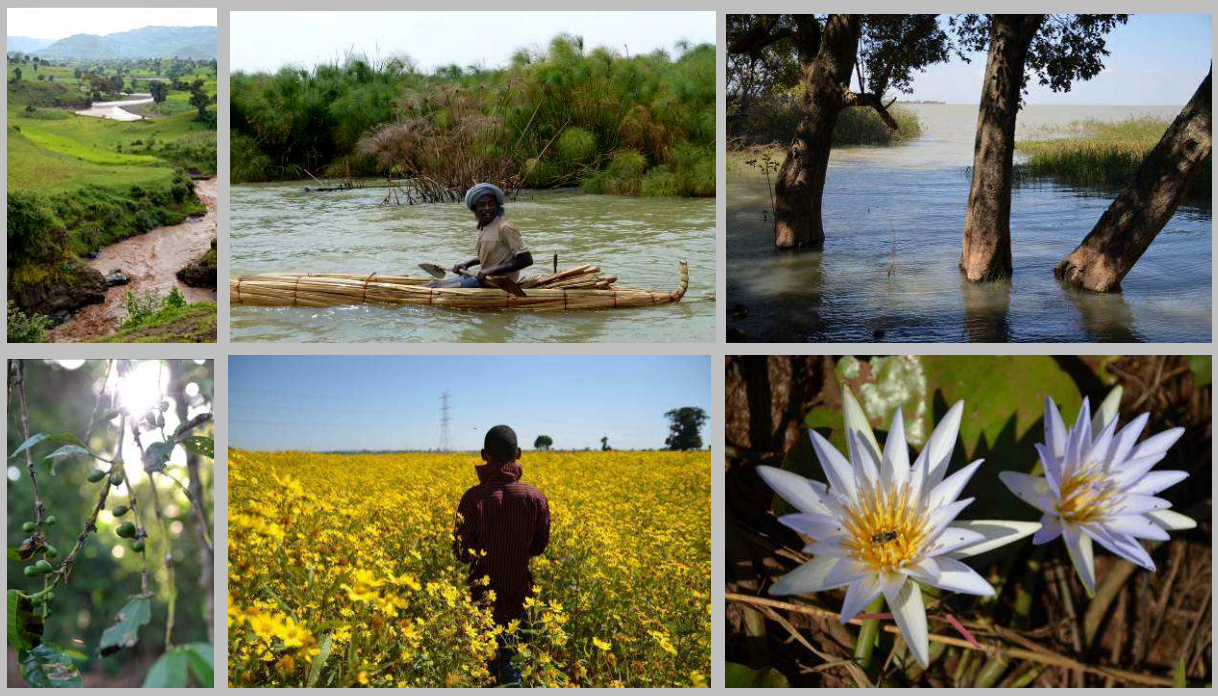
MICHAEL SUCCOW FOUNDATION
for the Protection of Nature

Feasibility study for a potential biosphere reserve Lake Tana

By Friedrich zur Heide



Conducted in cooperation with the Amhara National Regional State Bureau of Culture, Tourism and Parks Development

Supported by the German Federal Agency for Nature Conservation (BfN) with funds from the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU)

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Abbreviations

AfriMAB	Africa-wide Network of Biosphere Reserves
ANRS	Amhara National Region State
BDBNRMP	Bahir Dar Abay (Blue Nile) River Millennium Park
BDU	Bahir Dar University
BoA	ANRS Bureau of Agriculture
BoCTPD	ANRS Bureau of Culture, Tourism and Parks Development
BoEPLAU	ANRS Bureau of Environmental Protection, Land Administration and Use
BoWRD	ANRS Bureau of Water Resources Development
BR	Biosphere Reserve
CBD	Convention of Biodiverstiy
CCD	Convention to Combat Desertification
CITES	Convention of International Trade in Endangered Species
GoE	Government of Ethiopia
IK	Indigenous knowledge
IUCN	International Union for the Conservation of Nature
LTW	Lake Tana Watershed
LTR	Lake Tana Region
MAB	Man and the Biosphere (UNESCO programme)
MSF	Michael Succow Foundation (Michael Succow Stiftung)
MoARD	Ethiopian Ministry of Agriculture and Rural Development
MoST	Ethiopian Ministry of Science and Technology
NABU	Nature and Biodiversity Conservation Union
NAP	National Action Plan to Combat Desertification
PRA	Participatory Rural Appraisal
SARDP	The SIDA-Amhara Rural Development Programme
SWOT	Strengths, Weaknesses, Opportunities and Threats

1. Outline of feasibility study

1.1. Background of the feasibility study

This feasibility study is the result of a one year project (January to December 2011) conducted by the Michael Succow Foundation for the Protection of Nature (MSF), Germany. It was supported by the German Federal Agency for Nature Conservation (BfN) with funds from the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU).

As a result of NABU's project work with the aim of nature conservation, regional development and set up and effective implementation of protected areas in Ethiopia, a high level delegation trip took place in March 2009. For this purpose the NABU, UNESCO and the Ministry of Culture and Tourism were invited by the Ethiopian Ministry of Science & Technology (MoST) and the regional governments of Amhara, Oromia, Southern Nations and Nationalities and Peoples (SNNP). After the joint visit of several potential sites being considered as candidates for UNESCO Biosphere Reserves, NABU, MoST and UNESCO signed a trilateral Memorandum of Understanding (Umbrella MoU) in November 2009. The aim of the agreement is to work towards the protection of biodiversity and the use of natural resources from the perspective of sustainable development and conservation of cultural heritage. It was also agreed that the contracting parties work towards the establishment of a national network of biosphere reserves in Ethiopia.



Picture 1: Participants of the Workshop "Stakeholders' Workshop on Legal Aspects for Biosphere Reserves - A tool for conservation and development in Ethiopia" in 2009, including (from left to right), Claas Knoop (German Ambassador), Girma Wolde-Giorgis (President of Ethiopia H.E.), Alexandros Makarigakis, (UNESCO Science Programme Specialist), Michael Succow (Chairman Michael Succow Foundation), Juneydi Saddo (former Minister for Science and Technology)

In fulfilment of its commitments, NABU worked towards the establishment of Kafa Biosphere Reserve which was included in the world network of UNESCO Biosphere Reserves in June 2010 and officially launched in March 2011.

In order to facilitate and support the establishment of biosphere reserves in Ethiopia NABU, in accordance with the Umbrella MoU, invited international experts to Ethiopia, including the Michael Succow Foundation, for an in-depth evaluation of areas previously identified as potential biosphere reserves in December 2010. Due to long standing cooperation and MSF's expertise in the establishment of protected areas, NABU identified MSF amongst the expert institutions as an appropriate partner for the fulfilment of the Umbrella MoU.

As a result of the field trip in 2009 Lalibela and Dire Sheik Hussein as well as Lake Tana, were considered as potential Biosphere Reserves. With respect to the expert point of view, e.g. Professor Michael Succow and in consultation with the Ethiopian Government and German government bodies the development of Lalibela as well as Dire Sheik Hussein has been postponed for the time being and Lake Tana and Siemen Mountains are given first priority to be included in the baseline assessment done on the last delegation trip in 2010. To further deepen the knowledge on the potential and threats of the LTR to become a biosphere reserve, it was decided to initiate a feasibility study prior to any possible practical interventions.

The idea to make the LTR a biosphere reserve was already born in 2005, when a group of regional experts from various disciplines (environmental protection, land management, fisheries and tourism) have concluded in a regional workshop that a BR would be the best tool to address the already then existing severe environmental threats. Mainly due to a lack of political commitment this initiative did not gain sufficient attention and support then.

1.2. Purpose, objectives and scope of the study

This document focuses on the feasibility of the Lake Tana Region to become a UNESCO Biosphere Reserve. In order to structure and design such a feasibility study, the **selection criteria** of the Seville Strategy (2008) have to be regarded (see Box 1).

These specific criteria are again based on the three complementary and mutually reinforcing basic functions of BRs (cf. UNESCO 2004):

a) **Conservation** – contribute to the conservation of landscapes, ecosystems, species and genetic variation; importance for conservation at the regional or global scale

b) **Development** – foster economic and human development which is socio-culturally ecologically sustainable
Key projects and programs fostering sustainable economic and human development

c) **Logistic support** – support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation & sustainable development

Box 1: Selection criteria of the Seville Strategy
(source: UNESCO 2011: 128f)[1]:
It should encompass a mosaic of ecological systems **representative of major biogeographic regions**, including a gradation of human interventions.

It should be of significance for biological diversity conservation.

It should provide an opportunity to explore and **demonstrate approaches to sustainable development** on a regional scale.

It should have an **appropriate size** to support the three functions of biosphere reserves, as set out in Article 3 above.

- It should promote these functions, through appropriate **land-use planning and zonation**, recognising the following:
  a) Legally constituted **core areas**, or areas devoted to long-term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives.
  b) **Buffer zones** clearly identified and surrounding or contiguous to the core area, where only activities compatible with the conservation objectives can take place.

Transition areas where sustainable resource management practices are promoted and developed.

Organizational arrangements should be made for the **involvement and participation** of a suitable range of, inter alia, public authorities, local communities and private interests, in the design and carrying out the functions of a biosphere reserve.

- In addition, provisions should be made for:
  a) Mechanisms to **manage human use** and activities in the **buffer zone**.
  b) A **management policy** and **management plan** for the area as a biosphere reserve.
  c) A **designated authority** or mechanism to implement this policy and plan.

Programs for research, monitoring, education and training.

Some of the criteria include measures that will need to be taken for the further nomination process, including:

- Land-use planning and zonation (demarcation, legal constitution, buffer zone regulations etc.);
- Organizational arrangements for stakeholders´ involvement and participation;
- Management policy and management plan;
- Officially designated authority;
- Training programs.

[1] For the detailed list of UNESCO´s criteria designation criteria refer to the nomination form, UNESCO 2004 (available at: http://www.powys.gov.uk/rep_2007-10-16b1_362b_en.pdf?id=47)

Objectives of the study

The feasibility study serves to illustrate and prove which of the selection criteria are already fulfilled and how they are characterized. The objectives of this study are not only to assess the feasibility for a potential biosphere reserve as such, but also to:

- Better understand the complex natural, socioeconomic and organizational set-up and trends in the Lake Tana Region (LTR);
- Compile relevant data as a data basis for further BR planning and management processes and project preparations;
- Systematic approach based on clear UNESCO criteria;
- Address potentials and challenges in achieving sustainable regional development and a biosphere reserve in particular;
- Develop context-specific concepts, recommendations and visions for a BR;
- Thereby contribute to the fulfillment of the BR qualification.

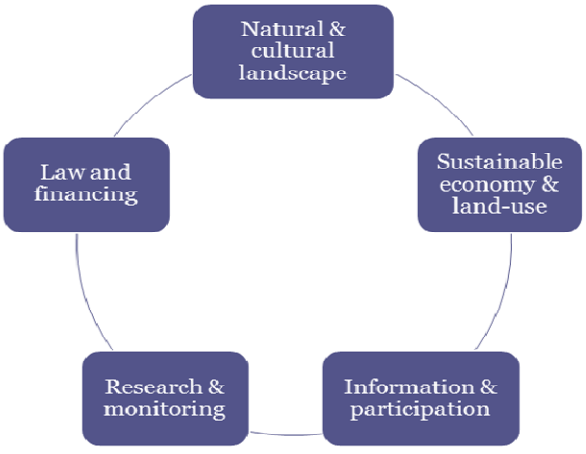
1.3. The five feasibility dimensions

The structure of this study is therefore based on the guidelines for the suitability of biosphere reserves (Lange 2008), dividing the suitability, i.e. feasibility into five dimensions (see Box 2).

