversity
			• Identify land-degradation hotspots, and prioritise interventions in these areas	
			• Research, develop and implement sector-specific guidelines for best practice	
			• Improve urban and infrastructure planning, construction and maintenance to reduce erosion	
			• Build capacity of institutions responsible for environmental impact assessments	
			• Promote participatory landuse planning	
			• Implement long-term monitoring, using remote sensing and GIS to map changes in landuse	

3.6 Strategic Component D: Protection, Restoration and Management of Critical Habitats

Environmental Quality Objective: Critical habitats are protected, restored and managed for conservation of biodiversity and sustainable management

While all proposed actions of the SAP fall within the framework of protecting biodiversity and promoting sustainable use of natural resources, specific actions are required to address the need for protection of critical habitats. Two aspects are important in this respect: firstly, the protection of areas that are key to the conservation of overall terrestrial and aquatic biodiversity and secondly, the protection of spawning and nursery habitats that are essential for the productivity of the fisheries in Lake Tanganyika.

The highest number of species in Lake Tanganyika occurs in rocky habitats in the littoral zone²⁴ (Coulter, 1991). High levels of biodiversity are found throughout the littoral zone of the entire lake, but many species have very limited geographic ranges. As a result, species assemblages are highly structured on a micro-geographical scale and typically change over distances of tens of kilometres along the coastline (Cohen, 1992; Sturmbauer, 2008). Little is known about the littoral habitat use of the juvenile stages of economically important pelagic fish, but there is some evidence that relatively shallow shelf areas are important for spawning and juvenile *Lates* species frequently occur in littoral patches of submerged macrophytes as well as rocky habitats (Coulter, 1991; Munyandorero and Mwape, 2001).

Habitat quality in the littoral zone is mainly threatened by deforestation

and poorly managed coastal development, leading to a loss of terrestrial vegetation and sedimentation, as well as increased pollution. Because of the close linkages that exist between terrestrial and aquatic ecosystems in the Lake Tanganyika basin, and because land degradation within the catchment ultimately also affects the lake itself, aquatic biodiversity conservation cannot be achieved without protection of terrestrial habitats.

Critical habitat protection would not only ensure conservation of biodiversity and important areas for fisheries production, but it would also allow preservation of other valuable ecosystem services. These include reservoir and filter functions for freshwater and genetic resources and recreational services. Furthermore, the tourism industry in the Lake Tanganyika basin could generate substantial additional revenue if protected areas are well managed and biodiversity levels are kept intact.

3.6.1 Improved Protected Area Resource Management

At present, the lake basin includes four formally protected areas²⁵: Gombe Stream, Katavi and Mahale Mountains National Parks in Tanzania and Nsumbu National Park in Zambia. The lakeshore adjacent to these parks includes relatively unimpacted sandy and rocky habitats. Mahale and Nsumbu also include *Neothauma tanganyicensis* shell-beds, which harbour unique assemblages of shell-dwelling cichlids and several small river delta areas, which provide vital habitats for Nile crocodiles and hippopotamus. Both Mahale and Nsumbu National Parks comprise protected aquatic areas that stretches approximately 1.6 km into the lake.

²⁴ In general, the highest species diversity levels in Lake Tanganyika are found between approximately 1-20m depth.

²⁵ 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.

The northern Lake Tanganyika includes the Rusizi River Reserve in Burundi, which covers a delta area that includes emergent macrophyte habitats. The Rusizi River harbours several non-cichlid fish species, some of which are rare, as well as crocodiles and hippos. As a wetland area, the Rusizi delta also offers crucial habitats for a wide diversity of migratory and non-migratory birds, and it is recognized as a Ramsar²⁶ site of global importance. The reserve itself only covers a small terrestrial area, whereas the river or the lacustrine habitats near the Rusizi do not have a protected status.

Increasing land pressure adjacent to the National Parks and Reserve has resulted in increasing encroachment attempts and resource conflicts between parks and neighbouring communities. The problem is compounded by a decline in financial and human resources available to parks from central governments as part of policies promoting decentralized management. Negotiations have taken place about access rights and compensatory mechanisms with local communities, however, these have not always had the desired result. For instance, in Nsumbu National Park fishing communities that traditionally inhabited the area are allowed restricted seasonal access inside the park, during which fishing regulations are often ignored and bushmeat is hunted illegally.

National parks can be major attractions for the tourist industry and recurrent costs of park management should be met from a combination of general government revenues, tax on the tourist industry and entry fees. Inadequately defined national policies governing the purposes and objectives of park management can stymie the reinvestment of funds into protection of biodiversity in these parks. In general, lack of resources for park management also results in a lack of possibilities for law enforcement, which increases the risks of encroachment, illegal fishing, bushmeat hunting and logging of trees inside parks.

²⁶ See <http://www.ramsar.org>

Improved protected area resource management is crucial to the survival of both terrestrial as well as aquatic biodiversity, and as such also to the continued attractiveness of parks to income-generating tourists. Examples exist of effective resource management in the region that can serve as a basis upon which to build further improvement. For instance, Tanzania National Parks Authority (TANAPA) has established procedures to optimise revenue without impairing park resources and has a well-developed program to share benefits with the communities surrounding the national parks.

Short-term targets (within 5 years): National policies governing parks management reviewed and revised, taking into account international best practise for protected area management; stakeholder benefit-sharing and alternative livelihood programs adopted.

Medium-term targets (within 5 to 10 years): Institutional capacities strengthened; stakeholder benefit-sharing and alternative livelihood programs implemented; revenue reinvested in enhanced protected area management.

Long-term targets (15 to 25 years): National Parks and Reserves fully protected; local communities benefiting from revenue generated through tourism and other alternative livelihood activities.

3.6.2 Protection of Critical Habitats

Although both Mahale Mountains and Nsumbu National Parks include protected lacustrine zones, this only represents a small percentage of the total lake shore and is not sufficient to guarantee adequate overall protection of aquatic biodiversity in Lake Tanganyika (e.g. Cohen, 1992; Coulter and Mubamba, 1993). Previous surveys indicate that the Congolese territory hosts high aquatic biodiversity, and particularly Pemba, Luhanga and Bangwe are key habitats meriting protected area

status (Allison *et al.*, 2000). However, no protected areas exist along the Congolese shoreline, even though this represents a major part of the lake.

It is also essential that some protected status is given to wetlands and river deltas. Key areas include the unprotected parts of the Rusizi and Malagarasi River deltas (both wetlands of international importance designated under the Ramsar Convention), the Lufubu and Chisala River deltas, Chituba Bay and the Lukuga effluent. There is a clear 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 local communities. One possibility is to establish micro-scale community-based protected areas throughout the lake basin (Sturmbauer, 2008), preferably adjacent to catchment areas where sustainable agriculture and agroforestry or forestry activities are being implemented for erosion control. Spillover effects²⁷ and targeted harvesting of predatory fish species could offer some incentives for local communities to participate in micro-scale conservation. Eco-tourism²⁸ offers additional opportunities that are currently largely untapped in the Lake Tanganyika basin and could provide possibilities for alternative income generation for communities participating in conservation activities.

Furthermore, coastal zone management (CZM) schemes could offer opportunities to establish integrated conservation and development regimes outside the protected areas. In such a scheme, appropriate protection would be given to specific areas within a wider strategy, including human development needs. Policy in each CZM area would differ according to development opportunities (e.g. fishing) or proximity to population centres, or if they border conservation reserves (Allison *et*

al., 2000)

Short-term targets (within 5 years): Protection status of critical habitats in all four countries reviewed, and contribution of each country to regional aquatic and terrestrial biodiversity protection documented; opportunities explored for expansion of existing protected areas and establishment of new protected areas; guidelines developed for improved critical habitat protection, and adopted by all stakeholders.

Medium-term targets (within 5 to 10 years): Total area of protected critical aquatic and terrestrial habitats increased with at least 10% each; conservation actions being implemented in participation with local communities.

Long-term targets (15 to 25 years): Critical habitats are protected, contributing to mitigating the loss of aquatic and terrestrial biodiversity in the Lake Tanganyika basin, and directly or indirectly benefiting local communities.

²⁷ Spillover effects occur when fish stocks within a protected area are replenished and spill over into non-protected areas.

²⁸ Ecotourism is defined as “responsible travel to natural areas that conserves the environment and improves the well-being of local people”. See: www.ecotourism.org

Table 7. Strategic Actions to Protect, Restore and Sustainably Manage Critical Habitats

Main Threat	Target	Priority	Strategic Actions	Specific Threat Addressed
Critical habitat destruction	Protected area resource management improved	High	• Revise national policies governing parks management and promote adaptive critical habitat management as part of implementation cycle	• Habitat degradation • Loss of biodiversity • Loss of ecosystem services
			• Enhance capacity for monitoring and law enforcement in protected areas	
			• Enhance institutional capacity for adequate parks management	
			• Conduct economic valuation of protected areas	
			• Review or develop procedures to optimise revenue without impairing protected area resources	
			• Improve infrastructure and increase accessibility of protected areas for tourism, taking into account the carrying capacity of the ecosystem	
			• Improve demarcation of protected areas	
			• Increase community involvement in critical habitat protection to promote benefit sharing and improve livelihoods	
	Critical aquatic and terrestrial habitats protected, restored and managed	High	• Implement long-term monitoring of aquatic and terrestrial biodiversity in protected areas	• Habitat degradation • Loss of biodiversity
			• Establish and agree on key indicators for terrestrial and aquatic critical habitats	
			• Identify critical habitats, and document contribution of each country to regional aquatic and terrestrial biodiversity protection	
			• Conduct economic valuation of critical habitats	
			• Develop and implement best practice guidelines for critical habitat management, with focus on an ecosystem approach to mitigate biodiversity loss	
			• Extend existing terrestrial protected areas to encompass a diversity of aquatic habitats	
			• Evaluate and promote possibilities to establish new protected areas	
			• Compensate local communities for expulsion from critical habitats	
			• Increase community involvement in critical habitat protection to promote benefit sharing and improve livelihoods	

3.7 Strategic Component E: Control and Prevention of Biological Invasions

Environmental Quality Objective: Biological invasions are controlled, and future invasions prevented.

Invasive species are often known to dominate the invaded ecosystems and exclude other species. There are many examples known of non-native animal species that have had significant detrimental effects on biodiversity and ecosystem productivity. For instance, the effect of the introduced Nile perch on the diversity of cichlid fish and other species in Lake Victoria has become an iconic example of biodiversity destruction by invasive species (Goudswaard *et al.*, 2008). A number of species of plants and animals have been introduced (intentionally and unintentionally) that did not previously exist in Lake Tanganyika or its catchment basin. Several of these species have become invasive and there is great risk for the establishment of additional biological invasions.

One of the most apparent invasive species in Lake Tanganyika is the water hyacinth, *Eichhornia crassipes*. The water hyacinth is native to tropical America, and has been introduced in the Congo River and Lake Victoria some decades ago. It entered Lake Tanganyika in the late 1990's and early 2000's, possibly from cultivated water gardens where it was grown for its attractive flowers. The hyacinth grows very fast and can double its population in as little as 12 days (Howard, 2008). It is spreading along the lakeshore and in shallow bays and backwaters of the northern end of the lake.

The water hyacinth can prevent sunlight and oxygen from reaching other organisms, and it can cause increased evapo-transpiration (resulting in excessive water loss) as well as accumulation of sediment. The consequences are reduced fish catches and aquatic biodiversity, as well as loss of aesthetic and recreational value of invaded areas. This also applies to many other invasive floating or submerged plants.



Invasive water hyacinth, *Eichornia crassipes* in Lake Tanganyika in Bujumbura; photo courtesy of Geoffrey Howard.



Invasive *Mimosa pigra* near the shores of Lake Tanganyika; photo courtesy of Geoffrey Howard.

Other exotic plant species have been observed and recorded in the lake, but have a more localized distribution. The most visible are the water lettuce, *Pistia stratiotes*, the red water fern, *Azolla filiculoides* (both exotic floating water plants), *Potamogeton* sp. (probably *P. crispus*), and *Hydrilla verticillata* (Howard, 2008).

A number of non-native fish species have also been introduced to the lake over the last decades, including *Oreochromis niloticus niloticus*. These introductions need to be monitored closely to ensure that they are not spreading and cause deleterious effects on the fisheries and on aquatic biodiversity. Significant risks derive from possible use of non-native species in aquaculture (either in the catchment or in the lake itself). Aquaculture inevitably results in escapes, which may be harmful to the lake and its biodiversity.

Invasion by freshwater crayfish also poses a serious threat to biodiversity in the Lake Tanganyika basin. There are no native crayfish in continental Africa, but they have been introduced for aquaculture purposes. There are already two species of freshwater crayfish that have dispersed into neighbouring watersheds: the Louisiana crayfish, *Procambarus clarkii* (native to the USA) is in the Nile River system as well as in Lake Bunyoni, Lake Edward and smaller lakes in Rwanda and *Cherax quadricarinatus* (native to Australia) is in the Zambezi system (Howard, 2008). Crayfish have little competition from other macro-invertebrates in Africa and they are voracious omnivores that reproduce quickly, are highly adaptive to different environmental circumstances and are able to disperse significant distances over land (Smart *et al.*, 2002).

Furthermore, several plant species have become invasive in the Lake Tanganyika basin, including *Lantana camara*, *Mimosa diplotricha*, *M. pigra*, *M. pudica*, and *Tithonia diversifolia* (Howard, 2008), which can become a problem to both terrestrial biodiversity as well as agricultural productivity.

Control and Prevention of Biological Invasions

The actions proposed here consist of assessment of the extent and impacts of biological invasions through a monitoring programme, mechanical and biological control, awareness creation and capacity building in the understanding of biological invasions and how to prevent and manage them. The following measures would be recommended:

- **Monitoring:** An important aspect of taking steps to reduce the threat of biological invasion is to monitor Lake Tanganyika and its catchment basin in a systematic way to detect any changes in the presence of species or populations. This requires a programme of regular observation and sampling. Monitoring also allows for the establishment of an early warning and response system.
- **Prevention:** The first line of defense against invasive species is to prevent their introduction. This is the most cost-effective option.
- **Eradication:** If prevention has failed and an introduced species is becoming invasive, eradication is the preferred course of action before the invasion does serious damage and spreads.
- **Control:** The last step in the sequence of management options is the control of an invasive species when eradication is no longer feasible. The aim of control is to reduce the density and abundance of an invasive organism to keep it below acceptable threshold. Control can be done mechanically, chemically, biologically and by habitat management.

Furthermore, it is important to monitor if the prevention, eradication or control measures taken are sufficiently effective and adapt management strategies if needed. It would also be recommended to coordinate actions with other national and regional management programmes, to ensure that the threats of biological invasions are addressed as widely as possible.

Short-term targets (within 5 years): Baseline monitoring implemented; stakeholders' capacity built in order to understand biological invasions and how to prevent and manage them; and appropriate physical, chemical and biological control programmes promoted.

Medium-term targets (within 5 to 10 years): Regional monitoring programme ongoing to regularly assess the extent and impacts of biological invasions; preventive measures in place; and existing biological invasions managed in order to control further spreading.

Long-term targets (15 to 25 years): Regional monitoring and management of existing invasions continues, and new biological invasions are prevented.

Table 8. Strategic Actions to Control and Prevent Biological Invasions

Main Threat	Target	Priority	Strategic Actions	Specific Threat Addressed
Biological invasions	Existing biological invasions controlled, and future invasions prevented	Medium	• Establish long-term national and regional monitoring programmes to assess extent and impact of biological invasions in terrestrial and aquatic ecosystems	• Decreasing ecosystem productivity • Alteration of economic use of invaded areas • Loss of biodiversity
			• Establish early warning and response systems.	
			• Review and revise regulations relevant to import and use of exotic species in agriculture, agroforestry and aquaculture	
			• Assess the extent and impact of relocation of ornamental fish species	
			• Build capacity to enforce regulations and implement adaptive management responses in order to control and prevent biological invasions	
			• Promote appropriate physical, chemical and biological eradication and/or control methods	
			• Promote reduction of eutrophication (see Component F)	
			• Conduct economic valuation, and raise awareness about economic loss resulting from (potential) biological invasions	
			• Promote community participation in control of invasive species	
			• Coordinate invasive species actions with national and regional programmes	
			•	

3.8 Strategic Component F: Reduction of Pollution and Improvement of Water Quality

Environmental Quality Objective: Pollution is reduced and water quality is improved to meet regionally agreed standards

With growing human populations, increasing urbanisation and industrialisation and the prospect of exploration and future production of oil in the Lake Tanganyika basin, pollution is becoming an increasing threat. Pollution sources are many, including domestic and industrial waste, as well as agricultural runoff. Collection and treatment of sewerage and solid waste is inadequate or non-existing in many places around Lake Tanganyika. Pollution effects can build up nearshore, causing risks for both biodiversity as well as human health. Furthermore, water in Lake Tanganyika has an average residence time of 440 years, and its flushing time is estimated to 7,000 years (Bootsma and Heck, 1993). As such, pollution takes significantly longer than in most lakes to be naturally removed from the aquatic ecosystem.

Regionally harmonized effluent and water quality standards and continuous national and regional monitoring of water quality is needed to guarantee safety for bathing and drinking. Improving water quality also requires a reduction of suspended solids and enhanced land management to reduce soil erosion (this is addressed under Strategic Component C).

3.8.1 Reduced 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 lakeshore, Bujumbura, has major industries discharging significant quantities of wastewater that eventually pass into

the lake. Polluting industries include the production of soap, paint, tannery, slaughterhouses, pharmaceuticals, other chemicals and oil depots and garages. Although at a smaller scale, similar sources of pollution also exist in the four other major towns along the lakeshore, Uvira, Kigoma, Mpulungu and Kalemie. Palm-oil production causes pollution near rivers throughout many parts of the lake basin. Solid waste is also a growing problem, as it is typically not collected or processed adequately, causing ground and lakewater pollution.

In addition, an increasing volume of domestic waste and effluents and inadequate or no wastewater treatment is an issue of concern. Even where settlements were originally planned to incorporate sewage and solid waste management, their growth has outstripped the planned capacity of local waste disposal systems, and untreated wastewater gets discharged directly to the lake. Monitoring and control of pollution requires commitment of local government and the communities involved, as well as major financial investments. Benefits to human health are immediate, with improved water quality benefiting many direct users. Long-term benefits for biodiversity and fisheries relate to a reduction of nutrient loads and leachates from solid waste disposal in the floodplain.

Short-term targets (within 5 years): Effluent and water quality standards developed and regionally harmonized; improved wastewater treatment plans developed and piloted; solid waste collection and treatment plans developed and piloted in each of the riparian countries.

Medium-term targets (within 5 to 10 years): Institutional capacities strengthened to enforce effluent standards; adequate sewage and solid waste management systems constructed in urban settlement on the lakeshore.

Long-term targets (15 to 25 years): All urban settlements on the lakeshore have adequate sewage and solid waste management systems, and their effluents and water quality meet regional standards.

3.8.2 Reduced Agricultural Pollution

Studies conducted in the northern part of the Lake Tanganyika basin demonstrated bio-accumulation of persistent organochlorine pesticides including DDT in several species of commercially important fish (Manirakiza *et al.*, 2002). Although the levels found in 2002 were not remarkably high, with agricultural activities evolving from extensive to intensive production systems, pesticides and chemical fertilizer use is also increasing. The shift from extensive to intensive agricultural production systems is likely to lead to non-source pollution and overall eutrophication if preventive actions are not taken.

Short-term targets (within 5 years): Legislation relevant to agricultural pollution revised and regionally harmonized.

Medium-term targets (within 5 to 10 years): Regional legislation on agricultural pollution enforced; and sustainable bio-control and fertilizing alternatives promoted.

Long-term targets (15 to 25 years): Use of pesticides in the Lake Tanganyika basin reduced to minimum; and sustainable fertilizing alternatives widely adopted.

3.8.3 Reduced Harbour Pollution

Accidental contamination from spillage during transfer of cargo, waste dumped from boats and shoreline factories make harbours a significant source of pollution. The majority of existing harbour facilities are designed for low volumes of traffic and they become over-stretched by high traffic volumes. Pollution problems are expected to occur with increasing traffic such as the transport of oil and other chemicals.

Short-term targets (within 5 years): Safety and pollution legislation and standards reviewed and regionally harmonized.

Medium-term targets (10 to 15 years): Institutional capacities strengthened to monitor and enforce regulations; emergency response systems in place, and preventive actions implemented against pollution from oil and other chemicals.

Long-term targets (15 to 25 years): Harbours managed in accordance to regionally agreed standards; vessels and cargo handling adhere to regionally agreed standards; water quality in and near harbours meets regionally agreed standards.

3.8.4 Reduced Lacustrine Traffic Pollution

Hazardous cargo such as oil and other toxic substances are transported across Lake Tanganyika with little monitoring of correct storage or handling. As the riparian countries continue to develop their industrial potential, the volume of traffic and the range of cargo are expected to increase. Existing legislation in the four countries deals with design of vessels and cargo handling, but this needs to be reviewed in the light of increasing traffic and range of hazardous cargo. Furthermore, with increasing lacustrine traffic, solid and liquid waste disposal from boats is becoming a growing pollution concern that needs to be monitored and addressed.

Short-term targets (within 5 years): Lake transport and traffic regulations reviewed and regionally harmonized; safety legislation and standards reviewed and regionally harmonized.

Medium-term targets (10 to 15 years): Institutional capacities strengthened in order to effectively monitor and enforce marine safety standards; national emergency response capacity developed for disaster management.

Long-term targets (15 to 25 years): Ship vessels and cargo handling adhere to regionally agreed safety standards.

3.8.5 Reduced Pollution from Mining Activities

Gold mining is carried out in several places within the Lake Tanganyika basin, including the upper catchment of the Malagarasi in Tanzania. It involves the use of mercury in processing, which is dangerous to human health if it accumulates in groundwater and fish. Recent studies have indicated a possible trend of increased mercury concentrations in the lake basin (Taylor *et al.*, 2005; Campbell *et al.*, 2008). Some fish species including *Ctenochromis horei*, *Neolamprologus boulengeri*, *Bathybates* spp., *Mastacembelus cunningtoni*, *Clarias theodora*, *Lates microlepis* and

Polypterus congicus may present a risk to human fish consumers according to World Health Organisation and International Marketing Limit guidelines. *Lates microlepis* and *Clarias theodora* have sufficiently elevated mercury concentrations approaching or exceeding IML guidelines (Campbell *et al.*, 2008). Monitoring of mercury concentrations of important market fish from higher trophic positions would be recommended to reduce human health risks.

There are also agreements for the exploitation of a nickel resource in the Burundi part of the Malagarasi Basin. A nickel processing factory would 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.

Short-term targets (within 5 years): Mines Acts and Regulations regionally reviewed and harmonized.

Medium-term targets (10 to 15 years): All mining activities in the lake basin are implemented in accordance with regionally harmonized Mining Acts and Regulations; institutional capacities strengthened for monitoring and enforcement.

Long-term targets (15 to 25 years): The quality of water near mining activities meets regional standards.

3.8.6 Reduced Risks Related to Petroleum Exploration and Production

Economically viable oil fields may exist in the Lake Tanganyika basin. Licences for inshore and offshore petroleum exploration have been issued for blocks in DR Congo, Burundi and Tanzania. It is clear that precaution must be taken before any action, because petroleum exploration and production are known to cause grave pollution risks for aquatic and terrestrial ecosystems. Beyond the environmental assessment that must take place before exploration, contingency plans and an intervention plan with the necessary resources must be set up for emergency action in case of spill and other environmental hazards.

Short-term targets (within 5 years): Petroleum exploration and production legislations developed and regionally harmonized; intervention plans in place for emergency action in case of spill and other environmental hazards.

Medium-term targets (10 to 15 years): All inshore and off shore petroleum exploration and production activities are undertaken in accordance with regionally harmonized petroleum exploration and production legislations.

Long-term targets (15 to 25 years): The quality of water near petroleum exploration and production activities meets regional standards.

Table 9. Strategic Actions to Decrease Pollution and Improve Water Quality

Main Threat	Target	Priority	Strategic Actions	Specific Threat Adressed
Increasing pollution	Urban and industrial pollution reduced	High	• Revise and regionally harmonise national effluent discharge standards	• Decline in water quality • Decline in air quality • Risks for human health • Loss of biodiversity
			• Strengthen capacity for monitoring of water quality and ensure that monitoring data feeds into adaptive management actions from relevant institutions	
			• Establish and enforce environmental regulations for production and disposal of hazardous products (e.g. paint, batteries, chemicals, plastics)	
			• Enhance wastewater treatment capacity in all major urban settlements on the lake shore	
			• Improve water and sanitation facilities for urban and rural populations	
			• Encourage private industries to establish wastewater pre-treatment facilities and implement appropriate pollution control measures	
			• Promote garbage collection and enhance capacity to establish controlled waste disposal sites in all major urban settlements on the lake shore	
			• Increase capacity of institutions responsible for Environmental Impact Assessments, and ensure enforcement of EIA prior to industrial development	
			• Raise awareness on the health hazards of pollution	
			• Research and promote alternative processing of waste and by-products (e.g. recycling, biogas)	
	Agricultural pollution reduced	Medium	• Review, update and regionally harmonize legislation relevant to agricultural pollution	• Decline in water quality • Risks for human health • Loss of biodiversity
			• Assess impact of herbicides on water quality in the catchment and the lake	
			• Research and promote sustainable bio-control alternatives to pesticides	
			• Assess impact of fertilisers on water quality in the catchment and the lake	
			• Research and promote sustainable fertilizing alternatives	
	Harbour pollution reduced	Medium	• Review and harmonize regulations (including Lake Traffic Act, navigation rules, pollution and security standards, resolutions on transport of hazardous cargo)	• Decline in water quality • Risks for human health • Loss of biodiversity
			• Strengthen capacity for monitoring and enforcement of regulations	
			• Assess and monitor impact of harbour pollution on water quality	
			• Establish shipyards for adequate maintenance of ships	
			• Establish shortterm emergency response systems, and implement longterm remedial and preventive actions for pollution from oil and other chemicals	
			• Increase capacity of institutions responsible for Environmental Impact Assessments, and	

Main Threat	Target	Priority	Strategic Actions	Specific Threat Adressed
Increasing pollution			ensure enforcement of EIA prior to harbour developments	
	Pollution from lacustrine traffic reduced	Medium	• Review and harmonize regulations (including Lake Traffic Act, navigation rules, pollution and security standards, resulations on transport of hazardous cargo)	• Decline in water quality • Risks for human health • Loss of biodiversity
			• Strengthen capacity for monitoring of lacustrine traffic and enforcement of regulations	
			• Monitor pollution impacts of waste disposal from boats and ensure enforcement of regulations	
			• Establish shortterm emergency response systems, and implement longterm remedial and preventive actions for pollution from oil and other toxins	
	Pollution from mining reduced	Medium	• Review and update regulations (e.g. Mining Acts) to ensure that environmental impacts are sufficiently taken into account	• Decline in water quality • Risks for human health • Loss of biodiversity
			• Strengthen capacity for sustainable management and control of mining activities	
			• Sensitize local administrations and organize mine workers in associations to support best mining practices	
			• Increase capacity of institutions responsible for Environmental Impact Assessments, and ensure enforcement of EIA prior to licencing of mining activities	
			• Promote appropriate mining technologies	
			• Raise awareness on environmental and human health hazards of pollution from mining activities (e.g. mercury accumulation in aquatic foodwebs)	
	Risks related to petroleum exploration and production reduced	High	• Review and update regulations (e.g. Mining Acts) to ensure that environmental impacts are sufficiently taken into account	• Decline in water quality • Risks for human health • Loss of biodiversity
			• Strengthen capacity for enforcement of regulations	
			• Review lessons learnt from petroleum exploration and production elsewhere and incorporate these in recommendations for best practice	
			• Establish an emergency-response fund and action plans in case of petroleum spills	
			• Increase capacity of institutions responsible for Environmental Impact Assessments and ensure enforcement of EIA prior to licencing of petroleum exploration and production	



Photo courtesy of Alain Gashaka: Uvira City on the shores of Lake Tanganyika in DR Congo

PART 4: IMPLEMENTATION AND FUTURE EVOLUTION OF THE SAP

Underlying the Strategic Action Programme is the recognition of the need for integrated management of what might appear to be single sector problems, but are in fact multi-sectoral in nature. In addition, the cause of environmental threats often involves complex socioeconomic and political situations, which usually require multidimensional solutions.