Box 2: The 5 BR feasibility dimensions (source: adapted from Lange 2008)

I. Natural and cultural potential
- Representative biogeogr. systems
- Areas with gradual human utilization
- Sufficient size for fulfilling functions
- Bio- and cultural diversity conservation
- Division into core, buffer and development zones
- Inventory of natural and cultural goods

II. Sustainable development and land-use
- Promotion of a sustainable development
- Primary sector: environmentally sound land-use; Secondary sector: energy consumption, raw material use, waste management; Tertiary sector: tourism and transport; Regional economic cycles and value chains; Concepts for reducing traffic



III. Participation, stakeholders
- Establishm. of central information Continuous PR for citizens, visitors;
- Promotion of (environmental) education for sustainable dev.
- Information exchange between BR
- Participation of all stakeholders
- Development of regional & topical networks; establishment of communication platforms; creation of advisory boards
- access & benefit sharing

1. Research and monitoring
- Establishment of research programmes
- Publication/sharing of research results
- Environmental monitoring programs
- Research focus on MAB interactions
- (inter)national research cooperation

2. Legal framework
- Biosphere reserves remain under the sovereignty of the state
- Legal safeguarding of the core and buffer zone
- Anchoring in the national legislation

1.4. Methodology and approach

Building on the existing

The feasibility is meant to be a compilation and a synthesis of the existing data as well as previous and current efforts to build on. The generation of new data is supplementary to address relevant aspects more specifically. In the understanding of UNESCO´s concept, a biosphere reserve is the framework or umbrella, under which a high number of (already existing and future) activities and initiatives in line with the BR criteria are accommodated. Therefore a status quo potential analysis comprises the following aspects to build on:

- Good showcase projects pertaining to nature conservation and sustainable development;
- Experts and institutions with the capacities to manage various aspects within the BR;
- Documents such as studies, workshop proceedings and project reports.

Data generation

Information and data were generated from primary and secondary sources, namely:

Issue / section	Methodology / data source / Resource persons
Vision and objective statements MAB programme, networking and BR management	• Group discussion in the "Stakeholder Workshop on a potential BR in the LTR", Bahir Dar (10 March 2011) • "Workshop on Linking Knowledge and Sharing Experiences within the Ethiopian MAB Programme", Addis (4-5 Nov. 2011) • "Stakeholder Coordination Workshop on the Feasibility of a Lake Tana Biosphere Reserve", Bahir Dar (14 Nov. 2011) • Discussion with relevant regional, national and international stakeholders (UNESCO, MoST, BoCTPD, Bahir Dar City, BoA, BoEPLAU, BoWRD, BDU, ANRS government, NABU, ECFF, etc.)
Land management, environmental issues and biodiversity conservation	• Statistical and qualitative data and documents reviews • PRA group discussions • Project site visits and interviews (GIZ-SLM, BoA, BoCTPD, Tana-Beles, NBA, BDU, Millennium Park, ORDA etc.)
Forests and forestry	• Expert interviews (ORDA, Amhara Forestry Enterprise, GIZ, BoA etc.) and document review • PRA group discussions • Field research on economic, social and ecological forest functions by Mrs. Renée Moreaux (integrated Master thesis)
(Eco)Tourism	• Expert interviews (tour operators, tourists, BoCTPD, Tesfa etc.) and PRA group discussion • Statistical and qualitative data and documents reviews • Field research on LT´s eco-tourism potentials by Mr. Christian Sefrin (integrated Master thesis)

Wetlands and its use	• Expert interviews (EWNRA, Bahir Dar University, BoCTPD, BoEPLAU ARARI etc.) • Document review and PRA group discussions • Field research on wetland ecology by Mrs. Fanny Mundt and on the livelihood transformations and benefits of wetlands by Mrs. Maxi Springsguth (integrated Master theses)
Aquatic ecosystems, water management and irrigation	• Expert interviews (MoWE, BoWRD, BDU, Fisheries Research Center, BoEPLAU, FAO etc.) • Document review
Socioeconomic trends	• Documents and expert interviews (BoFED, RUPI, BoA etc.) • Workshop "Prospectives for Urbanization in the Lake Tana Region", Bahir Dar (17-19 February 2011)

Table 1: overview of data sources for the study

Early stakeholder involvement

A feasibility study is not only paper work and data generation. It shall also initiate a dialogue with respective authorities and other stakeholders (cf. Bouamrane 2007), since the feasibility highly depends on the stakeholders views, commitment and reservations to a BR. Accordingly, early dialogue was created from the inception of the project through innumerable meetings, expert interviews, group discussions and workshops in order to bring in as many ideas as possible and create participation in the process of knowledge exchange and vision statements. For this purpose a "kick-off stakeholder workshop on a potential biosphere reserve in the LTR" was conducted on 10 March 2011. Similarly a wrap-up "Stakeholder Coordination Workshop on the Feasibility of a LT BR" on 14 November 2011 served to present and discuss the preliminary results of the feasibility study to a wider public, including representatives from all respective Woredas[2] (see chapter 5 xx). Through creating a platform for dialogue on a potential BR the respective stakeholders were encouraged to scrutinize prevailing questions on how to harmonize human activities with ecological needs, define their roles and responsibilities and identify fields of activities towards realizing a BR.

Support by in-depth studies

The Michael Succow Foundation seeks to fruitfully link scientific research with practical and applicable knowledge to improve the synergy between research and project operations. The feasibility was ideally supplemented by the input of in-depth studies from four master theses that were designed and conducted under the supervision of the project coordination in order to fill knowledge gaps in selected thematic areas (see list below).

[2] A Woreda in Ethiopia denotes an administrative unit (district), which is subordinated under zonal administrations and comprises several Kebeles (local peasant associations).

Topic	Person / institution
Wetlands around Lake Tana: A landscape and avifaunistic study	Fanny Mundt (Greifswald University, student of landscape ecology)
Land Use Change and Transformation of Agricultural Livelihoods along the Eastern Shores and Plains of Lake Tana. Alteration of Wetlands – Risk or Chance for Agricultural Livelihoods?	Maxi Springsguth (Greifswald Univ., student of landscape ecology) Babiyew Sibhat (BDU, MSc. student, counterpart)
Remaining Forests of the Lake Tana Region – Their Social, Ecological, Economical Functions and Possibilities for Rehabilitation	Renée Moreaux (Greifswald Univ., student of landscape ecology) Tesfaye Minalhegn (PRA expert, assistant)
Ecotourism in Lake Tana Region, Ethiopia – potentials for the implementation of community-based ecotourism Two case studies: Zege Peninsula & Tis Issat Falls	Christian Sefrin (Bonn University, student of Geography) Tesfaye Minalhegn (PRA expert, assistant)

A Memorandum of Understanding (MoU) was signed between the MSF, Bahir Dar University (BDU), Greifswald University and Addis Ababa University in order to integrate the research within Bahir Dar University. The master students were partly co-supervised by staff from BDU and conducted field studies jointly with counterpart students, which contributed to a fruitful mutual knowledge and cultural exchange. The results of the theses will be made available after completion in 2012.

Data processing

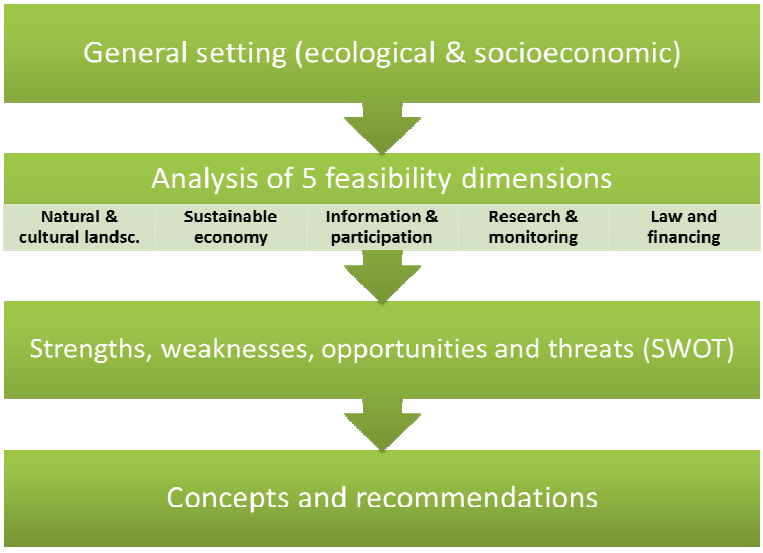


Figure 1: Data analysis frame (adapted from Lange 2008)

The structure of the document follows the data processing scheme in Figure 1. After the general ecological and socioeconomic settings have been described, the potential of the Lake Tana Region is being viewed and analysed against the background of the five feasibility dimensions (Figure 1). Based on these results, the strengths, weaknesses, opportunities and threats (SWOT) are being analysed to summarize the current situation and future trends. Finally specific concepts for various fields of activities within the envisaged BR are presented and recommendations for further steps in BR planning and management are made.

1.5. Designation procedure for biosphere reserves

The details for the steps to be taken towards the designation and guidance for biosphere reserves are described in the first draft of the Ethiopian MAB Strategy (UNESCO 2011). The International Coordinating Council (ICC) of the UNESCO MAB Program is responsible for designating biosphere reserves for the inclusion in the World Network of Biosphere Reserves in accordance with the following procedure):

1) States forward nominations through National MAB Committee, together with supporting documentation, to the UNESCO Secretariat after having reviewed potential sites, taking into account the selection criteria described in Box 1 above.
2) The Secretariat verifies the content and supporting documentation. The Secretariat requests missing information from the nominating State in case of incomplete nomination.
3) The Advisory Committee for Biosphere Reserves considers nominations for recommendation to the ICC.

Finally, the ICC decides on the nominations for designation and the Director-General of UNESCO notifies the State accordingly (UNESCO 2011: 129).

2. Introduction

The MAB program has undoubtedly contributed conceptually and demonstratively to reconciling man and nature with its concept of biosphere reserves, which is outlined in a bulk of literature[3]. On the occasion of the 40th anniversary of UNESCO´s MAB program, the role that biosphere reserves play for climate change protection have been addressed in the international BR conference "For life, for the future Biosphere reserves and climate change" in June 2011 in Dresden, Germany (DUK 2011).

Contrary to still prevailing misconceptions biosphere reserves are not exclusive nature "reserves", as the name may suggest. They are regional models for sustainable (human) development in which biodiversity and ecosystems conservation in a cross-cutting and cross-sectoral issue. It is based on the notion that for any sustainable social and economic development, ecosystem integrity and its capacity to provide ecosystem services are a prerequisite (see model).