The process of SAP implementation typically occurs in three phases, which are described below. These phases are general in character and may not necessarily apply to all aspects of the programme. Several components of the SAP are more advanced in some countries than in others, and some steps of the implementation process might be skipped.

Catalytic phase: Action is taken to address key priorities that are essential to the success of the programme and that lay the foundation for the next phase.

Mainstreaming phase: Major components of the strategy are incorporated into the programmes of responsible agencies and stakeholders.

Consolidation and long-term sustainability phase: Long-term objectives of the programme are achieved and their sustainability ensured.

The Lake Tanganyika Authority Secretariat (section 1.5.2) will serve as the main repository of the SAP and is responsible for coordination of its implementation as well as for future updating processes. Implementation of the SAP is ongoing, and started with two projects under the Lake Tanganyika Regional Integrated Management and Development Programme (section 1.5.3). The projects under the LTRIMDP recognize this need for integrated strategies, and focus both on environmental management as well as sustainable development activities.

4.1 Approaches and Conditions for Effective Implementation

The successful future implementation of priority actions on conservation and sustainable management described in this document will depend on a number of general approaches and conditions, which are briefly discussed below.

4.1.1 Ecosystem Approach

Lake Tanganyika and its basin comprise intricate ecological interrelationships between aquatic and terrestrial systems. Environmental degradation high up in upper reaches of the catchment can ultimately affect biodiversity in the lake. To enhance sustainability of regional conservation and management interventions in such complex, interlinked systems, an ecosystem approach²⁹ is needed. The ecosystem approach is a strategy for integrated management of land, water and living resources. The approach is based on the application of appropriate scientific methodologies focused on levels of biological organisation, which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity are an integral component of ecosystems and promotes conservation and sustainable use in an equitable way.

The ecosystem approach also recognizes that in order to tackle biodiversity loss and other environmental issues, poverty alleviation is key. It should be noted that although the conservation of biodiversity and sustainable use of natural resources has benefits at both global and local

²⁹ As described by the Conference of the Parties, the ecosystem approach is the primary framework for action under the Convention on Biological Diversity. See: www.cbd.int/ecosystem

levels, the cost of conservation (in terms of constraints on natural resource exploitation) are met by local communities. Therefore, it is important that strategies aimed at alleviation of environmental degradation integrate actions to develop and strengthen sustainable livelihoods.

4.1.2 Environmental Education

Environmental education at all levels of society is fundamental to the achievement of the goals outlined in the SAP. Environmental education is a primary agent for social change towards sustainable development and should encompass the wide variety of environment and development issues that affect and are affected by human activities and natural phenomena (UNEP, 2005). It should not only focus on raising awareness, sensitivity, knowledge and understanding about the environment and environmental challenges, but also teach people about the advantages and possibilities of a sustainable society.

The LTA Secretariat fosters environmental education and has implemented a range of relevant awareness raising activities in the riparian countries of Lake Tanganyika, with support of the UNDP/GEF Project and PRODAP. In the future, these activities should be expanded at both national and regional levels. Ultimately, the goal is to ensure protection of the environment and improvement of people's quality of life, by developing environmental education initiatives that are responsive, locally relevant and aimed at transforming people's visions and aspirations into reality for present and future generations. The following aspirations should be taken into account in order to achieve the goals of the SAP:

- Provide people with opportunities to develop awareness, knowledge, skills and commitment in order to protect and improve their environment.

- Incorporate environment and development dimensions into the educational processes of all four riparian countries.
- Encourage environmentally-friendly behaviour and sustainable lifestyles and foster ethical responsibilities.
- Sensitise individuals, groups, communities and countries to their ecological, economic, social and cultural interdependence.
- Increase general environmental and development awareness.

4.1.3 Socioeconomic Development and Governance

There is invariably a need for socioeconomic development and appropriate governance as components of sustainable development initiatives. In large parts of the Lake Tanganyika basin, demographic growth and population dynamics are significantly higher than resource production. As a result, socioeconomic inputs such as review of alternative livelihoods and food security, cultural opportunities and patterns of resource use, gender issues and participatory approaches to management, should be taken into account for appropriate interventions. Where a decision is to be made for a number of separate national or regional simultaneous actions, these recurring socioeconomic actions should be managed as a single supporting component.

4.1.4 Capacity Building and Institutional Reform

Several challenges have been identified in the TDA that can affect the implementation of the SAP, including lack of capacity, poor enforcement of regulations, lack of appropriate regulations and lack of institutional coordination. The LTA Secretariat attempts to address several of these challenges at the regional level, but reform and capacity building is also needed at the national level.

Capacity building should take into account training as well as physical infrastructure development. National research and management

institutions should have access to the appropriate technologies and information resources to allow efficient sharing of information. In some cases, reform is needed to allow the establishment of sustainable revenue generation mechanisms. For instance, adequate implementation of the “polluter pays” principle and enhanced monitoring and levying of fisheries resources could increase funding for national as well as regional institutions. Important in this aspect is the implementation of legal reviews and revisions, as well as regional harmonisation of environmental and fisheries policies and regulations.

4.1.5 Information Management

The effective management of the natural resources in the Lake Tanganyika basin 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. Much of this information will have wider relevance and should be used to support other interventions. There is a clear need to provide resources to a central information service, responsible for maintaining a GIS database, a literature reference system and other shared data sources. The LTA in collaboration with the UNDP/GEF Project has established a website, which should eventually also function as a clearinghouse mechanism through which relevant data can be disseminated: www.lta-alt.org³⁰

4.1.6 Environmental Monitoring

To ensure sustainable management of the biodiversity and natural resources of Lake Tanganyika and its basin, long-term 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 and NIGLAS aims to establish a Regional Integrated Environmental Monitoring Programme (RIEMP). This will incorporate 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, wildlife, 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 to establish a basis for implementation of Lake Tanganyika monitoring programme. The stakeholders agreed that monitoring activities should be consistent with the SAP, and inform the long-term management of the natural resources in the Lake Tanganyika basin. Monitoring of parameters relevant to water quality, fisheries, biological invasions, erosion and climate change were identified as important to allow for analyses of biodiversity as a function of these different threats.

To ensure sustainability, the RIEMP will focus on low-cost multidisciplinary monitoring activities using appropriate technologies that

³⁰ The LTA website was developed with support from the GEF International Waters Learning and Exchange Resources Network (IW-LEARN, see <http://iwlearn.net>). The LTA website can also be accessed through: www.lta.iwlearn.org

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 adopted.

4.1.7 Financing SAP Implementation

Implementing the SAP requires mobilization of considerable financial resources. The preparation of the SAP and the first stages of its implementation were made possible with funding from the AfDB, GEF, IUCN and NDF and substantial contributions from the governments of the riparian countries. The LTA Secretariat will be taking the lead in coordinating the mobilization of financial resources for the next stages of SAP implementation, at the national and regional as well as at the international level. The governments of the riparian countries are expected to generate a significant part of the funding, partly through innovative financing arrangements (e.g. use of economic instruments and incentives), and allocation of core government budgets, as well as by attracting donor support.

Funding sources could involve:

- General public funding (allocated through national/local budgets).
- Private financing.
- Economic instruments.
- Grants and loans.

Specific funding arrangements for the national policies and measures agreed on in the SAP will be presented to national authorities for consideration on the basis of the National Action Plans, or similar national planning instruments, being developed by each of the riparian countries.

Under the coordination of the LTA Secretariat, targeted projects involving appropriate partners will be prepared for submission to bilateral or/and multilateral funding agencies. NGOs play an important role in the implementation of the SAP, and it is expected that they will continue to raise funds for specific activities that are within the area of their interest and expertise. Furthermore, the LTA Secretariat is expected to convene donor conferences to create awareness and generate support among bilateral and multilateral donor agencies for the financing needs of the activities that are stipulated in this SAP.

4.1.8 Linking the SAP to National Policies and Action Plans

Integration of the proposed actions into the framework of environmental policy including biodiversity strategies, environmental assessment and ecosystem services valuation, is an important crosscutting issue. In addition to being parties of the Convention on the Sustainable Management of Lake Tanganyika, the four riparian countries are parties to a number of international agreements, including the Convention on Biodiversity, the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol of the UNFCCC, the United Nations to Combat Desertification and Drought, and the Ramsar Convention on Wetlands. As such, these countries are implementing several of the provisions of these treaties, including those relating to conservation of biodiversity and sustainable use of natural resources.

Each of the four countries also has a number of existing National Action Plans and policies that address topics pertinent to the implementation of the SAP, including National Environment Policies, Water Sector Policies

and Strategies, Fisheries Policies, Forest Policies, Biodiversity Strategy and Action Plans, and Adaptation Plans of Action for Adaptation to Climate Change (see Annex IV).

To ensure clear links with relevant national action plans and policies, the LTA in collaboration with the UNDP/GEF Project is supporting the development of National Action Plans for implementation of the SAP.

4.2 Monitoring and Evaluation of SAP Implementation

The Convention on the Sustainable Management of Lake Tanganyika requires that “the Contracting States shall monitor the effectiveness of the strategic action program and shall revise it as necessary” (Article 13, paragraph 3 of the Convention). The LTA Secretariat will be responsible for overall coordination, monitoring and evaluation of the implementation of the SAP. The specific results-based indicators of the SAP that are presented in Annex I will guide the monitoring and evaluation process.

The LTA Secretariat established a regional framework for progress monitoring of the projects that are implemented under the LTRIMDP, which will be updated and linked to the current SAP. The LTA Secretariat objectively monitors the implementation of SAP components, in a participatory and transparent manner. The Secretariat prepares bi-annual progress reports that are formally submitted twice a year to the National Steering Committees of the riparian countries. Furthermore, official reporting of the SAP implementation progress is done by the LTA Secretariat during the annual ordinary meetings of the Management Committee and the Conference of Ministers.

The updated information on the agreed results-based indicators generated through the monitoring and evaluation process will also serve

as an important tool to ensure that emerging issues are identified that need to be taken into account for the periodic updating of the SAP.

4.3 Future Evolution of the SAP

The proposed actions in this document are based on the best available knowledge, drawing on the most recent scientific findings as well as considerable experience of those using and managing the resources in the Lake Tanganyika basin. However, even as the actions described in this document are undertaken, the environmental and socio-economic situation in the region will continue to change.

As the objectives and the actions within the SAP will need to be continuously adapted to the changing environment and policies, the proposed interventions and the participating stakeholders are to evolve as well. New activities in the Lake Tanganyika basin may require new responses to protect biodiversity. New opportunities may be developed to make better and more sustainable use of the natural resources. New research may allow proposed actions to be refined and may define the need for further interventions.

The Contracting States of the Convention on the Sustainable Management of Lake Tanganyika bear the responsibility to facilitate timely revision and updating of the SAP as required, in order to ensure protection and sustainable management of the shared heritage and richness of Lake Tanganyika and its basin for the present and future generations. In view of this, it is expected that the LTA will assess the need to update the SAP every year during the annual ordinary meetings of the Conference of Ministers. The LTA Secretariat will subsequently facilitate the updating process. Given the current rate of environmental, political and socio-economic change in the Lake Tanganyika basin, it is expected that specific updates of the SAP will need to take place at least once every five years.



Delegates and Observers at the 5th Ordinary Meeting of the Conference of Ministers of the Lake Tanganyika Authority held at Kigoma – Tanzania on 29th February, 2012. **The Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of Natural Resources in Lake Tanganyika and its Basin** was endorsed by the Ministers at the end of the meeting.