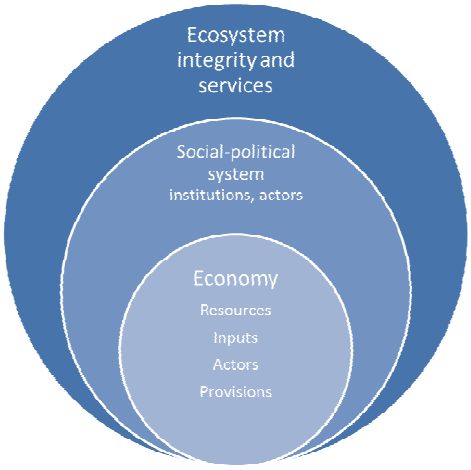


Figure 2: regional development model (adapted from UNESCO 2011)

In the light of the current debate on the Green Economy to harmonize economic activities with the ecosystem´s long-term capacity to provide resources, biosphere reserves can also be considered to be *Model Regions for a Green Economy* (GIZ 2011). The Green Economy concept also aims at harnessing the potential to generate economic opportunities from biosphere reserves in the primary, secondary and tertiary sector, through e.g. ecotourism and economizing various ecosystem services that derive from biodiversity conservation.

2.1. The MAB Program and Biosphere Reserves in Ethiopia

To date Ethiopia has two biosphere reserves, Kafa BR and Yayu BR, which have been successfully nominated in 2010. These nominations stem from a long-standing process and endeavour of various governmental and non-governmental institutions. The respective stakeholders worked towards the conservation of the last remaining

[3] A list of references for reading can be found in annex IX.

wild coffee forests in southwest Ethiopia while safeguarding the livelihoods of the rural communities, for example by creating economic incentives from coffee production for forest conservation.

Box 3: Guiding principles and criteria for the Ethiopian MAB Programme
(UNESCO 2011: 113)

- "The mutual relationships and linkages between land units must be understood and applied when delimiting and managing these units. This implies that a **system of ecological corridors** needs to be created, linking statutory and/or de facto nature areas;
- The protected nature area system should, wherever possible, **transect bioregions from low to high elevation** and through terrestrial, watersheds, wetlands, rivers, forests, and other ecosystem types, as well as the full range of climate, soil types, geology, etc.;
- The biosphere reserves should be **large enough to provide functional habitats** for the indigenous organisms that inhabit them. Where necessary, they should be **rehabilitated** and critical '**keystone' species** should be re-introduced. They should also be large enough to support natural disturbance regimes such as natural wildfires, floods, and storms that play a critical role in their dynamics. In order to provide evolutionary continuity, such disturbance regimes should either occur naturally, or be **carefully mimicked** through management intervention techniques;
- The system should include **representation from all levels of biodiversity**, including populations, species, and landscapes;
- The system should be managed in a way that **honours long-standing, benign uses by local people** for whom the system should include places of spiritual and cultural renewal;
- The biosphere reserves should as far as possible be protected by appropriate **buffer areas**;"
- replacing the current exclusionary protected area policy and adopting a community-based protection area strategy;
- biosphere reserves can be considered learning sites for practising the rules of sustainable development."

In the recent years a number of national workshops were conducted in Ethiopia to advocate the biosphere reserve concept and strengthen the MAB program in Ethiopia.[4] According to the Seville Strategy on biosphere reserves (cf. UNESCO 1996), the overall objectives of the Ethiopian MAB Program shall be to:

- Improve the coverage of natural and cultural biodiversity by means of the world network of Biosphere Reserves;
- Integrate biosphere reserves into conservation planning;
- Integrate biosphere reserves into regional planning;
- Improve education, public awareness and involvement.

[4] Namely: (*a*) "Biosphere Reserves – a tool for Conservation and Development in Ethiopia. Stakeholders´ Workshop on Legal Aspects", December 2008 (organized by GTZ SUN, MoST, NABU); (*b*) "National Workshop on Biosphere Reserves (BR) and Landscape Planning", April 7-9, 2009 (organized by IBC, BfN, EFCC, ZEF, UNESCO); (*c*) "The First Ethiopian UNESCO Biosphere Reserves Inauguration Workshops", October 5-12, 2010, Addis Ababa and Metu (organized by MoST, BfN, ECFF, IBC); (*d*) "Workshop on Linking Knowledge and Sharing Experiences within the Ethiopian MAB Programme", November 4-5, 2011 (organized by MSF, MoST, UNESCO, BfN)

In the first draft of the MAB Strategy for Ethiopia a number of guiding principles and criteria were formulated for the establishment of a network of biosphere reserves in Ethiopia (Box 3).

The lessons from the establishment and planning process as well as management issues nourished this study in different ways. However, transferability of experiences is to some extent limited by the fact that the ecological and socioeconomic contexts within Ethiopia, and particularly between the coffee forests and the Lake Tana Region, are very contrasting. Unlike Kafa and Yayu, the LTR has a much higher degree of human intervention through (agri)cultural landscapes, high population density, rural-urban linkages and a low forest cover. Instead of forests, the pivotal element that determines the regional ecology is water in many forms (the lake, the big streams and Blue Nile in particular, the wetlands). As each BR has its own context-specific potentials, this study is dedicated to exploring this context.

2.2. The general policy framework in Ethiopia and links to other conventions

The **overall policy framework**, in which various conventions and conservation endeavours are embedded and that determines the wider decision-making context, consists of the following strategies and policies (for further reading refer to UNESCO 2011):

- Ethiopia´s Poverty Reduction Strategy Paper called Sustainable Development and Poverty Reduction Programs (SDPRP) was prepared in 2002, prioritizing following areas for action: land degradation, the strengthening of regulatory and institutional capacity, and the enhancement and protection of biodiversity. Build on this, Ethiopia prepared a **Plan for Accelerated and Sustained Development to End Poverty** (PASDEP) in 2005 which "*aims to mainstream environment into development, to strengthen city and regional governments for environmental protection and to develop regulatory frameworks and systems for alleviating deforestation and soil degradation, which are major causes of food insecurity and poverty in Ethiopia*" (IFAD 2007: 9).
- Ethiopia´s role in the New Partnership for Africa's Development (NEPAD), which includes the **Comprehensive Africa Agricultural Development Programme** (CAADP). It aims at fostering a broad-based agricultural-led economic growth in African countries by focusing on enhancing agricultural productivity and competitiveness. In this context, Ethiopia has issued the Agriculture Development-Led Industrialization (ADLI) strategy as being the country´s core economic development strategy (MoA 2009).
- With respect to water policies, Ethiopia is a member of the **Nile Basin Initiative** (NBI) of the Nile riparian countries as equal members in a regional partnership to promote economic development and fight poverty throughout the basin. It is guided by the vision "*to achieve socio-economic development through the equitable utilization and benefit from the common Nile Basin water resources*" (NBI 2011). As the source of the Blue Nile, the Lake Tana Basin plays a crucial geopolitical role in utilization and conservation of the Nile water resources.
- Ethiopia has a wide range of national policies that commit the country to a comprehensive and integrated management system for the protected areas

and institutions mandated for promoting sustainable development and biodiversity conservation (Box 4).

Box 4: Overview of key policies, conventions and institutions for BR related issues

Conventions:
- Convention on Biological Diversity (CBD);
- Convention on Migratory Species;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- UN Convention on Combating Desertification (UNCCD);
- UN Framework Convention on Climate Change (UNFCCC): signed by Ethiopia on 5 April 1994;
- Kyoto Protocol;
- World Heritage Convention (heritage sites as core areas);
- Ramsar Wetland Convention.

Policies:
- Environmental policy: issued in 1997 for a sound management and use of natural resources;
- National Policy on Biodiversity Conservation and Research Policy (1998);
- National Conservation Strategy (NCS) of Ethiopia 1997: umbrella strategy that; comprises all relevant sectors (agriculture, forestry, wildlife, fisheries, soil, water and minerals); sets main objective for biodiversity conservation;
- "Biodiversity Conservation and Development: Strategy and Action Plan for Ethiopia", December 2005, by the IBC;
- National Livestock Development Programme (1997);
- Rural Development Strategy (2002);
- National Food Security Strategy (2003) and Programme.

Institutions:
- Institute of Biodiversity Conservation (IBC): established by proclamation; objectives: ensure appropriate conservation, research, development and sustainable utilization of biodiversity in Ethiopia;
- Ethiopian Wildlife Conservation Authority (EWCA): Protected Area System focus on management and conservation of large fauna;
- Forestry Research Center (FRC): research on species establishment, nursery techniques, etc.;
- National Herbarium: established in 1959, managed by Addis Ababa University Biology Department, depository of collected flora, it is a center for scientific information undertaking studies on plant species;
- Ethiopian Agricultural Research Organization (EARO): legally mandated to conduct agricultural research, coordinate other research of universities;
- Ethiopian Forestry Action Program (EFAP): issued in 1994.

The country has committed itself to issues pertaining to sustainable development and biodiversity conservation in a number of **international conventions** (Box 4), which are synergetic with the objectives of the MAB programme, namely the Convention on Biological Diversity (CBD), the UN Convention on Combating Desertification (UNCCD), UN Framework Convention on Climate Change (UNFCCC), the World Heritage Convention (heritage sites as core areas) and the Ramsar Wetland Convention (currently under preparation). These conventions could in parts be

fulfilled by the tool of biosphere reserves by developing showcase projects under the BR umbrella. Protocols between the MAB program and the respective conventions have already been established (UNESCO 2011: 15-18).

Ethiopia ratified the **UN Convention to Combat Desertification** (UNCCD) in 1997 and developed a National Action Program (NAP) in 1998 focusing on the management of natural resources, the intensification and diversification of agriculture, the promotion of alternative livelihoods and rural credit to improve institutional capacity, particularly at the community level. Accordingly, in 2002 the Amhara National Regional State government through the Environmental Protection Land Administration and Use Authority (EPLAUA) prepared a Regional Action Program (RAP) to Combat Desertification, within the framework of the NAP. The federal and regional governments enacted a wide range of policies, strategies, action plans and programs against land degradation (IFAD 2007: 9).

The country ratified the **Convention on Biological Diversity** (CBD) in 1994 and developed its Biodiversity Strategy and Action Plan in 2005 to meet the planning requirement of Article 6 of the convention. In addition, the Cartagena Protocol on Bio-safety was ratified in 2003. A "Conservation Strategy of Ethiopia" (CSE) was developed in 1997 with the help of World Conservation Union (IUCN) and accordingly, the ANRS formulated and developed a Regional Conservation Strategy (RCS) in 1999 with the overall objective of conserving and protecting the natural resources and environment of the region. As a party to the CBD and in fulfilment of its obligation, Ethiopia prepared its National Biodiversity Strategies and Action Plan (NBSAP) document in 2005 and prepared the final draft of its biosafety law in 2007. "*The NBSAP document defines the current status of, pressure on, options for, and priority action to ensure the conservation, sustainable use, and equitable share of benefits accrued from the use of biological diversity of the country*" (IFAD 2007: 9).