ANNEXES

Annex I Result-based Indicator Framework

Strategic Component A: Adaptation to Climate Change Impacts

Objective/Target	Verifiable Indicators
Aquatic and terrestrial ecosystems as well as human societies are sufficiently resilient to adapt to the impacts of climate change and variability	• Adequate awareness on the impacts of climate change and variability • Sustainable livelihood alternatives developed, adopted and widely implemented at regional and national levels to adapt to the impacts of climate change and variability • Harmonized legal framework for adaptation to climate change impacts in place at regional and national level • Regional monitoring, early warning and response systems developed, adopted and implemented

Target	Baseline	Short-term results (2015)	Medium-term results (2020)	Long-term outcomes (2025)	Risks and assumptions
1. Enhanced resilience of aquatic and terrestrial ecosystems	Aquatic and terrestrial ecosystems under stress from a range of environmental and human impacts, decreasing their resilience	• Awareness of riparian communities, local authorities and stakeholders raised • Sustainable livelihood alternatives adopted and implemented; • Emergency funds for climate change adaptation programmes established	• Regional institutional capacities in monitoring, early warning and response systems strengthened • Regionally harmonize legal framework for adaptation to Climate Change Impacts in place; • Increased resources and financial mechanisms for adaptation to climate change in place	• Increased preparedness and capacity to adapt to climate change impacts in all the riparian countries with involvement of all the stakeholders • Improved knowledge-base, monitoring and information-management mechanisms on climate change impacts	• Adequate political and community will • Adequate institutional capacity and financial resources for implementation

Strategic Component B: Sustainable Fisheries

Objective/Target		Verifiable Indicators			
Healthy fish stocks, which are adequately managed to sustain future populations		- Adequate awareness of the importance of co-management fisheries approaches - Co-management fisheries practices developed, adopted and widely implemented at regional and national levels as tool for fisheries management on Lake Tanganyika - Fisheries co-management policies, plans and legislation in place in all countries - Harmonized legal framework for fisheries management in place at regional and national levels - Regional Monitoring and surveillance system developed, adopted and implemented			

Target	Baseline	Short-term results (2015)	Medium-term results (2020)	Long-term outcomes (2025)	Risks and assumptions
1. Reduce excessive fishing pressure in the littoral zone	Most of the littoral zone is under heavy pressure from both artisanal and subsistence fishermen using a range of gears	- Awareness of fishing communities, local authorities and stakeholders raised; - Co-management plans adopted and implemented; - Communities and stakeholders involvement in co-management strengthened.	- Regional institutional capacities in monitoring and surveillance strengthened - Regionally harmonized co-management legislations; - Community-based management programmes promoted.	Regional monitoring and surveillance programme and community-based fisheries management practices implemented in Lake Tanganyika.	- Adequate political and community will; - Adequate institutional capacity and financial resources for implementation
2. Reduce excessive fishing pressure in the pelagic zone	There is excessive fishing pressure in the pelagic zone	- Awareness of fishing communities, local authorities and stakeholders raised - Standards for acceptable fishing practices established - Fishing quotas promoted and licensing reviewed	- Regional and cost-effective monitoring, control and surveillance established - National and regional institutional capacities strengthened - Fisheries legislation regionally harmonized	Sustainable national and regional Fisheries Management Plan applied in all the riparian countries with involvement of all the stakeholders	- Adequate political will at national and regional level; - Adequate institutional capacity and financial resources for implementation
3. Control and manage Ornamental Fisheries	Little control and monitoring of the collection and marketing of ornamental fisheries	- Awareness of fishing communities, local authorities and stakeholders raised; - List of threatened species established; - Regulations, control and monitoring aquarium trade promoted.	- Institutional capacities to control extraction and exporting strengthened; - Protected areas with management plans including ecotourism development established and promoted.	- Protected areas with management plans applied in all the riparian countries contributing to preventing and managing relevant cichlid species; - Relevant cichlid species included on CITES appendices	- Adequate political and community will; - Adequate institutional capacity and financial resources for implementation

Strategic Component C: Sustainable Land Management

Objective/Target	Verifiable Indicators
Erosion and sedimentation rates in the Lake Tanganyika Basin are reduced to allowable levels through sustainable land management practices	• Adequate awareness of the importance of good sustainable agriculture practices and forest management • Sustainable agriculture practices developed, adopted and implemented at regional and national levels • Participatory forest management mechanism developed and widely utilized as a tool for forest management regime in target forests in the catchment basin • Land conservation and reforestation programmes in catchment area promoted at regional and national levels • Participatory forest management policies, plans and legislation in place in all countries • Harmonized legal framework for transboundary catchment ecosystem management in place at regional and national levels

Target	Baseline	Short-term results (2015)	Medium-term results (2020)	Long-term outcomes (2025)	Risks and assumptions
1. Promotion of Sustainable Agriculture	Basic awareness of Sustainable Agriculture existing and being implemented in very small areas	• Awareness of target riparian community groups raised • Regional best-practice guidelines and strategy for sustainable agriculture developed and implemented	• Institutional capacities to implement sustainable agriculture strengthened • Sustainable agriculture programmes promoted.	• Sustainable agriculture practiced in catchment area of the lake results in allowable sediment loads into the Lake	• Capacity to promote and implement sustainable agriculture practices • Adequate buy-in at political and community levels
2. Deforestation rates decreased in the Lake Tanganyika catchment area	Most of the lake catchment is characterized by deforestation as result of agricultural expansion and the demand for wood energy	• Awareness of communities, local authorities and stakeholders raised • Catchment management plans adopted and implemented • Communities and stakeholder involvement in catchment management strengthened	• Institutional capacities Strengthened • Legislation catchment management regionally harmonized • Land conservation and reforestation programmes promoted.	• Land conservation and reforestation programmes in catchment area of the lake result in allowable sediment loads into the Lake	• Capacity to promote and implement Catchment management plans • Adequate buy-in at political and community levels

Strategic Component D: Protection, Restoration and Management of Critical Habitats

Objective/Target	Verifiable Indicators
Critical habitats in the Lake Tanganyika Basin are protected, restored and managed for conservation of biodiversity and sustainable management.	• Adequate awareness of the importance of good marine and coastal management • Critical habitats identified, assessed, documented and mapped at regional and national levels • Conservation plans and monitoring framework for critical habitats developed, adopted and implemented at regional and national levels • Co-management policies, plans and legislation in place in all countries • Harmonized legal framework for transboundary ecosystem management in place at regional and national level

Target	Baseline	Short-term results (2015)	Medium-term results (2020)	Long-term outcomes (2025)	Risks and assumptions
1. To improve resource management of protected area by associating an adjacent aquatic zone with an existing terrestrial national park or reserve	Protection of adjacent aquatic zones undertaken on a limited scale and community conflicts exist	• Awareness of target riparian community groups raised • Guidelines for co-management and zoning developed and implemented	• Institutional capacities to implement co-management and zoning strengthened • co-management and zoning programmes implemented	• Protected critical aquatic habitats adjacent to parks and reserves established and contributing to mitigating habitat loss in the lake.	• Adequate political and community will for co-management approaches • Adequate institutional capacity for implementation of zoning and co-management approaches
2. Conservation of sensitive coastal habitats	Conservation of sensitive coastal habitats undertaken on a limited scale and community conflicts exist	• Awareness of local communities and stakeholders raised; • Conservation guidelines with community involvement regionally developed and agreed • Sensitive coastal habitats identified for conservation	• Institutional capacities Strengthened • Regionally harmonize legislation for conservation of sensitive coastal habitats • Implement conservation of sensitive coastal habitats with community involvement.	• Sensitive coastal habitats are conserved with community involvement and contributing to mitigating habitat loss in the lake	• Adequate political and community will for co-management approaches; • Adequate institutional capacity and financial resources for implementing sensitive coastal habitats conservation

Strategic Component E: Control and Prevention of Biological Invasions

Objective/Target	Verifiable Indicators
Biological invasions in the Lake Tanganyika Basin are controlled and future invasions prevented	• Adequate capacity for effective biological invasion control and management existing • Control plans and monitoring framework for regular assessment of biological invasions developed, adopted and implemented at regional and national levels • Harmonized legal framework for transboundary biological invasion control and management in place at regional and national levels

Target	Baseline	Short-term results (2015)	Medium-term results (2020)	Long-term outcomes (2025)	Risks and assumptions
1. Existing biological invasions controlled and future invasions prevented	Some alien plants and animals species intentionally and unintentionally introduced in the lake and its catchment basin have become invasive causing deleterious effects on lake's natural biodiversity	• Awareness of communities, local authorities and other stakeholders raised • Capacity building to understand biological invasions and how to prevent and manage them undertaken • mechanical and biological control programmes promoted	• Institutional capacities strengthened • Regional monitoring programme to regularly assessing the extent and impacts of biological invasions and how to prevent and manage them established.	• A regional monitoring and management programme established and is contributing to preventing and managing invasive species	• Adequate political and community will • Adequate institutional capacity and financial resources

Strategic Component F: Reduction of Pollution and Improvement of Water Quality

Objective/Target	Verifiable Indicators
Pollution is reduced and water quality is improved to meet regionally agreed standards	• Adequate Institutional capacities at national and regional levels to monitor and enforce regionally harmonized water quality regulations • Adequate harmonized regional sewage and solid waste discharge (effluent) standards developed and adopted • Adequate sewage and solid waste management systems installed in the urban settlements on the lakeshore • Monitoring framework for regular assessment of pollution and water quality developed, adopted and implemented at regional and national levels

Target	Baseline	Short-term results (2015)	Medium-term results (2020)	Long-term outcomes (2025)	Risks and assumptions
1. Urban and industrial pollution reduced	Limited sewage and solid waste management and treatment capacity in all the cities situated on the shores of Lake Tanganyika	• Awareness of stakeholders (communities, industries and civil authorities) raised; • Regional Sewage and solid waste discharge (effluent) standards developed and regionally harmonized	• Adequate sewage and solid waste management systems in the urban settlements on the lakeshore constructed; • Institutional capacities to enforce effluent standards strengthened	• All urban settlements on the lakeshore have adequate sewage and solid waste management systems; • The quality of lake waters at pollution hotspots meet regionally agreed standards	• Adequate political will to comply with regional standards • Adequate regional and national capacity and financial resources
2. Agricultural pollution reduced	The shift from extensive to intensive agricultural production systems using pesticides and chemical fertilizer is likely to lead to pollution and overall eutrophication	• Awareness of stakeholders (communities, industries and civil authorities) raised; • Legislation relevant to agricultural pollution revised and regionally harmonized	• Regional legislation on agricultural pollution enforced; • Sustainable agriculture soil fertility and pest control practices promoted	• Sustainable agriculture soil fertility and pest control practices widely adopted • Use of chemical pesticides and fertilizers in the Lake Tanganyika basin reduced to minimum	• Adequate political will to comply with regional standards • Adequate regional and national capacity and financial resources
3. Harbour pollution reduced	Contamination from spillage during transfer of cargo and through waste dumped from boats and ships exist	• Awareness of stakeholders raised; • Regional lake transport and traffic legislations and regulations developed and harmonized	• Institutional capacities to monitor and enforce lake transport and traffic regulations strengthened. • Regional lake transport and traffic legislations and regulations implemented	• All harbour on the lakeshore adhere to regionally agreed lake transport and traffic legislations and regulations • The quality of lake waters around harbours on the lake shore meet regionally agreed standards	• Adequate political will to comply with regional standards • Adequate regional and national capacity and financial resources for regular monitoring
4. Pollution from lacustrine traffic reduced	Hazardous cargo is transported across Lake Tanganyika with little monitoring of correct storage or handling	• Awareness of stakeholders raised; • Regional lake transport, safety legislation and standards developed and harmonized	• Institutional capacities to monitor and enforce lake transport and traffic regulations strengthened. • Regional lake transport, safety legislation and standards implemented	• All ship vessels and cargo handling adhere to regionally agreed safety standards	• Adequate political will to comply with regional standards • Adequate regional and national capacity and financial resources for regular monitoring

Annex II Strategic Implementation Plan per Country

The tables below present an overview of the regional targets and strategic actions at the national level, including possible funding mechanisms, national stakeholders that should be involved in implementation of the actions and prospective partnerships with international organisations.

Table A: Adaptation to Climate Change Impacts

Target	Strategic Actions ³¹	Funding Mechanism	Key Stakeholders to be Involved ³²		Prospective Partnerships
Enhanced resilience of aquatic and terrestrial ecosystems	See Strategic Components on Unustainable Fisheries, Excessive Sedimentation, Critical Habitat Destruction, Biological Invasions and Pollution	GPF, PF, EI, G&L	BDI	See stakeholders listed under relevant strategic components	See partnerships listed under relevant strategic components
			DRC		
			TNZ		
			ZAM		
Increased preparedness and capacity to adapt to climate change impacts	Establish sustainable livelihood alternatives	GPF, PF, G&L	BDI	MEFCD, MEEATU, MAE, CBOs, NGOs, local authorities	IGOs (incl. AfDB, UNDP, UNEP, UNIDO, FAO, WB), CGIAR and other NGOs
			DRC	MECNT, MINAGRI, CBOs, NGOs, local authorities	
			TNZ	MAFSC, MNRT, NEMC, CBOs, NGOs, local authorities	
			ZAM	MFLD, MTENR, MACO, ECZ, CBOs, NGOs, local authorities	
	Increase resources and financial mechanisms for adequately dealing with integrated water resources management (IWRM) issues	GPF, PF, EI, G&L	BDI	MEEATU, Min. Finance	IGOs (incl. UNDP, UNEP), GWP, IUCN and other NGOs
			DRC	MECNT, Min. Finance	
			TNZ	Min. Water, MNRT, Min. Finance	
			ZAM	MTENR, MFNP, ECZ	
	Improve mechanisms for institutional coordination and inter-sectoral governance	GPF, G&L	BDI	MEEATU, MAE, MAFSC	IGOs (incl. UNDP)
			DRC	MECNT, MINAGRI	
			TNZ	MAFSC, MNRT, NEMC	
			ZAM	MTENR, MACO, ECZ	

³¹ Environmental education and awareness raising are overarching themes that are relevant to each of the strategic actions. See section 4.1.2. of the Strategic Action Programme.

³² As the regional body that coordinates the implementation of the overall programme, the Lake Tanganyika Authority is a key stakeholder for all strategic actions.

Target	Strategic Actions ³¹	Funding Mechanism	Key Stakeholders to be Involved ³²		Prospective Partnerships
Increased preparedness and capacity to adapt to climate change impacts	Establish emergency funds for climate change adaptations	GPF, EI, G&L	<i>BDI</i>	MEFCD, MEEATU, MAE	WB, GEF
			<i>DRC</i>	MECNT, MINAGRI	
			<i>TNZ</i>	MAFSC, MNRT, NEMC	
			<i>ZAM</i>	MFLD, MTENR, MACO, ECZ	
	Improve management of urban and rural water drainage systems as well as river courses	GPF, EI, G&L	<i>BDI</i>	MEEATU, SETEMU, INECN	IGOs (incl. WB, UN-HABITAT, UNIDO)
			<i>DRC</i>	MITPR, OVD	
			<i>TNZ</i>	MLHSD, Min. Water, KUWASA	
			<i>ZAM</i>	MLGH, MEWD	
	Review and enforce laws relevant to construction and settlements near lakeshore, and flood-prone areas	GPF	<i>BDI</i>	MEEATU	IGOs, MEAs
			<i>DRC</i>	MITPR	
			<i>TNZ</i>	MLHSD, Min. Water	
			<i>ZAM</i>	MLGH, ECZ	
Improved knowledge-base, monitoring and information-management mechanisms	Research and modelling of climate change impacts	G&L	<i>BDI</i>	MEEATU, research Institutions	IGOs (incl. IPCC, FAO, UNEP), ICRAF
			<i>DRC</i>	MINAGRI, CRH, INERA and other research Institutions	
			<i>TNZ</i>	TMA, NEMC, research Institutions	
			<i>ZAM</i>	DMMU, NISIR and other research Institutions	
	Establish monitoring programmes linked to early warning and response systems	GPF, EI, G&L	<i>BDI</i>	MEEATU, MAE, research Institutions	IGOs (incl. IPCC, UNEP), ICRAF
			<i>DRC</i>	MINAGRI, Min. Environment, CRH, INERA, and other research Institutions	
			<i>TNZ</i>	TMA, NEMC, VPO, Min. Natural Resources, Min. Agriculture, Min. Water, TAFIRI and other research Institutions	
			<i>ZAM</i>	DMMU, MEWD, MOH, NISIR and other research institutions	

Key: BDI = Burundi; DRC = Democratic Republic Congo; TNZ = Tanzania; ZAM = Zambia; GPF = General public funding, allocated through national or local budgets; PF = Private funding; EI = Economic instruments; G&L = Grants and Loans; Dept. = Department; Div. = Division; Min. = Ministry

Table B: Sustainable Fisheries

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Reduced fishing pressure in the pelagic zone	Review and revise national and regional components of the Framework Fisheries Management Plan	GPF, G&L	<i>BDI</i>	MAE Dept. Fisheries, FBP, ADEP, AVEPOMABU	IGOs (incl. FAO)
			<i>DRC</i>	MINAGRI (SENADEP), local authorities	
			<i>TNZ</i>	MNRT Div. Fisheries, Min. Regional Administration, local authorities	
			<i>ZAM</i>	MAC Dept. Fisheries, MTENR, local authorities	
	Establish standards for acceptable practices, including appropriate fishing gears, optimum mesh sizes and fishing quotas	GPF, G&L	<i>BDI</i>	MAE Dept. Fisheries, INECN, BBN, UB	IGOs (incl. FAO), MEAs, WFC
			<i>DRC</i>	MINAGRI, MECNT, CRH	
			<i>TNZ</i>	MNRT Div. Fisheries, TAFIRI	
			<i>ZAM</i>	MAC Dept. Fisheries, local authorities	
	Review and update fisheries licencing procedures	GPF, G&L	<i>BDI</i>	MAE Dept. Fisheries	IGOs
			<i>DRC</i>	MINAGRI	
			<i>TNZ</i>	MNRT Div. Fisheries	
			<i>ZAM</i>	MAC Dept. Fisheries, Licensing Committee	
	Update fisheries laws and bylaws	GPF, G&L	<i>BDI</i>	MAE Dept. Fisheries	IGOs , MEAs
			<i>DRC</i>	MINAGRI	
			<i>TNZ</i>	MNRT Div. Fisheries	
			<i>ZAM</i>	MAC Dept. Fisheries, local authorities	
	Negotiate interim acceptable fleet, and establish plan to reduce future fleet	GPF, G&L	<i>BDI</i>	MAE Dept. Fisheries	IGOs
			<i>DRC</i>	MINAGRI	
			<i>TNZ</i>	MNRT Div. Fisheries	
			<i>ZAM</i>	MAC Dept. Fisheries	
	Build capacity to implement regional, cost-effective monitoring and surveillance programmes	GPF, EI	<i>BDI</i>	MAE Dept. Fisheries	IGOs
			<i>DRC</i>	MINAGRI	
			<i>TNZ</i>	MNRT Div. Fisheries, TAFIRI	
			<i>ZAM</i>	MAC Dept. Fisheries	
	Increase capacity for enforcement of fisheries regulations	GPF, EI	<i>BDI</i>	MAE Dept. Fisheries	IGOs
			<i>DRC</i>	MINAGRI	
			<i>TNZ</i>	MNRT Div. Fisheries, Min. Regional Administration, local authorities, TAFIRI	
			<i>ZAM</i>	MAC Dept. Fisheries	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Reduced fishing pressure in the pelagic zone	Establish general fund for aquatic resources management, fed by fisheries taxes	EI	<i>BDI</i>	MAE Dept. Fisheries	IGOs
			<i>DRC</i>	MINAGRI, local authorities	
			<i>TNZ</i>	MNRT Div. Fisheries, Min. Regional Administration, local authorities	
			<i>ZAM</i>	MAC Dept. Fisheries, MTENR, local authorities	
	Increase community involvement in fisheries management	GPF, PF, G&L	<i>BDI</i>	MAE Dept. Fisheries, FBP, ADEP, AVEPOMABU, NGOs, artisanal and commercial fishermen	IGOs (incl. FAO), WFC and other NGOs
			<i>DRC</i>	MINAGRI, CBOs, NGOs, artisanal and commercial fishermen	
			<i>TNZ</i>	MNRT Div. Fisheries, Min. Regional Administration, local authorities, TAFIRI, local authorities, CBOs, NGOs, artisanal and commercial fishermen	
			<i>ZAM</i>	MAC Dept. Fisheries, local authorities, CBOs, NGOs, artisanal and commercial fishermen	
	Promote sustainable livelihood alternatives	GPF, PF, EI, G&L	<i>BDI</i>	MAE, MEEATU, NGOs	IGOs (incl. FAO), CGIAR and other NGOs
			<i>DRC</i>	MINAGRI, MECNT, NGOs	
			<i>TNZ</i>	MNRT Div. Fisheries, MLFD, Min. Regional Administration, local authorities, NGOs	
			<i>ZAM</i>	MAC Dept. Fisheries, MTENR, MCDSS, CBOs, NGOs	
Reduced fishing pressure in the littoral zone	Obtain baseline data on present and potential littoral fisheries	GPF, PF, G&L	<i>BDI</i>	MAE Dept. Fisheries, MEEATU, INECN, FBP, ADEP, AVEPOMABU, research institutions	IGOs (incl. FAO), WFC and other NGOs
			<i>DRC</i>	MINAGRI, CRH	
			<i>TNZ</i>	MNRT Div. Fisheries, TAFIRI	
			<i>ZAM</i>	MAC Dept. Fisheries	
	Establish standards for acceptable practices, including appropriate fishing gears, optimum mesh sizes and fishing quotas	GPF, G&L	<i>BDI</i>	MAE Dept. Fisheries, INECN, BBN, UB	IGOs (incl. FAO), MEAs, WFC
			<i>DRC</i>	MINAGRI, CRH, local authorities	
			<i>TNZ</i>	MNRT Div. Fisheries, TAFIRI	
			<i>ZAM</i>	MAC Dept. Fisheries	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Reduced fishing pressure in the littoral zone	Review and update fisheries licencing procedures	GPF, G&L	BDI	MAE Dept. Fisheries	IGOs (incl. FAO), WFC
			DRC	MINAGRI, local authorities	
			TNZ	MNRT Div. Fisheries, TAFIRI	
			ZAM	MAC Dept. Fisheries	
	Build capacity to implement regional, cost-effective monitoring and surveillance programmes	GPF, EI, G&L	BDI	MAE Dept. Fisheries	IGOs
			DRC	MINAGRI, CRH	
			TNZ	MNRT Div. Fisheries, TAFIRI	
			ZAM	MAE Dept. Fisheries	
	Increase capacity for enforcement of fisheries regulations	GPF, EI, G&L	BDI	MAE Dept. Fisheries	IGOs
			DRC	MINAGRI, local authorities	
			TNZ	MNRT Div. Fisheries, TAFIRI, local authorities	
			ZAM	MAE Dept. Fisheries	
	Increase community involvement in fisheries management	GPF, PF, G&L	BDI	MAE Dept. Fisheries, FBP, ADEP, AVEPOMABU, CBOs, artisanal and commercial fishermen	IGOs (incl. FAO), WFC and other NGOs
			DRC	MINAGRI (SENADEP), CBOs, artisanal and commercial fishermen	
			TNZ	MNRT Div. Fisheries, TAFIRI, local authorities, CBOs, artisanal and commercial fishermen	
			ZAM	MAE Dept. Fisheries, ZAWA, local authorities, CBOs, artisanal and commercial fishermen	
	Establish protocols and regulations for aquaculture	GPF, PF, G&L	BDI	MAE Dept. Fisheries	IGOs (incl. FAO), WFC
			DRC	MINAGRI (SENAQUA), CRH	
			TNZ	MNRT Div. Fisheries, MLFD, TAFIRI	
			ZAM	MAE Dept. Fisheries	
	Promote sustainable livelihood alternatives	GPF, PF, G&L	BDI	MAE Dept. Fisheries, FBP, ADEP, AVEPOMABU, CBOs, NGOs	IGOs (incl. FAO), CGIAR and other NGOs
			DRC	MINAGRI, MECNT, NGOs	
			TNZ	MNRT, MLFD, NGOs	
			ZAM	MAE, MTENR, MCDSS, ZAWA, CBOs, NGOs	
	Protect critical habitats	See Strategic Component D	BDI	See Strategic Component D	See Strategic Component D
			DRC		
			TNZ		
			ZAM		

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Ornamental fisheries controlled and managed	Revise list of threatened species, and propose species for inclusion in CITES Appendices	GPF, PF, G&L	BDI	MAE Dept. Fisheries, FBP, ADEP, AVEPOMABU	IGOs (incl. FAO)
			DRC	MINAGRI, local authorities	
			TNZ	MNRT Div. Fisheries, Min. Regional Administration, local authorities	
			ZAM	MAC Dept. Fisheries, MTENR, local authorities	
	Obtain baseline data on present and potential ornamental fishery exports	GPF, PF, G&L	BDI	MAE Dept. Fisheries, INECN, UB, ornamental fish exporters	IGOs (incl. FAO), WFC
			DRC	MINAGRI, MECNT, CRH, ornamental fish exporters	
			TNZ	MNRT Div. Fisheries, TAFIRI, ornamental fish exporters	
			ZAM	MAC Dept. Fisheries, ornamental fish exporters	
	Review and update ornamental fisheries licencing procedures (species, quantities, sites)	GPF, PF, EI, G&L	BDI	MAE Dept. Fisheries, INECN, UB	IGOs
			DRC	MINAGRI, MECNT, CRH	
			TNZ	MNRT Div. Fisheries, TAFIRI	
			ZAM	MAC Dept. Fisheries	
	Promote captive breeding of ornamental fish species	GPF, PF, EI, G&L	BDI	MAE Dept. Fisheries, INECN, UB, ornamental fish exporters	IGOs
			DRC	MINAGRI, MECNT, CRH, ornamental fish exporters	
			TNZ	MNRT Div. Fisheries, TAFIRI, ornamental fish exporters	
			ZAM	MAC Dept. Fisheries, ornamental fish exporters	
	Protect critical habitats	See Strategic Component D	BDI	See Strategic Component D	See Strategic Component D
			DRC		
			TNZ		
			ZAM		

Key: BDI = Burundi; DRC = Democratic Republic Congo; TNZ = Tanzania; ZAM = Zambia; GPF = General public funding, allocated through national or local budgets; PF = Private funding; EI = Economic instruments; G&L = Grants and Loans; Dept. = Department; Div. = Division; Min. = Ministry