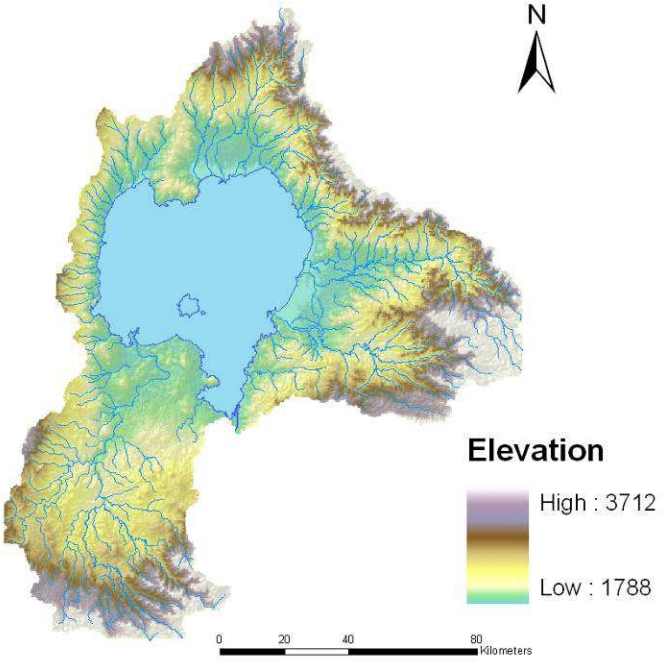
In the face of the still ongoing serious deforestation and overall environmental degradation, Ethiopia issued a 20 year Ethiopian Forestry Action Program (EFAP) in 1994. ANRS developed the **Amhara Forestry Action Program (AFAP)** in 1999 with following main objectives: (a) increasing output of forest products on a sustainable basis; (b) increasing agricultural production through reduced land degradation; (c) increasing soil fertility; (d) conserving forest ecosystems as well as genetic resources; (e) and improving the welfare of rural communities (IFAD 2007: 9). So far there is no institutional set-up for the conservation of forest genetic resources.

3. Dimension I: natural and cultural potential

3.1. Baseline of the Lake Tana Region

The Lake Tana region is situated in the northern part of the Ethiopian Highlands in Amhara National Regional State. The Lake Tana Region is not a clearly demarcated area but it lies within the Lake Tana watershed (LTW) and includes those areas around the lake with strong ecological, socioeconomic but also cultural linkages to the lake itself.[5] Geographically situated between latitude 10°58`–12°47`N and longitude 36°45`-38°14`E, the watershed consists of 347 *Kebele*s and 21 *Woredas* (districts) in four administrative zones (IFAD 2007).

With a surface of 3156 km² stretching approximately 84 km north-south and 66 km east-west, Lake Tana is the largest lake of Ethiopia and one of the largest in Africa. Located at an elevation of 1840 masl it is also the highest lake in Africa. Its maximum depth is 14m with a decreasing trend due silation and lowering water level. As the main source of the Blue Nile at its upper course, the Lake Tana Basin accounts for 50 % of the inland water amount, draining a long way through Khartoum in Sudan to the Mediterranean Sea. The LTW has a drainage area of 15,096 km². The lake is surrounded by lagoons and wetlands and has 40 tributaries (rivers and streams), on which Gilgel Abbay, Ribb, Gumara and Megech account for 93 % of the total inflow (Setegn et al. 2008). The lake was formed 20 million years ago by a lava extrusion that functions as a natural dam (UNESCO 2011).



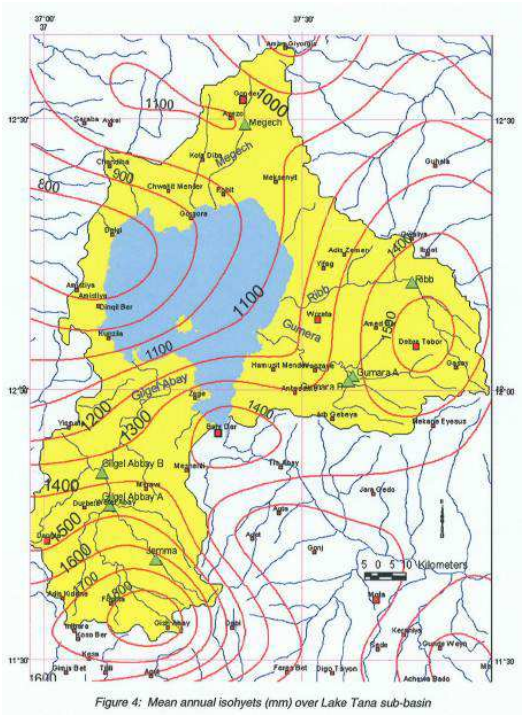
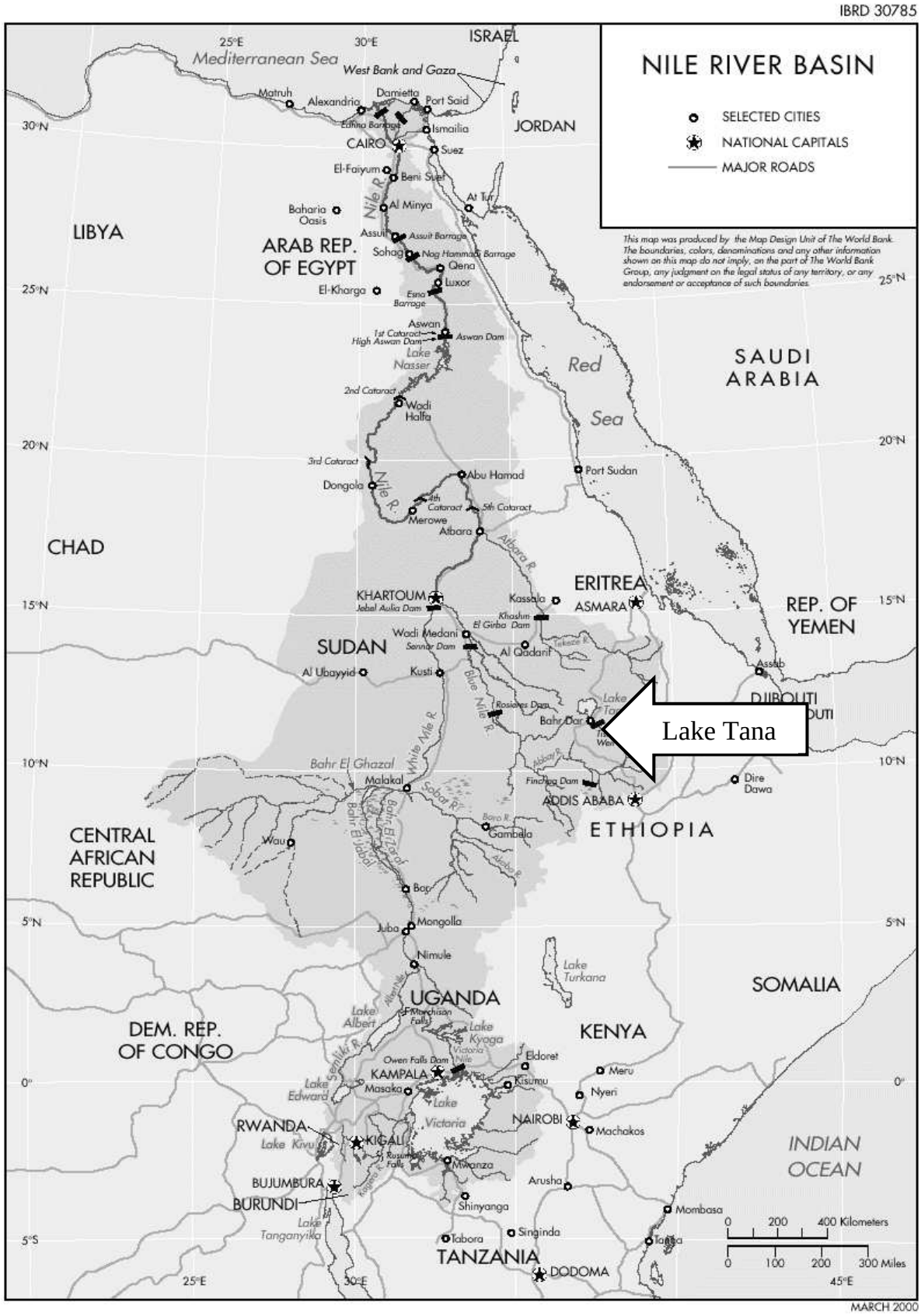


Figure 4: Mean annual isohyets (mm) over Lake Tana sub-basin

Map 1(left): Altitudinal range of LT basin (source: ANRS Bureau of Agriculture 2011).
Map 2 (right): Mean annual isohyets in mm (source: MoWE 2009)

[5] Note: For the feasibility study the whole catchment has been taken into consideration, even though the actual outer boundaries of a potential biosphere reserve still need to be defined and are part of a negotiation process.



Map 3: The Nile Basin (modified after IFPRI 2007: 3)

The **climate** around the Lake is a warm-temperate tropical highland monsoon with a mean temperature of 21.7℃, large diurnal but small seasonal changes of 5℃ and

two temperature peaks around May/June and October/November. Rainfall is strongly seasonal with a dry season between October/November and May/June and a pronounced rainy season (*kiremt*) between July and September. Due to its high altitudinal variations within the whole basin of Lake Tana, it covers eight agro-ecological zones (IFAD 2007)[6]. Accordingly, mean annual rainfall ranges from 800 to 2000 mm (see Map 2).

Major **soils** in the basin are Chromic Luvisols, Eutric Cambisols, Eutric Fluvisols, Eutric Leptosols, Eutric Regosols, Eutric Vertisols, Haplic Alisols, Haplic Luvisols, Haplic Nitisols and Lithic Leptosols (annex IV). The majority of the land area, 51 %, of the Lake Tana Basin is used for agriculture, 29 % is agropastoral area, 20 % of the basin is covered by the lake´s water (Setegn et al. 2009).

The LTR has **national and international importance** in many ways: it is rich in biodiversity with many endemic plant species and cattle breeds; it contains largest areas of wetlands; and it is home to many endemic birds and cultural and archaeological sites. In particular, Lake Tana has 37 islands of which 20 have Ethiopian Orthodox churches and monasteries with an enormous historical and cultural value, dating back up to the 14th century. The basin is also critical for the national economy, as it has great potentials for irrigation, hydroelectric power, water supply, high value crops and livestock production, transportation, (eco-)tourism attractions and others.

With 85 % of the Nile water originating from Ethiopia and most of it being precipitated in the LTW, the area has undoubtedly enormous international importance for the Blue Nile River and water supply in all the downstream regions and countries, i.e. Sudan and Egypt.

3.2. Ecosystem types and potential natural vegetation

UNESCO designation criterion:
"*Major biogeographic regions (gradation of human interventions)*"

According to the designation criteria a BR should comprise a diversity of major biogeographic regions where the degree of human activities like land-use is heterogeneous.

To date an ecosystem and vegetation classification and at the regional level has been very limited. Ethiopia is categorized by ten vegetation-based major ecosystems (IBC 2009) which correspond with a wide range of ecological, edaphic, altitudinal and climatic conditions and account for the wide diversity of biological resources both in terms of flora and fauna.

The Ethiopian highlands host more than 50 % of the land cover with Afromontane vegetation, which would naturally be dominated by dry montane forests. In fact, although evergreen scrubland vegetation naturally occurs in association with dry evergreen montane forests, but usually it is found as secondary growth after deforestation or on rugged or highly degraded places in the northern parts of Ethiopia (UNESCO 2011: 57).

[6] Namely: hot to Warm Sub-Moist (SM1) (4 % of the area); Tepid to Cool Sub-moist (SM2) (17 %); Cold to very Cold Sub-Moist (SM3) (1 %); Hot to Warm Moist (M1) (1 %); Tepid to Cool Moist (M2) (64 %); Cold to very Cold Moist (M3) (5 %); Tepid to Warm Sub-Humid (SH1) (1 %); Tepid to Cool Sub-Humid (SH2) (7 %).

Given the high altitudinal range and the vast water resources, the LTW has five **main ecosystem types** (see Map 4):

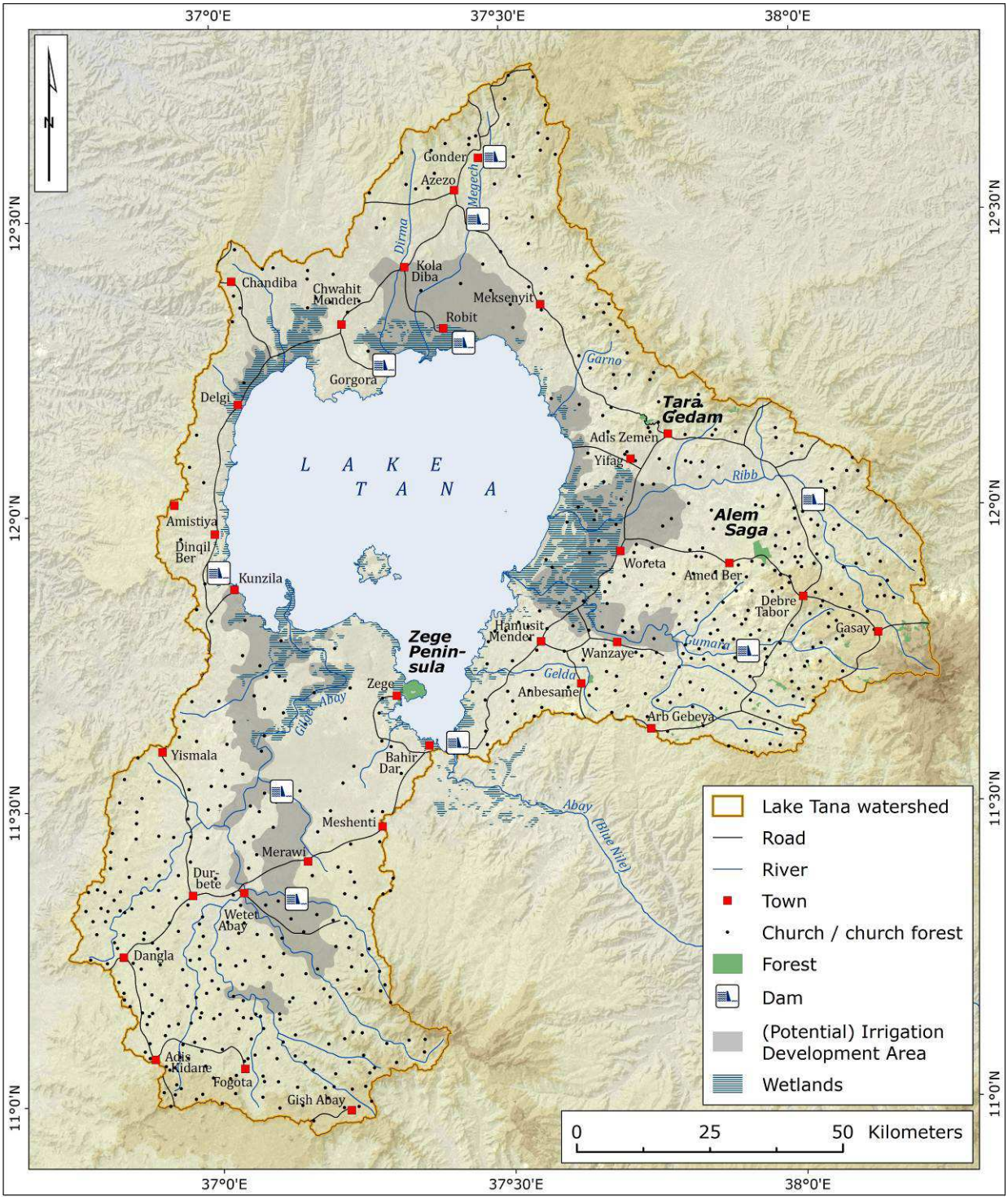
- Dry evergreen montane forest and evergreen scrub ecosystem;
- Aquatic ecosystem;
- Wetland ecosystems;
- Additional on higher elevations at the margins of the watershed:
    - Alpine and sub-afroalpine ecosystems;
    - Montane grassland ecosystem.

Despite the natural abundance of various ecosystem and vegetation types determined by the diverse ecological and physical settings, the actual land-cover shows a high degree of **human intervention** (see Table 2), which has been considerably altered by the following processes:

- **Deforestation:** the forest cover in Ethiopia was reduced from about 40 % in 1900 to less than 4.2 % today (Eshete 2007). In the LTW, dry Afromontane forests have experienced such vast exploitation that only few remnants of Church forests left amounting for only 0,39 % of the total area. Plantation forests are by large dominated by Eucalyptus;
- Corresponding with a profound population increase and demand for food, most of these forests have been converted into farmland and grazing land. Although farmland cultivation can be found throughout the watershed, the important areas of cultivation with fairly productive soils (Vertisols and alluvial soils) are the plains in the east of Lake Tana, e.g. Fogera Plains (see 4.1.1 on agriculture);
- One fifth of LTW (>3000km²) is covered by the water body of Lake Tana which creates a smooth transition to various types of seasonal and permanent wetlands that surround the whole lake and form large areas along the eastern shores of Lake Tana (see Map 4: on the extend of wetlands).

Type of land use/land cover	Area (ha)	%
Cultivated	824,285	54.95
Water	315,960	21.06
Grassland	155,735	10.38
Shrub land	134,250	8.95
Wetlands/Swampy/	24,000	1.6
Plantation Forest	16,410	1.09
Rock	7,925	0.53
Natural Forest	5,910	0.39
Others/Settlement	5,330	0.36
Woodland	4,710	0.31
Bare Soil	3,310	0.22
Afro-alpine	2,235	0.15
Total	**1,500,060**	**100**

Table 2: land-use/land cover of Lake Tana Basin (source: IFAD 2007: 13)



Map 4: Wetlands and church forests in the LTR (design: S. Busse, MSF 2011)

As a result of the high diversity of geographical positions, and wide altitudinal range, rainfall patterns and soils as well as human-induced landscape transformations, a wide variety of fauna and flora and habitats emerged with local and global significance for biodiversity conservation.

3.3. Important habitats and significance for biodiversity

UNESCO designation criterion:
***"Significance for biodiversity conservation"* → conservation function**

The high biological diversity of the LTR on the species-level is first and foremost conditional on the ecological state and integrity of its habitats in total – and this also includes the physical environment such as water and soils. The LTR has a number of those **important habitats** with respect to biodiversity that will be further characterized in separate chapters:

- Wetlands: floodplains, riparian, river mouth, lake shore and manmade wetlands, natural reservoirs (for wetland plant species like papyrus, typha and medicinal plants, roosting areas of endemic and migratory birds, micro-invertebrates and fish);
- Aquatic ecosystems: lake and riverine (16 fish species fish, wildlife like hippopotamus, crocodile and Nile monitor);
- Remnant church forests – islands of biodiversity (indigenous trees, species, gene pools wild coffee and field crop varieties, bird habitats).

Of course the determination of what is important in terms of conservation is founded in a setting of **conservation values** that are (a) per se normative, (b) highly contingent on a set of factors (cultural, knowledge, evaluations and preferences), and (c) human needs. Against this background conservation values need to be redefined in relation to their objectives or purposes. In this sense conservation always remains selective. Making these objectives more explicit helps to overcome contradiction between various objectives.

Biodiversity hotspots

Ethiopia has the fifth largest flora in tropical Africa and is one of the 12 centers of origin of crops. The flora of the country is estimated that 6,500-7,000 species of higher plants occur, of which 12 % are endemic. Ethiopia as a center of fauna diversity: of the 277 mammals, 862 birds, 201 reptiles and 63 amphibians, 29, 16, 10 and 34 species are endemic to Ethiopia, respectively (IBC 2009). The LTR is part of the Eastern Afromontane Hotspot and Horn of Africa Hotspot identified by Conservation International (2011)[7]. Accordingly, it is home of important flora and fauna, namely:

- Aquatic biodiversity: endemic **fish species** and other important species (cf. Dejen 2003, Getahun et al. 2008, Nagelkerke 1997) with the last flocks of Barbus; habitats for hippopotamus and reptiles like the Nile crocodile; rich in invertebrate diversity.
- Habitat of the **Fogera cattle** breed: one of the best native Ethiopian milk cow breeds which is at risk of genetic dilution.
- Important **bird nesting** and sanctuary areas of global importance (cf. Francis & Aynalem 2007, Tassie 2007, Tassie & Bekele 2007). 500,000 ha are estimated as Important Bird Areas (IBAs) that qualify as a Ramsar site (Birdlife International 2002).

[7] For further information on the Eastern Afromontane and the Horn of Africa Hotspots see http://www.biodiversityhotspots.org/

- Ethiopia a primary **gene centre** of several **field crops** which can be found in the LTR including *noug* (*Guizotia abyssinica*), *tef* (*Eragrostis tef*), *mashila* (*Sorghum bicolor*) and Ethiopian mustard (*Brassica carinata*) (IFAD 2007: 15, IBC 2009: 17).
- Many **indigenous medicinal plants** such as *endod* (*Phytolacca dodecandra*), *kosso* (*Hagyinia abyssinica*), *gesho* (*Rhamnus prinoides*), *wanza* (*Cordia africana)* and *girawa* (*Vernonia amygdalina*) are also found in the watershed (IFAD 2007: 15) and with 67 documented plants from the natural forest of Zege Peninsula alone (Teklehaymanot & Giday 2007).
- **Church forests** as islands of biodiversity (Eshete 2007), Zege peninsula with 113 documented woody plant species (Alelign et al. 2007, Alelign 2001) and the Bahir Dar Blue Nile River Millennium Park with 140 woody plant species identified (Marye 2009, 2010).

3.3.1. Aquatic ecosystems

With its vast water resources, water plays a pivotal role for the ecosystems´ constitution and **ecological processes** within the LTR. Lake Tana is considered as the water tower of Ethiopia because it accounts for 50 % of the total inland water of the country with 60 rivers and streams that flow into it. The four perennial rivers, Gilgel Abay, Gumara, Rib and Megech contribute 91 % to the inflow into the lake. The water of the lake comes from surface run-off, direct rainfall and groundwater recharge from its surrounding wetlands. The annual outflow from Lake Tana 4km³, i.e. 7 % of the total Blue Nile water flow (Dixon & Wood 2001: 35). The annual outflow for the period 1959 to 1995 as measured on the Abay River at Bahir Dar was 114 m^3/s, while the total flow in the Abay River at Tis Abay (Nile Falls) was 126m^3/s. The lake is turbid and has an oligotrophic trophic status (Dejen 2005: 37). The Dembia Plain to the north, the Fogera to the east and the Kunzula Plains to the southwest are low areas with a dendritic drainage network. The seasonal rainfall fluctuations cause a lake level range of about 1.5 m (2.5 m in 1997). Due to the higher water turbidity caused by the large tributaries, the transparency of the lake (*Secchi depth*) varies from 1.3 m in the rainy season to 1.82 m in the dry season (Dixon & Wood 2001: 36).

Economically the water resources play a significant role, because:

a) It has significant share of the country's` irrigation and hydropower potential (4.2.2).

b) As the source of Blue Nile, it contributes a significant amount of water to the Sudan and Egypt through the Nile system, on which their agricultural sectors are highly dependent (geopolitical relevance due to interregional dependence).

c) It is habitat for various fish species that makes the fisheries sector a viable sector (4.1.3)

d) It is essential as a source of drinking water and for many forms of urban use.

e) It is an asset for tourism and ecotourism in particular, as it contributes considerably to the region´s attractiveness (e.g. the Nile falls, wetlands as bird watching areas).