Table C: Sustainable Land Management

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Sustainable agriculture activities increased	Review and update existing regulations and bylaws	GPF, G&L	BDI	MAE, MEEATU	IGOs
			DRC	MINAGRI, local authorities	
			TNZ	MAFSC, NEMC, local authorities	
			ZAM	MACO, ECZ, local authorities	
	Develop and implement sector-specific guidelines for best practice	GPF, G&L	BDI	MAE, MEEATU, ISABU	IGOs, CGIAR
			DRC	MINAGRI, ISDR	
			TNZ	MAFSC, NEMC	
			ZAM	MACO, ECZ	
	Implement demonstration activities to provide incentives for recognising good practice across levels of society and governance	GPF, PF, G&L	BDI	MAE, MEEATU, NGOs	IGOs (incl. AfDB, UNDP, UNEP, FAO, WB), CGIAR, NGOs
			DRC	MINAGRI, ISDR, NGOs	
			TNZ	MAFSC, NEMC, NGOs	
			ZAM	MACO Dept. Field Services	
	Promote soil conservation and anti-erosive agricultural practices, including establishment of sediment traps, and use of curve levels and terraces	GPF, PF, G&L	BDI	MAE, MEEATU, ISABU, NGOs	IGOs (incl. AfDB, UNEP, FAO, WB), CGIAR and other NGOs
			DRC	MINAGRI, ISDR, INERA, NGOs	
			TNZ	MAFSC, NEMC, NGOs	
			ZAM	MACO Dept. Field Services, ECZ, NGOs	
	Review and promote alternative practises, including rainwater harvesting and irrigation	GPF, PF, G&L	BDI	MAE, MEEATU	IGOs (incl. AfDB, UNEP, FAO, WB), CGIAR and other NGOs
			DRC	MINAGRI, ISDR, INERA, CRSN	
			TNZ	MAFSC Dept. Research & Development, NEMC, NGOs	
			ZAM	MACO, MEWD Dept. Water Affairs	
	Promote sustainable agroforestry practices	GPF, PF, G&L	BDI	MAE, MEEATU, ISABU, NGOs	IGOs (incl. AfDB, UNEP, FAO, WB), ICRAF and other NGOs
			DRC	MINAGRI, ISDR, INERA, CRSN, NGOs	
			TNZ	MNRT Div. Forestry & Beekeeping, MAFSC, NEMC, TAFORI, TAF, NGOs	
			ZAM	MACO Dept. Field Services, ECZ, NGOs	
Deforestation rates decreased	Review and update existing Land and Forest Acts, ensuring harmonization with Environmental Code	GPF, G&L	BDI	MEEATU DGFE, MAE	IGOs, MEAs
			DRC	MECNT	
			TNZ	MNRT, local authorities	
			ZAM	ECZ	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Deforestation rates decreased	Strengthen capacity for control and enforcement of regulations	GPF, G&L	BDI	MEEATU, MAE	IGOs, MEAs
			DRC	MECNT, ICCN, local authorities	
			TNZ	MNRT, local authorities	
			ZAM	MTENR, local authorities	
	Promote widescale reforestation and afforestation, particularly in erosion-sensitive sub-catchment areas	GPF, PF, EI, G&L	BDI	MEEATU DGFE, NGOs	IGOs (incl. AfDB, UNEP, FAO, WB), ICRAF, WWF, and other NGOs
			DRC	MECNT, ICCN	
			TNZ	MNRT, TAFORI, NLUPC, NGOs	
			ZAM	MTENR	
	Increase community involvement in forestry management activities that promote benefit-sharing and improve livelihoods (e.g. private woodlots, agroforestry)	GPF, PF, G&L	BDI	MEEATU DGFE, CBOs, NGOs	IGOs (incl. AfDB, UNEP, WB), ICRAF, NGOs
			DRC	MECNT, ICCN, CBOs, NGOs, local authorities	
			TNZ	MNRT Div. Forestry & Beekeeping, TAF, CBOs, NGOs	
			ZAM	MTENR, CBOs, NGOs	
	Promote energy-efficient cooking	GPF, PF, G&L	BDI	MEEATU DGFE, NGOs	IGOs (incl. UNEP), ICRAF, WWF and other NGOs
			DRC	MECNT, MEH, CRSN, ICCN, NGOs	
			TNZ	MNRT, NGOs	
			ZAM	MTENR, CBOs, NGOs	
	Promote alternatives for fuel wood and charcoal (e.g. recycled briquettes, solar energy, biogas, hydropower)	GPF, PF, G&L	BDI	MEEATU DGFE, NGOs	IGOs (incl. UNEP), ICRAF, WWF and other NGOs
			DRC	MECNT, MINAGRI, MEH, CRSN, ICCN, NGOs	
			TNZ	MNRT, Div. Forestry & Beekeeping, TAF, NGOs	
			ZAM	MTENR, MEWD, NGOs	
	Protect critical habitats	See Strategic Component D	BDI	See Strategic Component D	See Strategic Component D
			DRC		
			TNZ		
			ZAM		
Sustainable land management strategies in place	Facilitate and support government-driven processes to undertake spatial planning	GPF, G&L	BDI	MEEATU, MAE	IGOs (incl. UNEP), ICRAF and other NGOs
			DRC	MECNT, MINAGRI, local authorities	
			TNZ	MNRT, MAFSC, local authorities	
			ZAM	MTENR, Min. Lands, local authorities	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Sustainable land management strategies in place	Identify land-degradation hotspots, and prioritise interventions in these areas	GPF, PF, G&L	BDI	MEEATU (PNLAE), MAE, INECN	IGOs (incl. AfDB, UNEP, FAO, WB), ICRAF and other NGOs
			DRC	MECNT, MINAGRI, CRSN	
			TNZ	MNRT, MAFSC Dept. Research & Development	
			ZAM	MTENR, Min. Lands	
	Research, develop and implement sector-specific guidelines for best practice	GPF, PF, G&L	BDI	MEEATU, MAE, reseach institutions, NGOs	IGOs (incl. AfDB, UNEP, FAO, WB), CGIAR and other NGOs
			DRC	MECNT, MINAGRI, INERA, ISDR, CRSN and other research institutions	
			TNZ	MNRT, MAFSC Dept. Research & Development, TAFORI and other research institutions	
			ZAM	MTENR, Min. Lands, NISIR and other research institutions	
	Improve urban and infrastructure planning, construction and maintenance to reduce erosion	GPF, PF, EI, G&L	BDI	MPDR	IGOs (incl. AfDB, WB)
			DRC	MITPR	
			TNZ	MLHSD	
			ZAM	MLGH	
	Build capacity of institutions responsible for Environmental Impact Assessments	GPF, PF, EI, G&L	BDI	MEEATU	IGOs (incl. UNEP), MEAs
			DRC	MECNT, local authorities	
			TNZ	EMC, local authorities	
			ZAM	ECZ, local authorities	
	Promote participatory landuse planning	GPF, PF, G&L	BDI	MEEATU, MAE, CBOs, NGOs	IGOs (incl. UNEP), ICRAF, WWF and other NGOs
			DRC	MECNT, MINAGRI, ISDR, local authorities, CBOs, NGOs	
			TNZ	MNRT, MAFSC, local authorities, CBOs, NGOs	
			ZAM	MTENR, Min. Lands, local authorities, CBOs, NGOs	
	Implement long-term monitoring, using remote sensing and GIS to map changes in landuse	GPF, PF, EI, G&L	BDI	MEEATU, IGEBU	IGOs (incl. UNEP, FAO), ICRAF and other NGOs
			DRC	MECNT, MINAGRI, INERA, CRSN	
			TNZ	MNRT, MAFSC Dept. Research & Development, TAFORI	
			ZAM	MTENR, Min. Lands	

Key: BDI = Burundi; DRC = Democratic Republic Congo; TNZ = Tanzania; ZAM = Zambia; GPF = General public funding, allocated through national or local budgets; PF = Private funding; EI = Economic instruments; G&L = Grants and Loans; Dept. = Department; Div. = Division; Min. = Ministry

Table D: Protection, Restoration and Management of Critical Habitats

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Protected area resource management improved	Revise national policies governing parks management, and promote adaptive critical habitat management as part of implementation cycle	GPF, PF, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP)
			DRC	MECNT, ICCN	
			TNZ	MNRT, TANAPA	
			ZAM	MTENR, ECZ, ZAWA	
	Enhance capacity for monitoring and law enforcement in protected areas	GPF, PF, EI, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP), MEAs
			DRC	MECNT, ICCN	
			TNZ	MNRT, TANAPA	
			ZAM	MTENR, ZAWA	
	Enhance institutional capacity for adequate parks management	GPF, PF, EI, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP)
			DRC	MECNT, ICCN	
			TNZ	MNRT, TANAPA	
			ZAM	MTENR, ZAWA	
	Conduct economic valuation of protected areas	GPF, PF, G&L	BDI	MEEATU, INECN, research institutions	IGOs (incl. UNEP)
			DRC	MECNT, MICPT, ICCN, CRSN and other research institutions	
			TNZ	MNRT, TANAPA, TAWIRI, TAFORI and other research institutions	
			ZAM	MTENR, ZAWA, NISIR and other research institutions	
	Review or develop procedures to optimise revenue without impairing protected area resources	GPF, PF, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP)
			DRC	MECNT, ICCN	
			TNZ	MNRT, TRA, TANAPA	
			ZAM	MTENR, ZAWA	
	Improve infrastructure and increase accessibility of protected areas for tourism, taking into account the carrying capacity of the ecosystem	GPF, PF, EI, G&L	BDI	MCIT, MEEATU, INECN	IGOs (incl. AfDB, WB)
			DRC	MITPR, ONATRA, MECNT, ICCN	
			TNZ	MLHSD, MNRT, TANAPA	
			ZAM	MCT, MTENR, ZAWA	
	Improve demarcation of protected areas	GPF, PF, EI, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP)
			DRC	MECNT, ICCN	
			TNZ	MNRT, TANAPA	
			ZAM	MTENR, ZAWA	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Protected area resource management	Increase community involvement in critical habitat protection to promote benefit sharing and improve livelihoods	GPF, PF, EI, G&L	<i>BDI</i>	MEEATU, INECN, CBOs, NGOs	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			<i>DRC</i>	MECNT, ICCN, local authorities, CBOs, CENADEP and other NGOs	
			<i>TNZ</i>	MNRT, TANAPA, local authorities, CBOs, NGOs	
			<i>ZAM</i>	MTENR, ZAWA, MCDSS, local authorities, CBOs, NGOs	
	Implement long-term monitoring of aquatic and terrestrial biodiversity in protected areas	GPF, PF, EI, G&L	<i>BDI</i>	MEEATU, INECN and other research institutes	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			<i>DRC</i>	MECNT, ICCN, CRSN, CRH and other research institutions	
			<i>TNZ</i>	MNRT, TANAPA, TAWIRI, TAFIRI and other research institutions	
			<i>ZAM</i>	MTENR, ZAWA, research institutions	
Critical aquatic and terrestrial habitats protected, restored and managed	Establish and agree on key indicators for terrestrial and aquatic critical habitats	GPF, PF, G&L	<i>BDI</i>	MEEATU, INECN and other research institutes	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			<i>DRC</i>	MECNT, ICCN, CRSN, CRH and other research institutions	
			<i>TNZ</i>	MNRT, TANAPA, TAWIRI, TAFIRI and other research institutions	
			<i>ZAM</i>	MTENR, ZAWA, research institutions	
	Identify critical habitats, and document contribution of each country to regional aquatic and terrestrial biodiversity protection	GPF, G&L	<i>BDI</i>	MEEATU, INECN and other research institutes	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			<i>DRC</i>	MECNT, ICCN, CRSN, CRH and other research institutions	
			<i>TNZ</i>	MNRT, TANAPA, TAWIRI, TAFIRI and other research institutions	
			<i>ZAM</i>	MTENR, ZAWA, research institutions	
	Conduct economic valuation of critical habitats	GPF, PF, G&L	<i>BDI</i>	MEEATU, INECN and other research institutes	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			<i>DRC</i>	MECNT, ICCN, CRSN, CRH and other research institutions	
			<i>TNZ</i>	MNRT, TANAPA, TAWIRI, TAFIRI and other research institutions	
			<i>ZAM</i>	MTENR, ZAWA, research institutions	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Critical aquatic and terrestrial habitats protected,	Develop and implement best practice guidelines for critical habitat management, with focus on an ecosystem approach to mitigate biodiversity loss	GPF, PF, G&L	BDI	MEEATU, INECN, NGOs	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			DRC	MECNT, ICCN, CRSN, CRH, NGOs	
			TNZ	MNRT, TANAPA, TAWIRI, TAFIRI, NGOs	
			ZAM	MTENR, ZAWA, research institutions	
	Extend existing terrestrial protected areas to encompass a diversity of aquatic habitats	GPF, PF, EI, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			DRC	MECNT, ICCN	
			TNZ	MNRT, Min. Water, MLHSD, MAFSC, VPO, TANAPA	
			ZAM	MTENR, ZAWA	
	Evaluate and promote possibilities to establish new protected areas	GPF, PF, G&L	BDI	MEEATU, INECN	IGOs (incl. UNEP), IUCN, TNC, WWF and other NGOs
			DRC	MECNT, ICCN, local authorities	
			TNZ	MNRT, Min. Water, TANAPA, local authorities	
			ZAM	MTENR, ZAWA, local authorities	

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Table E: Control and Prevent Biological Invasions