Lake Tana´s fish resources

By Dereje Tewabe [8]

Twenty of the twenty seven fish species of Lake Tana are endemics to the Lake Tana catchment. Despite the unique fish biodiversity and its high economic value of Lake Tana, fish resources are under pressure from several threats. The major threats are illegal fishing and habitat destruction (wetlands, rivers and the lake itself) due to human intervention. One of the few continuous long-term studies of fish communities conducted in Ethiopia has been in Lake Tana through an exploratory program, in which the spatial and temporal distribution of Lake Tana fish species were studied from January 2000 to date. Fish samples were collected monthly from representative habitats using gill nets of 60, 80, 100, 120 and 140 mm stretched mesh size. Length, weight, sex, and maturity stages of gonads were considered. The results indicated that *Labeobarbus spp*., *Oreochromis niloticus*, *Claris gariepinus* and *Varchrominus beso* are commercially important fish species and form 77 %, 13 %, 9 % and 1 % of the pooled experimental fish catch respectively. The high density of *Labeobarbus spp.* in the river mouth was associated with its reproductive behaviour (spawning aggregations) which is during peak rainy seasons. High density of *Oreochromis niloticus* was associated with its spawning aggregations at most wetlands and shore areas of Lake Tana during February to March, *C. gariepinus* has also shown high density during its spawning aggregations from June to July particularly at the wetlands and seasonal ponds of Lake Tana. The observed decline in densities of those economically important fish spp. stresses the need for the urgent development of a management plan focusing on ensuring wetlands and rivers connectivity, fishing effort, respecting closing seasons, gear type and mesh size restrictions and control in the river mouths and major tributaries during the breeding seasons of a year.

3.3.2. Wetlands around Lake Tana[9]

Wetland ecosystems have a high local and global significance as natural and economic resource. They provide a wide set of environmental services, such as flood control and biodiversity maintenance, and socioeconomic services for production and use, such as plants, crops, fish and grazing and thus are important for human use as well as for plants and animals. Therefore they are recognized as extremely valuable and the protection of wetland ecosystems has become highly important all over the world. According to Davis (1994), wetlands can be defined as, "*areas where water is the primary factor controlling the environment and the associated plant and animal life. They occur where the water table is at or near the surface of the land, or where the land is covered by shallow water (…). "Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."*

[8] Fisheries expert at the Amhara Fisheries Research Center, Bahir Dar (contact: drjetewabe@yahoo.com)
[9] This chapter was compiled and supported by Fanny Mundt (Greifswald University, Germany)

The Lake Tana Region is endowed with a large number of wetlands that are among the largest and ecologically most important ones of the country and the Horn of Africa. They surround the whole Lake and are flooded during the rainy season. Lake Tana and its associated wetlands are part of the Central Ethiopian Highland Wetland Complex (Hailu 2005) including (see Map 3):

- Lake Tana
- Fogera Floodplain to the east (see Keffie 2005)
- Dembia Floodplain to the north
- Dangela and the surrounding Wetlands (see Guade 2005)
- Bahir Dar Zuria (see Negatu 2005)
- Kunzula to the southwest

Wetlands account for 13,699 km² (i.e. 1.14 %) of land surface in Ethiopia. Of this 1,803km² (0.16 %) of Ethiopia is covered by marshes and swamps. If water bodies are included, in ANRS 3.7 % is covered by wetlands, with 288,744 ha covered by swamps and marshes, and 316,609 ha by water bodies (Kindie 2001).

Wetland ecosystems support a diverse flora and fauna, high diversity in habitat types dependent on altitude, rainfall, temperature and geographic location. The National Consultative Workshop on the Ramsar Convention and the World Habitat Society already identified Lake Tana and the Fogera wetlands as potential sites for a Biosphere Reserve and wetland conservation in 2004.



Picture 2: The Fogera flood plain (© F. Mundt)

More than 60 seasonal and perennial rivers that are equipped with distinct riparian and wetland vegetation can be found in the Lake Tana region. But the vast majority of this vegetation type is concentrated in the flat plains of Lake Tana. The wetland distribution around the lake can be seen on Map 1.

One of the characteristic features of Lake Tana, the papyrus populations, has dramatically declined in its distribution due to over-exploitation and habitat fragmentation and loss. Nowadays papyrus populations are mainly found in pocket habitats along the shorelines (Woldegabriel & Solomon 2006).

Within the Lake Tana Region one can classify **four major wetland ecosystems**: (1) riverine freshwater wetlands, (2) lacustrine freshwater wetlands, (3) palustrine freshwater wetlands and (4) agricultural flooded freshwater wetlands.

(1) Riverine freshwater wetlands: Riverine freshwater wetlands include all permanent and seasonal rivers and streams, and their inland delta and floodplains. There are seven large, permanent rivers and about 40 small seasonal rivers, which induce their water into the Lake by different geomorphologic processes. As a result of different climatic seasons floodings occur in the rainy season corresponding with a

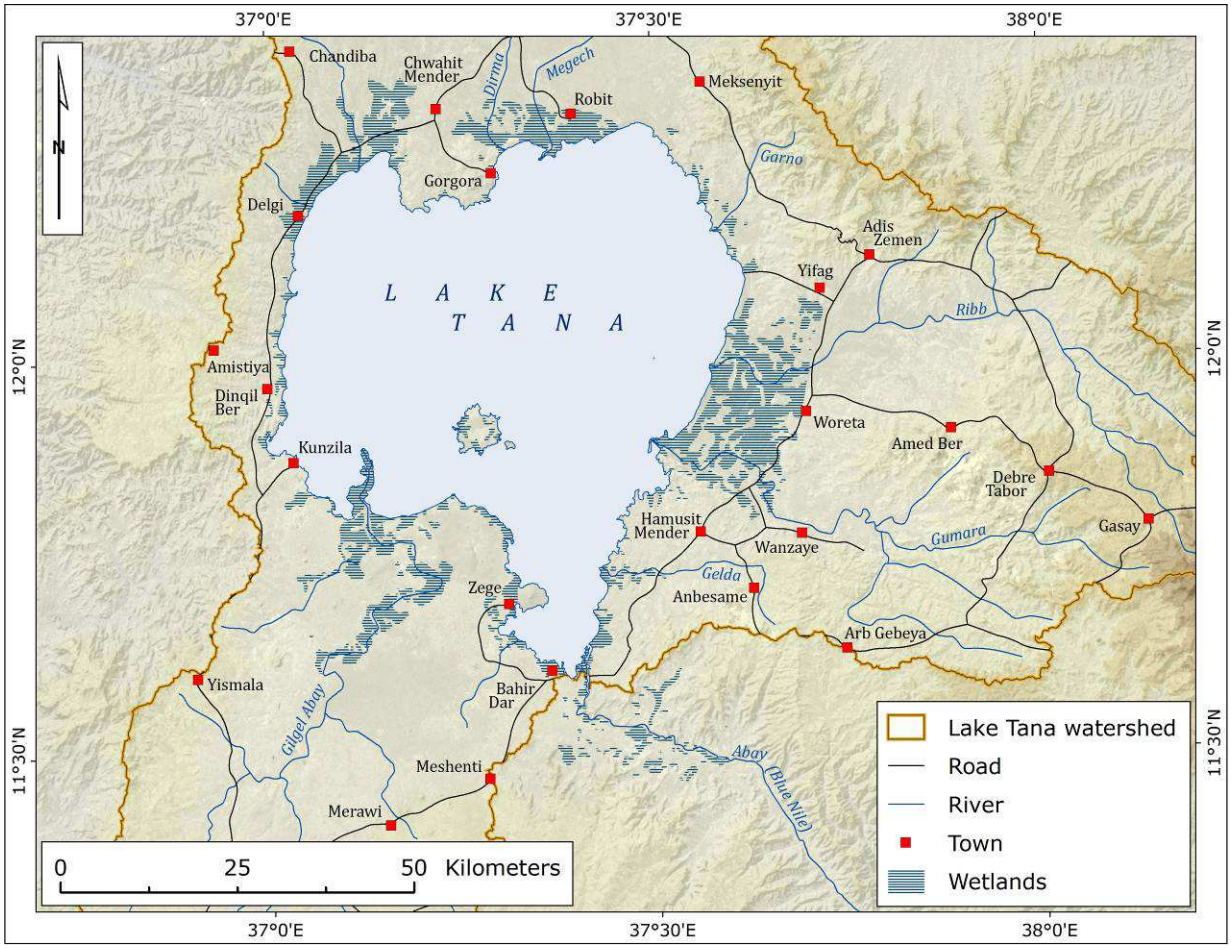
high input of alluvial soils mixed with nutrients and massive sediment accumulations along the river beds. This accumulation along the river beds leads as well to the creation of new wetland areas.

Of the riverine freshwater wetlands, Gilgel Abay, Gumara, Rib, and Megech Rivers are frequently perturbed by such dynamic processes at their lower reaches. All these permanent and seasonal feeder rivers and streams are ecologically significant in providing habitats as breeding and spawning grounds for riverine migrating fish species, especially for the **endemic fish stock** and hence play keystone ecosystem functions. The dynamic nature of the riverine wetland ecosystems, which are usually perturbed and perpetually changing, acts to structure wetland ecosystems in spatial and temporal scales. The long-term ecosystem functions of the riverine wetlands depend on their specific habitats and structure, as habitat structures of rivers and streams play an important role with regard to the ability of water bodies to function in natural systems and as habitats for aquatic organisms. Generally, the various riverine freshwater wetlands are important ecological units in conserving biodiversity because of their natural dynamics. Thus, they maintain the dynamic nature of the lake system to function as habitats for aquatic organisms (Woldegabriel & Solomon 2006).

(2) Lacustrine freshwater wetlands: The whole water body of Lake Tana can be classified as a lacustrine freshwater wetland. Based on the definition provided on Article 2.1 of the Ramsar convention, Lake Tana freshwater can be categorized as inland freshwater wetlands. With regard to limnology, the ecology of the lake is divided into littoral, sub-littoral and pelagic zones, based on light penetration. All these zones are interlinked and provide habitats for the various fish stocks and other aquatic lives (Woldegabriel & Solomon 2006).

(3) Palustrine freshwater wetlands: Palustrine freshwater wetlands include permanently or seasonally flooded freshwater marshes and swamps growing on inorganic soils. The various palustrine wetland ecosystems, located on-shore and off-shore of the lake and rivers and streams, are among the valuable ecological units that conserve important genetic resources and biodiversity species. The various vegetated wetlands have important ecological linkages between the water realms of the lake and terrestrial lands and hence require their joint management as they play keystone ecosystem functions in reducing point and non-point source pollutions, regulating flood velocity, providing important habitats for waterfowls and breeding and spawning grounds for fish species.

The various natural and near-natural palustrine freshwater swamp wetlands are ecologically significant in conserving the water tolerant vegetation communities of the *Cyperus papyrus-Typhae latifolia* (Woldegabriel & Solomon 2006).



Map 5: Wetland distribution around Lake Tana (design: S. Busse, MSF 2011, based on MoWE 2010a: 4/17)

(4) Agricultural flooded freshwater wetlands: The term agricultural floodplain wetland refers mainly to the Fogera floodplains, located within the coordinates of latitude 11044'-12003'N and Longitude 37025`-370 58`. These seasonal floodplains are located at the eastern side of Lake Tana and have an estimated size of 28,000 hectares. These wetlands had been part of the lake, but at the times of the pluvial period they have been changed into the present land forms due to high sediment loads, eroded by inflowing rivers to Lake Tana. The soils are alluvial with no stones. Because of their fertility they have been used by humans for several thousands of years. Rib River is the most important river that overflows its banks to form seasonal wetlands. The habitat structure of the flooded wetlands includes both semi-natural and arable lands, which are critically important in agro-biodiversity and wild diversity conservation. Within the Fogera floodplain rice is cultivated. This rice cultivation is one of the threats for the wetlands within the area and it results in a loss of biodiversity due to the destruction of the ecosystem.

The land of the Fogera floodplain provides habitats for wildlife species, especially for waterfowls and seasonally migrating fish stocks for spawning. The ecological significance of this area is manifested by its international recognition as important bird areas (IBA) for its support of globally threatened bird species. Despite, they are threatened by ecological degradation stemmed from drainage and channelling, invasion by alien species and farmland expansion.

Wetland functions and benefits

The wetlands around Lake Tana provide several **benefits** that can be categorized into ecological benefits, ecological functions with socioeconomic benefits and socioeconomic benefits indicated in Table 3.

Wetland function / benefits	Examples in Lake Tana
Provisioning (socioeconomic benefits)	
Food	Use as grazing sites, crop production for rice, pulses, vegetables (Fogera) / Agricultural land / Irrigation area / Fish / Seedling nursery site
Water	Domestic water supply Water for livestock and domestic consumption
Energy	Protection of hydroelectric power supplies in the dry season
Health	Better health through water purification / Medicinal plants
Construction and material	Thatching grass for houses / Papyrus for construction and handicraft, especially for poor / Clay for pottery
Regulating services (ecological benefits)	
Water / hydrological regulation	Groundwater recharge including maintenance of springs and moderation of stream flow and floods / Water storage throughout the year
Water purification	Purification of water through the functioning of reed beds / Filtration of water flow and sediment trapping
Erosion regulation	Sediment and nutrient retention / Protection of dams from siltation
Natural hazard protection	Flood control
Climate regulation	Creation of unique microclimates / Wetlands are part of the carbon cycle
Biodiversity	Provision of biodiversity and habitats for birds, such as roosting and feeding and breeding areas (IBA) / Habitat for pollinators

Table 3: Wetland ecosystem functions, services and benefits (own design, adapted from EWNRA 2008: 19, EWNRA 2001, Hailu 2005)

Farmers´ views on wetlands

In an assessment by Springsguth (2011) of Lake Tana´s eastern wetlands, it was found that wetlands are valued by farmers for their economic functions, i.e. their provisioning services such as source of animal feed, irrigation or domestic water supply. Only a few people mention the importance of wetlands for animals (e.g. fish breeding) and plants (supporting service), temperature regulation (regulating service) and recreation (cultural service) (Figure 3). The value of a wetland apparently depends upon the needs and motivations of the people. Thus, whilst people living adjacent to and within the Tanqua wetland (Wagetera and Nabega Kebeles) prefer

the conversion of this wetland with its fertile soil, people in Agid Kirigna see the need to preserve the wetland as a source of fodder.

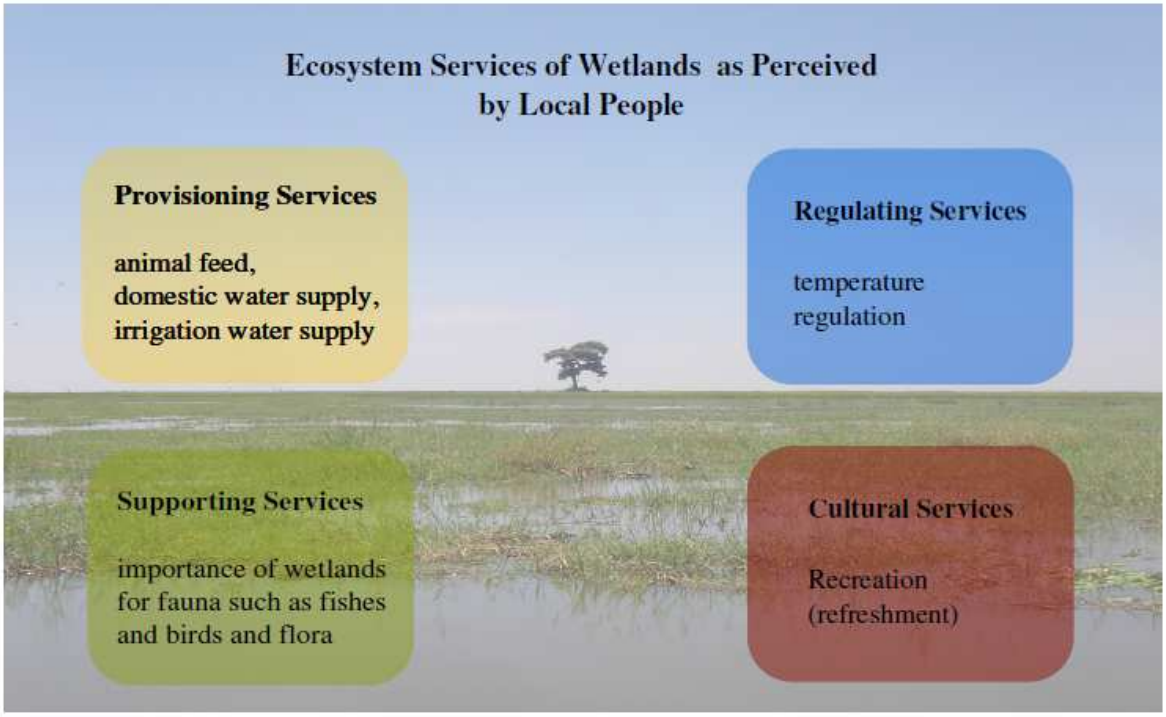


Figure 3: Ecosystem services of wetlands (© M. Springsguth 2011)

The local people's ideas on wetland conservation are manifold: (a) Wetlands protect themselves; (b) The resource use of wetlands needs to be managed; (c) Wetlands should be conserved as pastures; (d) Conserving wetlands without the utilisation of their resources (area closure) is impossible.

These ideas indicate that: some people may not be aware of how sensitive wetland ecosystems are and respond to anthropogenic influences; some people are aware of this sensitivity and thus recognise the importance of a regulated resource use; wetlands should be conserved for the benefit of humans; and local people clearly depend upon the wetland resources. Fishermen of the Negede ethnic group in Agid Kirigna (whose livelihoods depend upon fishing) said they were willing to conserve the wetland, but they had no idea of how to manage wetland resources under the existing population pressure and the open access of this wetland to people from Dembia and Fogera Woredas.

Wetlands as habitats

The wetlands around Lake Tana play an important role for wildlife and biodiversity. The Lake Tana region is an important **roosting site for migratory bird species** such as the Common Crane (*Grus grus*), Northern Shoveller (*Anas clypeata*), Northern Pintail (*Anas acuta*), Black-tailed Godwit (*Limosa limosa*) and Ruff (*Philomachus pugnax*). And it provides habitats for several endangered and endemic species, for example the Wattled Crane (*Grus carunculatus*), Wattled Ibis (*Bostrychia carunculata*), White-collared Pigeon (*Columba albitorques*) , Black-winged Lovebird (*Agapornis taranta*) and Whitecheeked Turaco (*Tauraco leucotis*), Pallid Harrier (*Circus macrourus*) and Black-crowned Crane (*Balearica pavonina*) (pers. comm.

Shimelis Aynalem 2011). Among the wetlands around the Lake Tana are few almost pristine wetlands, which are dominated by **Papyrus** and **Typha stands**.

Wetlands and climate change: Wetlands and climate change are strongly interrelated both by wetlands being subject to climate change and by regulating local climate and the carbon cycle. As wetlands can be sinks and sources of greenhouse gases (GHG), there is a reciprocal relationship between wetlands and climate change. Wetland degradation exacerbates climate change, which in turn can cause wetland degradation through increased extreme weather events leading to floods and drought. Properly managed wetlands can contribute to climate mitigation through the conservation of the organic material containing carbon (Taffa 2009).

Wetlands as a **carbon sink**: Wetlands store carbon in many different ways, e.g. in form of evergreen plants that sequester carbon; dead, un-decomposed plant material (litter, peat, organic soils, sediments) formed over thousands of years under anaerobic conditions (oxygen deficiency). Wetlands and peatlands in particular account for 35-40 % of the global terrestrial carbon pool, thereby exceeding both the total agro-ecosystems and forests systems. **Impacts of climate change on wetlands** are expected to be tremendous due to their highly vulnerable hydrological regimes. Changes in ground water levels, evaporation rates, droughts, floods and storm frequency have strong implications for wetland ecosystems which are already **vulnerable**, notably because (Taffa 2009: 33):

- Flora and fauna is sensitive to small changes in the water level and temperature;
- Additional stresses on hydrological systems and pollution;
- Wetlands are highly fragmented limiting migration of plants and animals in response to temperature or water level changes.

On the other hand wetlands play an important role in creating ecological benefits for climate protection (Taffa 2008: 35) for following reasons:

- Retaining carbon in the wetlands;
- Wetlands are buffers for extreme weather events like floods and droughts, regulating stream flows by storing and slowing down flood flows;
- Retaining polluted floodwaters and improve their quality;
- Reducing peak flow by delaying and storing flood water;
- Groundwater recharge during rainy season and availability during droughts.

Changes of and threats to wetlands

Wetlands are under severe pressure from water and land-based human activities, jeopardizing the natural services that they provide. Most of the wetlands around the lake are already modified and threatened by different causes. Unless conservation action will be undertaken, they will be lost, having tremendous effects on the whole LTR. Major threats to the long-term ecological integrity of Lake Tana and its associated wetlands can be summarized into four major categories, among others:

- Alteration of ecosystems leading to habitat fragmentation and loss;
- Loss of species;

- Loss of genetic diversity and Invasion of exotic species;
- Reduced water quality and quantity and food production.





Picture 3: (Left) Rice cultivation Fogera flood plain (© M. Springsguth 2011)
Picture 4: (Right) Grazing on the Dembia wetlands (© MSF 2011)

The processes that cause the ecological degradation are induced by human activities. One of the major man-made threats is the **conversion of the wetlands to farm and grazing land**, which leads to the loss of the above mentioned benefits, notably in following ways: **Draining** of the wetlands leads to the degradation of the previously anaerobic wetland soils through acidification, oxidation etc. The reduced infiltration capacity and the increased water outflow lower the water table on the upper slopes causing a change in the vegetation. As a result the characteristic papyrus and reed vegetation are decreasing. In some regions around the lake the papyrus is already disappeared, especially along the river mouths. Instead rooted plants and floating weeds have increased. There is also an increased fluctuation of stream flows and a decline in water quality. Furthermore there is over-utilization and unregulated management like changes in land-use practices, heavy **cattle grazing**, clearing of the vegetation, construction of dams and irrigation channels and frequent fires, overfishing, excessive (water) exploitation of wetlands, which can eventually lead to ecosystem collapse, similar to Lake Alemaya in the eastern part of Ethiopia (EWNRA 2001, Hailu 2005). The clearing of wetland vegetation support the invasion of non-wetland species. These processes undermine the ability of wetlands to support agriculture and turn against the initial intention to increase production with rough grazing and Eucalyptus as the terminal land-use.