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Existing biological invasions controlled, and future invasions prevented	Establish long-term national and regional monitoring programmes to assess extent and impact of biological invasions in terrestrial and aquatic ecosystems	GPF, PF, G&L	<i>BDI</i>	MEEATU, MAE, INECN, research institutions	IGOs (incl. UNEP), IUCN and other NGOs
			<i>DRC</i>	MECNT, MINAGRI, ICCN, CRSN, CRH and other research institutions	
			<i>TNZ</i>	MNRT, MAFSC, TANAPA, TAWIRI, TAFIRI, TAFORI and other research institutions	
			<i>ZAM</i>	MTENR, MACO Dept. Fisheries, ZAWA, NISIR and other research institutions	
	Establish early warning and response systems.	GPF, PF, G&L	<i>BDI</i>	MEEATU, MAE, INECN	IGOs (incl. UNEP), IUCN and other NGOs
			<i>DRC</i>	MECNT, MINAGRI, ICCN, CRSN, CRH	
			<i>TNZ</i>	MNRT, MAFSC, TANAPA, TAFIRI	
			<i>ZAM</i>	MTENR, MACO Dept. Fisheries, ZAWA	
	Review and revise regulations relevant to import and use of exotic species in agriculture, agroforestry and aquaculture	GPF, PF, G&L	<i>BDI</i>	MEEATU, MAE	IGOs (incl. UNEP, FAO), IUCN and other NGOs
			<i>DRC</i>	MECNT, MINAGRI	
			<i>TNZ</i>	MNRT, MAFSC	
			<i>ZAM</i>	MTENR, MACO, MLFD, ECZ	
	Assess the extent and impact of relocation of ornamental fish species	GPF, PF, G&L	<i>BDI</i>	MEEATU, INECN, research institutions	IGOs, IUCN and other NGOs
			<i>DRC</i>	MECNT, CRH and other research institutions	
			<i>TNZ</i>	MNRT, TAFIRI and other research institutions	
			<i>ZAM</i>	MTENR, MACO Dept. Fisheries, ZAWA, research institutions	
	Build capacity to enforce regulations and implement adaptive management responses in order to control and prevent biological invasions	GPF, PF, G&L	<i>BDI</i>	MEEATU, MAE, INECN, NGOs	IGOs (incl. UNEP), IUCN and other NGOs
			<i>DRC</i>	MECNT, MINAGRI, ICCN, CRSN, CRH, NGOs	
			<i>TNZ</i>	MNRT, MAFSC, TANAPA, TAWIRI, TAFIRI, NGOs	
			<i>ZAM</i>	MTENR, MACO Dept. Fisheries, ZAWA	
	Promote appropriate physical, chemical and biological eradication and/or control methods	GPF, PF, G&L	<i>BDI</i>	MEEATU, MAE	IGOs (incl. UNEP, FAO), IUCN and other NGOs
			<i>DRC</i>	MECNT, MINAGRI	
			<i>TNZ</i>	MNRT, MAFSC	
			<i>ZAM</i>	MTENR, MACO	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Existing biological invasions controlled, and future invasions prevented	Promote reduction of eutrophication	See Strategic Component F	BDI	See Strategic Component F	See Strategic Component F
			DRC		
			TNZ		
			ZAM		
	Conduct economic valuation, and raise awareness about economic loss resulting from (potential) biological invasions	GPF, PF, G&L	BDI	MEEATU, MAE, INECN, research institutions	IGOs (incl. UNEP), NGOs
			DRC	MECNT, MINAGRI, ICCN, CRSN, CRH and other research institutions	
			TNZ	MNRT, MAFSC, TANAPA, TAWIRI, TAFIRI, TAFORI and other research institutions	
			ZAM	MTENR, MACO Dept. Fisheries, ZAWA, NISIR and other research institutions	
	Promote community participation in control of invasive species	GPF, PF, G&L	BDI	MEEATU, MAE, INECN, CBOs, NGOs	IGOs (incl. UNEP, FAO), IUCN and other NGOs
			DRC	MECNT, MINAGRI, ICCN, CBOs, NGOs	
			TNZ	MNRT, MAFSC, TANAPA, CBOs, NGOs	
			ZAM	MTENR, MACO, ZAWA, CBOs, NGOs	
	Coordinate invasive species actions with national and regional programmes	GPF, G&L	BDI	MEEATU, MAE	IGOs (incl. UNEP, FAO), IUCN and other NGOs
			DRC	MECNT, MINAGRI	
			TNZ	MNRT, MAFSC	
			ZAM	MTENR, MACO, MLFD	

Key: BDI = Burundi; DRC = Democratic Republic Congo; TNZ = Tanzania; ZAM = Zambia; GPF = General public funding, allocated through national or local budgets; PF = Private funding; EI = Economic Instruments; G&L = Grants and Loans; Dept. = Department; Div. = Division; Min. = Ministry

Table F: Decrease Pollution and Improve Water Quality

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Urban and industrial pollution reduced	Revise and regionally harmonise national effluent discharge standards	GPF, PF, G&L	BDI	MEEATU, SETEMU, INECN, BBN	IGOs (incl. AfDB, UNEP, WB), MEAs, GIZ and other NGOs
			DRC	MECNT, MUH	
			TNZ	Min. Water, TBS, NEMC	
			ZAM	MEWD, ECZ	
	Strengthen capacity for monitoring of water quality, and ensure that monitoring data feeds into adaptive management actions from relevant institutions	GPF, PF, EI, G&L	BDI	MEEATU, SETEMU, INECN	IGOs (incl. AfDB, UNEP, WB), GIZ and other NGOs
			DRC	MECNT	
			TNZ	Min. Water, NEMC, WBO	
			ZAM	ECZ, NISR, RWSSU, D-WASHE Committees, Chambesi Water & Sewerage Company	
	Establish and enforce environmental regulations for production and disposal of hazardous products (e.g. paint, batteries, chemicals, plastics)	GPF, PF, EI, G&L	BDI	MEEATU, SETEMU, MICPT, CCIB, BBN	IGOs (incl. AfDB, UNEP, WB), MEAs, NGOs
			DRC	MECNT, Min. of Industry, OCC	
			TNZ	NEMC	
			ZAM	ECZ	
	Enhance wastewater treatment capacity in all major urban settlements on the lake shore	GPF, PF, EI, G&L	BDI	MEEATU, SETEMU	IGOs (incl. AfDB, UN-HABITAT, WB), NGOs
			DRC	MUH, OVD	
			TNZ	MLHSD, KUWASA	
			ZAM	MEWD Dept. Water Affairs, MLGH DISS, Chambesi Water & Sewerage Company	
	Improve water and sanitation facilities for urban and rural populations	GPF, PF, EI, G&L	BDI	MEEATU, SETEMU, REGIDESO	IGOs (incl. AfDB, UNICEF, WB), GIZ and other NGOs
			DRC	MUH	
			TNZ	MLHSD, KUWASA	
			ZAM	MEWD Dept. Water Affairs, MLGH DISS, RWSSU, Chambesi Water & Sewerage Company	
	Encourage private industries to establish wastewater pre-treatment facilities and implement appropriate pollution control measures	GPF, PF, G&L	BDI	MICPT, CCIB, industries	IGOs (incl. AfDB, WB), MEAs
			DRC	MUH, Min. of Industry	
			TNZ	TANESCO, TRC and other industries	
			ZAM	MEWD Dept. Water Affairs, D-WASHE Committees, Chambesi Water & Sewerage Company	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Urban and industrial pollution reduced	Promote garbage collection and enhance capacity to establish controlled waste disposal sites in all major urban settlements on the lake shore	GPF, PF, EI, G&L	BDI	MEEATU, SETEMU	IGOs (incl. AfDB, UNEP, UN-HABITAT, WB), NGOs
			DRC	MUH	
			TNZ	MLHSD, KUWASA and other local authorities	
			ZAM	MOH, ZRA, D-WASHE Committees	
	Increase capacity of institutions responsible for Environmental Impact Assessments, and ensure enforcement of EIA prior to industrial development	GPF, PF, G&L	BDI	MEEATU, MICPT, INECN	IGOs (incl. UNEP), MEAs, NGOs
			DRC	MECNT	
			TNZ	MNRT, NEMC	
			ZAM	MEWD Dept. Water Affairs, MLGH DISS, ECZ	
	Raise awareness on the health hazards of pollution	GPF, PF, G&L	BDI	MSPLCS, INSP, SETEMU, INECN, NGOs	IGOs (incl. UNICEF, WHO), NGOs
			DRC	MSP, NGOs	
			TNZ	MHSW, NGOs	
			ZAM	MOH, D-WASHE Committees, District Health Management Team, NGOs	
	Research and promote alternative processing of waste and by-products (e.g. recycling, biogas)	GPF, PF, G&L	BDI	MEEATU, MICPT, research institutions, NGOs	IGOs (incl. UNEP, UNIDO), NGOs
			DRC	Min. Industry, research institutions, NGOs	
			TNZ	MITM, research institutions, NGOs	
			ZAM	NISR and other research institutions, NGOs	
Agricultural pollution reduced	Review, update and regionally harmonize legislation relevant to agricultural pollution	GPF, PF, G&L	BDI	MAE	IGOs, MEAs
			DRC	MINAGRI	
			TNZ	MAFSC	
			ZAM	MAC	
	Assess impact of herbicides on water quality in the catchment and the lake	GPF, PF, G&L	BDI	MAE, INECN, research institutions, NGOs	IGOs (incl. UNEP), NGOs
			DRC	MINAGRI, CRH and other research institutions	
			TNZ	MAFSC, NEMC, WBO, research institutions	
			ZAM	MEWD, MOH, research institutions	
	Research and promote sustainable bio-control alternatives to pesticides	GPF, PF, G&L	BDI	MAE, research institutions, NGOs	IGOs (incl. UNEP), CGIAR and other NGOs
			DRC	MINAGRI, INERA and other research institutions	
			TNZ	MAFSC, research institutions	
			ZAM	MAC, NISR and other research institutions	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Agricultural pollution reduced	Assess impact of fertilisers on water quality in the catchment and the lake	GPF, PF, G&L	BDI	MAE, INECN, research institutions, NGOs	IGOs (incl. UNICEF), NGOs
			DRC	CRH and other research institutions	
			TNZ	MAFSC, research institutions	
			ZAM	MEWD, MOH, research institutions	
	Research and promote sustainable fertilizing alternatives	GPF, PF, G&L	BDI	MAE, research institutions, NGOs	IGOs (incl. FAO), CGIAR and other NGOs
			DRC	MINAGRI (SENAFIC), INERA and other research institutions, NGOs	
			TNZ	MAFSC, research institutions, NGOs	
			ZAM	MAC, NISR and other research institutions	
Harbour pollution reduced	Review and harmonize regulations (including Lake Traffic Acts, navigation rules, pollution and security standards, regulations on transport of hazardous cargo)	GPF, PF, G&L	BDI	MCIPT, MTTPE, BBN	IGOs, MEAs
			DRC	MTVC, MECNT, ONATRA	
			TNZ	NEMC, MITM	
			ZAM	MEWD, ECZ, MCT Dept. Maritime and Inland Waterways, harbour authorities	
	Strengthen capacity for monitoring and enforcement of regulations	GPF, PF, EI, G&L	BDI	MCIPT, MTTPE	IGOs, MEAs
			DRC	MTVC, MECNT	
			TNZ	Min. Water, NEMC	
			ZAM	MEWD	
	Assess and monitor impact of harbour pollution on water quality	GPF, PF, EI, G&L	BDI	MEEATU, INECN	IGOs
			DRC	MTVC, MECNT	
			TNZ	TPA, NEMC	
			ZAM	MAC, NISR and other research institutions, harbour authorities	
	Establish shipyards for adequate maintenance of ships	GPF, PF, G&L	BDI	MCIPT, EPB	IGOs
			DRC	MTVC	
			TNZ	MITM, TPA	
			ZAM	MCT Dept. Maritime and Inland Waterways, harbour authorities	
	Establish shortterm emergency response systems, and implement longterm remedial and preventive actions for pollution from oil and other chemicals	GPF, PF, G&L	BDI	MCIPT, Min. Public Security	IGOs
			DRC	MTVC, MIDS	
			TNZ	MDNS, TPA	
			ZAM	DMMU, Min. Defence, Police Dept., MCT	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Harbour pollution reduced	Increase capacity of institutions responsible for Environmental Impact Assessments, and ensure enforcement of EIA prior to harbour developments	GPF, PF, G&L	BDI	MAE, MCIPT, EPB	IGOs, MEAs
			DRC	MECNT, MTVC	
			TNZ	NEMC, TPA	
			ZAM	ECZ, MCT Dept. Maritime and Inland Waterways, harbour authorities	
Pollution from lacustrine traffic reduced	Review and harmonize regulations (including Lake Traffic Act, navigation rules, pollution and security standards, regulations on transport of hazardous cargo)	GPF, PF, G&L	BDI	MICPT, MTTPE, BBN	IGOs, MEAs
			DRC	MTVC, MECNT	
			TNZ	Min. Transport, NEMC	
			ZAM	MCT Dept. Maritime and Inland Waterways	
	Strengthen capacity for monitoring of lacustrine traffic and enforcement of regulations	GPF, PF, G&L	BDI	MICPT, Min. Public Security	IGOs, MEAs
			DRC	MTVC, MECNT	
			TNZ	Min. Transport	
			ZAM	MCT Dept. Maritime and Inland Waterways	
	Monitor pollution impacts of waste disposal from boats and ensure enforcement of regulations	GPF, PF, G&L	BDI	MTTPE, INECN	IGOs
			DRC	MTVC, MECNT	
			TNZ	Min. Transport, NEMC	
			ZAM	ECZ, MCT Dept. Maritime and Inland Waterways	
	Establish shortterm emergency response systems, and implement longterm remedial and preventive actions for pollution from oil and other toxins	GPF, PF, EI, G&L	BDI	Min. Public Security	IGOs
			DRC	MIDS	
			TNZ	MDNS	
			ZAM	DMMU, Min. Defence, Police Dept., MCT	
Pollution from mining reduced	Review and update regulations (e.g. Mining Acts) to ensure that environmental impacts are sufficiently taken into account	GPF, PF, G&L	BDI	MEM	IGOs, MEAs, industries
			DRC	Min. Mines	
			TNZ	MEMTZ	
			ZAM	MMMD, ECZ	
Pollution from mining reduced	Strengthen capacity for sustainable management and control of mining activities	GPF, PF, G&L	BDI	MEM, mining companies	IGOs, industries
			DRC	CRGM, Min. Mines, mining companies	
			TNZ	MEMTZ, mining companies	
			ZAM	MMMD, ZCCM and other mining companies	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
	Sensitize local administrations and organize mine workers in associations to support best mining practices	GPF, PF, G&L	BDI	MEM, NGOs, mining companies	IGOs, industries
			DRC	Min. Mines, NGOs, mining companies	
			TNZ	MEMTZ, mining companies	
			ZAM	MMMD, mining companies	
	Increase capacity of institutions responsible for Environmental Impact Assessments, and ensure enforcement of EIA prior to licencing of mining activities	GPF, PF, G&L	BDI	MEM, MEEATU, mining companies	IGOs, industries
			DRC	Min. Mines, mining companies	
			TNZ	MEMTZ, mining companies	
			ZAM	MMMD, ECZ, mining companies	
	Promote appropriate mining technologies	GPF, PF, G&L	BDI	MEM, mining companies	IGOs, industries
			DRC	CRGM, Min. Mines, mining companies	
			TNZ	MEMTZ, mining companies	
			ZAM	MMMD, ZCCM and other mining companies	
	Raise awareness on environmental and human health hazards of pollution from mining activities (e.g. mercury accumulation in aquatic foodwebs)	GPF, PF, G&L	BDI	MSPLCS, INSP, MEM, INECN, mining companies	IGOs, MEAs, industries
			DRC	MSP, Min. Mines, mining companies	
			TNZ	MHSW, MEMTZ, mining companies	
			ZAM	MMMD, MOH, ZCCM and other mining companies	
Risks related to petroleum exploration and production reduced	Review and update regulations (e.g. Mining Acts) to ensure that environmental impacts are sufficiently taken into account	GPF, PF, G&L	BDI	MEM, MEEATU	IGOs, MEAs
			DRC	MEH, MECNT	
			TNZ	MEMTZ, NEMC	
			ZAM	MMMD, ECZ	
	Strengthen capacity for enforcement of regulations	GPF, PF, G&L	BDI	MEM, MEEATU	IGOs, MEAs
			DRC	MEH, MECNT, CRGM	
			TNZ	MEMTZ, NEMC	
			ZAM	MMMD	
	Review lessons-learnt from petroleum exploration and production elsewhere, and incorporate these in recommendations for best practice	GPF, PF, G&L	BDI	MEM, MEEATU, private companies	IGOs (inc. UNEP), industries
			DRC	MEH, MECNT, CRGM, private companies	
			TNZ	MEMTZ, NEMC, private companies	
			ZAM	MMMD, private companies	

Target	Strategic Actions	Funding Mechanism	Key Stakeholders to be Involved		Prospective Partnerships
Risks related to petroleum exploration and production reduced	Establish an emergency-response fund and action plans in case of petroleum spills	GPF, PF, EI, G&L	<i>BDI</i>	MEM, MEEATU	IGOs, industries
			<i>DRC</i>	MEH, MECNT, MIDS	
			<i>TNZ</i>	MEMTZ, NEMC	
			<i>ZAM</i>	MMMD	
	Increase capacity of institutions responsible for Environmental Impact Assessments, and ensure enforcement of EIA prior to licencing of petroleum exploration and production	GPF, PF, G&L	<i>BDI</i>	MEM, MEEATU	IGOs, MEAs
			<i>DRC</i>	MEH, MECNT	
			<i>TNZ</i>	MEMTZ, NEMC	
			<i>ZAM</i>	MMMD, ECZ	

Key: BDI = Burundi; DRC = Democratic Republic Congo; TNZ = Tanzania; ZAM = Zambia; GPF = General public funding, allocated through national or local budgets; PF = Private funding; EI = Economic Instruments; G&L = Grants and Loans; Dept. = Department; Div. = Division; Min. = Ministry

Annex III References and Background Documentation

Key references and background documentation for the updating of the Strategic Action Programme for the Protection of Biodiversity and Sustainable Management of Natural Resources in Lake Tanganyika and its Basin are listed below. A list of other useful references is provided for further reading. Additional references and copies of published scientific papers and reports can be obtained through the Lake Tanganyika Authority Secretariat.

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Lake Tanganyika Authority: www.lta-alt.org³³

Lake Tanganyika Biodiversity Project Special Studies: www.ltbp.org

Lake Tanganyika Research Project on Management of Fisheries: www.fao.org/fi/oldsite/ltr/index.htm

The Ramsar Convention on Wetlands of International Importance: www.ramsar.org

GEF International Waters Learning and Exchange Resources Network IW-LEARN: www.iwlearn.net

The ecosystem approach as the primary framework under the Convention on Biological Diversity. See: www.cbd.int/ecosystem

Annex IV Relevant National Action Plans and Policy Documents

Republic of Burundi

- 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.
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- République du Burundi, MINATTE, 2007: Plan d'Action National d'Adaptation aux Changements Climatiques, Bujumbura, Burundi
- République du Burundi, MEEATU, 2010: Deuxième communication nationale sur les changements climatiques

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.

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 capacity for effective conservation of protected areas.
6. Fight against bush fires in natural ecosystems.
7. Reforest the water basins and especially bare mountain.

³³ Alternative link: www.lta.iwlearn.org

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.

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.

Democratic Republic of Congo

- 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: Loi 011/2002 du 29 Août 2002 portant Code Forestier en République Démocratique du Congo.
- République Démocratique du Congo, 2002: Communication Nationale initiale de la RDC sur les changements climatiques, RDC.
- République Démocratique du Congo, Ministère de l'Environnement, 2006: Programme d'Action National d'Adaptation au Changement Climatique de la République Démocratique du 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 as follows:

1. Urban and rural electrification.
2. Reinforcement of agriculture and livestock production capacity.
3. Management of water reservoirs.
4. Rural population stabilisation.

5. Communication pathways improvement and development (roads, railways and fluvial navigation).
6. Bore water wells.
7. Reinforcement of national meteorological services.
8. Rational management of forest resources.
9. Erosion and Floods management.
10. Protection of coastal zones.

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 Lake Tanganyika Basin, they are provided by the commitment of the DRC in signing and or ratification of the related international conventions.

United Republic of Tanzania

- National Adaptation Programme of Action (NAPA), Vice President's Office (January 2007)
- Initial National Communications under the United Nations Framework Convention on Climate Change, Vice President's Office (March 2003).
- National Action Programme to Combat Desertification (NAP), Vice President's Office (August 1999)

- National Biodiversity Strategy and Action Plan (NBSAP), Vice President's office (August 2001)
- Fourth National Report on the Implementation of the CBD, Vice President's Office (06 March 2010)
- Thematic Report on Alien and Invasive Species, under the CBD, Vice President's Office (02 April 2004)
- Thematic Report on Forest Ecosystems, under the CBD, Vice President's Office (02 April 2004)
- United Nations Framework Convention on Climate Change (UNFCCC), (June 1992)
- Convention on Biological Diversity (CBD), (May 1992)
- National Environmental Policy (NEP), Vice President's Office (1997)
- National Forestry Policy (NFP), Ministry of Natural Resources and Tourism (1998)
- National Fisheries Sector Policy and Strategy Statement, Ministry of Natural Resources and Tourism (1997)

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.

Republic of Zambia

- National Adaptation Programme of Action (NAPA), Final Report, Ministry of Tourism, Environment and Natural resources (September 2007)
- National Action Programme for Combat Desertification and Mitigating Serious Effects of Drought in the context of UNCCD (NAP), Ministry of Tourism, Environment and Natural Resources (28 February 2002)
- National Biodiversity Strategy and Action Plan (NBSAP), Ministry of Tourism, Environment and Natural Resources (10 November 2003)
- Fourth National Report on the Implementation of the CBD, Ministry of Tourism, Environment and Natural Resources (2009)
- United Nations Framework Convention on Climate Change (UNFCCC), June 1992
- National Fisheries Policy, Ministry of Livestock and Fisheries Development (December 2004)
- National Forestry Policy, Ministry of Tourism, Environment and Natural Resources (1998)

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.

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NATIONAL INSTITUTIONS

Republic of 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 to Counteract 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

NGOs: Pays de la Loire, ACVE, FBP, Amis de la Nature, AVEPOMABU

Private Sector: Provinciana, Fishes of Burundi (ornamental fisheries), Huileries Artisanales (palmoil industry)

Democratic Republic Congo

Public Institutions

- President's Office
- 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, REDD-Congo, Environmental NGOs

Private Sector: MIB'S SHIYARD & Fisheries

United Republic of 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 (GIZ)

Republic of Zambia

Public Institutions

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

Annex VI Geological and Climatic History of Lake Tanganyika

Epoch	Event ¹	Reference
MIOCENE 5.3-23 ma	Formation of a flat basin with slowly meandering proto-Malagarasi river. Connection to the Congo River basin hydrological system: 20-12 ma.	Tiercelin & Mondegue (1991), Cohen <i>et al.</i> , (1993)
	Transformation of the proto-Malagarassi-Congo River in a swampy area with a mosaic of shallow lakes: 12-8 Ma.	
	Initiation of tectonic activity in northern Lake Tanganyika region: 7.8-5 Ma. Formation of the northern basin.	Lezzar <i>et al.</i> , (1996), Cohen <i>et al.</i> , (1997)
PLIOCENE 1.8-5.3 ma	Establishment of a truly lacustrine habitat. Subsidence of the graben produces progressively deeper lakes.	Tiercelin & Mondegue (1991)
	Closing of the drainage system at the Lukuga outlet to the Congo river: 6-5 Ma.	
	Formation of the southern basin. Pliocene regional aridification in East and Central Africa: 3-2 Ma.	Cohen <i>et al.</i> , (1997)
PLEISTOCENE 10 ka -1.8 ma	Strong tectonic activity on the Kivu-Rusizi Volcanic Dome: 1.9 Ma. Major lake level decline of 650-700 m bpl.	Lezzar <i>et al.</i> , (1996), Cohen <i>et al.</i> , (1997), Scholz & Rosendahl (1988) ²
	Separation of the northern, middle and southern basin. Small and probably saline lakes in the northern basin.	
	Rise of lake levels in the northern basin, evidence of sedimentation from the Proto-Rusizi River basin drainage: 670-550 ka	Cohen <i>et al.</i> , (1997)
HOLOCENE present-10 ka	Formation of Burton's Bay: 360-390 Ka. Tectonically driven, and/or climatic driven low lake levels of 350 m bpl.	
	Low lake level of 350 m bpl, followed by transgression in the northern basin between 260-190 ka	
	Severe aridity in East African region: 135-75 ka.	Scholtz <i>et al.</i> , (2007)
	Low lake level of > 400 m bpl³: 170-40 ka.	Scholz <i>et al.</i> , (2003), Mc. Glue <i>et al.</i> , (2007)
	Period of repeated fluctuations. Probably dry intervals at 42, 29, and 23 ka, causing lake levels to drop 160-260 m bpl.	Cohen <i>et al.</i> , (1997), Scholz <i>et al.</i> , (2003), Mc. Glue <i>et al.</i> , (2007)
	Insufficient to separate the northern, middle and southern basin, but low enough to cause near-total desiccation of Burton's Bay in the north.	
	Continued lowering of lake levels, probably associated with a cooler and drier climate resulting from Late Pleistocene glaciation events.	Gasse <i>et al.</i> , (1989), Johnson (1996), Guiot & Tiercelin (1993), Scholz <i>et al.</i> , (2003), Gasse (2000), Talbot <i>et al.</i> , (2006)
	Low lake level of 400 m bpl around 26-14 ka. Possibly increase of precipitation and temperature from 18-17 ka to 15-14.5 ka.	Gasse <i>et al.</i> , (1989), Tiercelin & Mondegue (1991), Guiot & Tiercelin (1993), Johnson (1996)
	Rising water levels. Increased waterflow through the Rusizi river caused by upfolding of the Virunga volcanoes north of Lake Kivu.	Felton <i>et al.</i> , (2007)
	Establishment of post-glacial climatic conditions by 12 ka, with increasing temperatures and humidity.	
	Arid period with Rusizi connection closed 8-6.8 ka.	Tiercelin & Mondegue (1991), Nicholson (1999)
	Intermittent closing and opening of Rusizi connection and intermittent establishment of open drainage via Lukuga river.	
	Highest known water level (784 asl) around 1878, re-establishing Lukuga outlet and causing flood in the Congo river.	
	Regression (40 m) between 1880 and 1890. Minor regressions during late 1920's, and 1950's.	
	High water levels after 1960's El Niño event. Minor regressions during mid-1970's and mid-1980's.	

Ma=million years before present; Ka=thousand years before present; bpl=below present lake level (present=1990's); asl =above sea level.

¹ These are all approximate numbers that are subject to discussion and must be interpreted with caution. ²Scholz & Rosendahl (1988) estimated an age of 25,000 ya for a 600 m lake level decline in Lake Tanganyika, based on sedimentation rates of 1mm/year. Tiercelin & Mondegue (1991) estimated a minimum of 200,000 years based on sedimentation rates of 0.5 mm/year. ³Scholz *et al.* (2003) estimated an age of between ~130-190 ya for a lake level drop of at least 400 m, probably as a response to the cool and arid tropical climate during the penultimate Pleistocene glaciation.