Land-use change: Between the time of the Haile Selassie regime and today the major land use change as perceived by the farmers has been the conversion of communal grazing lands and wetlands to cultivated land as a result of an increasing population pressure. Formerly the Fogera floodplains had mainly been used for livestock grazing before they were changed into arable land. Efforts to introduce rice (*Oryza spp.*) cultivation in the research areas during the socialist era failed. Recently, the effective introduction of rice under the ruling party (Ethiopian People's Revolutionary Democratic Front) has to some extend replaced other crops such as teff (*Eragrostis tef*) and maize (*Zea mays*). Bread, injera and beer are now prepared from rice (Springsguth 2011) (Picture 3).

The fallowing of land has almost become impracticable in the face of land scarcity. Pastures for an increasing number of livestock have become rare and are mainly overgrazed. Sedimentation processes have accelerated favouring the cultivation of lakeshore areas and river banks rather than making use of them as pastures. Floodings have occurred more frequently postponing the beginning of recession farming which follows the receding water level of Lake Tana. Typical wetland plant species like Papyrus (*Cyperus papyrus*) have radically been limited in their distribution or even became locally extinct (Springsguth 2011).

Urbanization, settlements and pollution from **industrialization** are putting pressure on the wetlands by the application of agro-chemicals, salinization related to irrigation, overflowing, siltation and soil erosion. **Sand mining** is threatening the wetland ecosystems, which already caused the loss of wetlands around the lake.



Picture 2: Eichhornia spec. at the shoreline of Lake Tana in 2011 (© F. Mundt)

A recently observed threat is the expansion of the highly **invasive water Hyacinths** (*Eichhornia spec.*) along several parts of the lake´s shorelines (see Picture 2). It is a new species for Lake Tana spreading rapidly. It is currently being monitored, because as seen at Lake Victoria water hyacinth can, unless controlled, cover lakes entirely, with dramatic impacts on water flow, it blocks sunlight from reaching native aquatic plants and hampers oxygen supply to the water body. Furthermore it creates a main habitat for mosquitoes, the classical vectors of disease, and a snail species known to host a parasitic flatworm which causes schistosomiasis (bilharzia). This is specially known from Lake Victoria, where increased incidents of skin rash, cough, malaria, encephalitis, bilharzias, gastro intestinal disorders and schistosomiasis occur. This weed also interrupts local subsistence fishing by blocking access to the shores.

On the other hand, it can have positive influence, if managed properly. The plant is extremely tolerant to and has a high capacity for the uptake of heavy metals, including Cd, Cr, Co, Ni, Pb and Hg, which could make it suitable for the bio-cleaning of industrial wastewater. They can also enhance nitrification in waste water treatment cells of living technology. Their root zones are superb micro-sites for bacterial communities. Additionally, water hyacinths may be used as forage for cattle, but in some regions the cattle is rejecting it.

The root causes of threats

Shortage of agricultural land derived from increased human and livestock populations, the low awareness of communities regarding the ecological benefits of wetlands and the lack of technical and financial support for wetland conservation are underlying factors exerting pressure on the wetlands (EPA 2003). The lack of conservation and sustainable use of wetlands are (a) political shortcomings, i.e. giving high priority to short term economic benefits rather than to sustainability

issues, (b) the absence of policy and a strong legal framework for the conservation and sustainable use of wetlands (e.g. change in grazing system towards year-round grazing due to land ownership as communal grazing land), (c) institutional shortcomings (by the absence of legally structured institution or within existing institutions), (d) socio-economic and environmental shortcomings such as poverty, lack of awareness, population pressure and climate change (EWNRA 2009). Farmland expansion on wetlands is linked to the intensification of cultivation, for example the introduction of rice and double-cropping. One reason for the conversion of wetlands is that despite their benefits, wetlands are seen as wastelands and are connoted with mosquitoes, diseases and floods so that prevailing policies usually encourages wetland draining.

Policy implications and conclusions

The recognition of the essential roles that wetlands play for the ecosystem integrity as well as for creating various direct and indirect socioeconomic benefits should have the following (policy) implications (cf. EWNRA 2001: 13):

- Wetlands are assets whose values in their natural state should be recognised and valorised;
- Wetland benefits come from both their ecological functions and the socio-economic value of these and the products they produce;
- The various socio-economic groups benefit differently from wetlands depending on whether the wetlands are in their natural state or converted by drainage;
- The conversion of wetlands by complete drainage reduces the overall range of benefits produced by wetlands and involves a trade-off of benefits, with some gains and some losses;
- Maintaining new agricultural benefits from wetlands following drainage is usually difficult to achieve and sustain. As a result wetlands are often degraded in terms of their hydrological, pedological and biodiversity characteristics by conversion and end up as rough grazing areas;
- The protection and reestablishment of wetlands in valley bottoms contribute to flood control, reduction of stream flow and buffering and filtering of pollutants and sediments (siltation);
- As wetlands are not useless, their conversion into arable land has to be evaluated against the loss in social and ecological benefits;
- The role of wetlands in climate regulation, adaptation and mitigation and the impacts of climate change on wetlands have to be recognized;
- The conservation and wise use of wetlands have to be designed to contribute to climate mitigation and adaptation.

Recommended measures in the LTR

For the conservation and wise utilization of the wetland resources following measures need to be taken (cf. EWNRA 2005):

- Raising awareness of local community of wise use and ecological benefits;
- Implementing water conservation activities for soil erosion control;
- Controlling livestock grazing (reduction of free grazing), crop production and Eucalyptus plantation;
- Moderating excessive use of papyrus;
- Extending area closures, reforestation, planting different tree and grass species;
- Developing water springs;
- Improving livestock breed to reduce stock number.

3.3.3. Birdlife and other wildlife

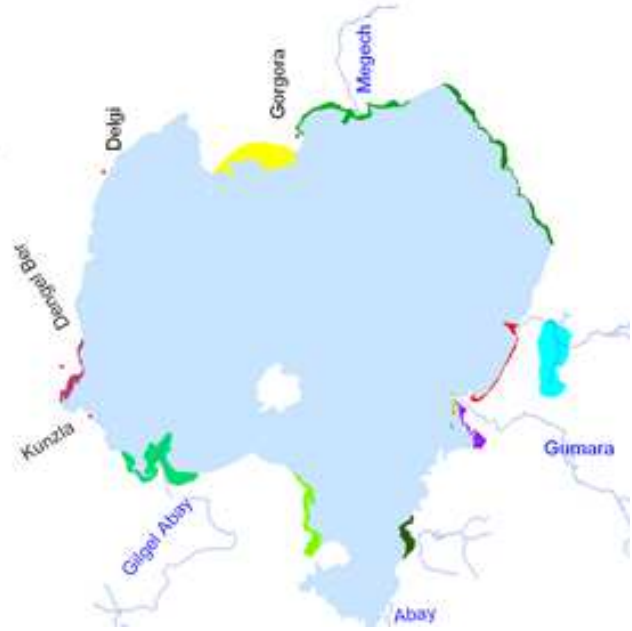
The presence of the diverse birdlife and wildlife naturally is bound to the existence and ecological status of the habitats that these species are associated to. This chapter is to give an overview of key species that can be found in the LTR (Table 4).

For further reading on their distribution and ecology references will be provided. A comprehensive biodiversity assessment has been made by the BoCTPD (2009).

The wetlands and forests host various aquatic and terrestrial mammals. Hippopotamus *(Hippopotamus amphibius)* as the most prominent large mammal can be found in the inlet and outlet of Lake Tana and Blue Nile River. Higher mammals are endangered by habitat fragmentation, overgrazing, farmland expansion, settlements, hunting and deforestation (Marye et al. 2011). Among the reptiles, the particularly the python is critically endangered by habitat loss and hunting. The LTR is also inhabited by globally threatened and biome-bound bird species and large numbers of waterfowls (as many as 20,000) including Palaearctic and intra-African migrants (the bird life of Lake Tana has been documented by Francis & Aynalem 2007, Tassie 2007, Tassie & Bekele 2007, Aynalem & Bekele 2008).

Wildlife and bird species	Further reading
Mammals: • Hippopotamus *(Hippopotamus amphibious)*, Black and White Colobus Monkeys *(Colobus guereza*), Aard Vark *Orycteropus afer, Crested Procupine Hystrix cristata, Grimm's Duiker Sylvicapra grimmia, Leopard Panthera ardus, Ratel (honey badger) Mellivora capensis, African civet cat Civetticties civetta (Teregn)* • Foxes, highland hyenas, rabbits and other rodents	BoCTPD (2009) Tourism Destination Networking Management Plan (Marye et al. 2011) EPLAUA (2007)
Reptiles: • Crocodile (*Crocodyla niloticus),* Monitored Lizard (*Varanus niloticus),* water snake and python *(Python sebae).* Crocodile (*C. niloticus)*	Woldegabriel & Solomon (2006)
Birds (altogether 257 species were recorded, esp. Fogera Plains): • Cormorant (*Phalacrocoraxm carbo*), Anhinga (*Anhinga rufa*), and intermediate Egret (*Mesophoyx intermedia*), Sacred Ibis (*Threskiornis aethiopicus*), Fulvous Whistling-Duck (*Dendrocygna bicolor*) and White-faced Whistling-Duck (*D. viduata*), Open-billed Stork (*Anastomus lamelligerus*) and Common Crane (*Grus grus*), Black-crowned Crane (*Grus pavonina*), Great Black-headed (*Gull Larus Ichthyaetus*), Yellow-legged Gull (*Larus cachinnans*) and Western Reef-Heron (*Egretta gularis*) occur in smaller numbers, Great Bittern (*Botaurus stellaris*) and African Finfoot (*Podica senegalensis*) • Pelicans, eagles • Palaearctic migrant birds*:* Osprey *(Pandion halictus),* Great Black-headed Gull, Lesser-black headed Gull, Herring Gull, Whiskered Tern, White-winged Black Tern • Globally threatened waterfowls (213 recorded species)	Francis & Aynalem (2007) Aynalem & Bekele (2008) Tourism Destination Networking Management Plan (Marye et al. 2011) Woldegabriel & Solomon (2006)
Fish (altogether 67 species): • 18 endemic barb species (*Cyprinidae* family) • Tilapia and catfish	Dejen (2003) Getahun et al (2008) Nagelkerke (1997)
Flora – key forest species: • *Coffea arabica, Justicia schimperiana, Syzygium, guineense, Mimusops kummel, Rothmannia urcelliformis, Juniperus procera, Ficus spp. Millettia ferruginea, Ehretia cymosa. Albizia schimperiana, Ritchiea albersii* and rare species of *Prunus Africana* and Po*docarpus falcatus* • A large number of indigenous trees species, e.g. *Dokma, Marents, Eshe, Kawot, Azamer, Chibha*	BoCTPD (2009) Tourism Destination Networking Management Plan (Marye et al. 2011)
Lakeshore and riverine to upland vegetation: • *Maytenus arbutifolia, Carissa edulis, Croton macrostachyus, Phoenix reclinata, Cordia africana, Acokanthera schimperi, Diospros mespiliformis, Ficus vasta, Celtis africana, Acacia abyssinica* and *Grewia bicolor*	BoCTPD (2009) Tourism Destination Networking Management Plan (Marye et al. 2011)

Table 4: Overview of key wildlife species around Lake Tana and study references



Map 6: Areas identified as important for biodiversity (source: BoCTPD 2009: 2)

The LTR is a major centre of genetic diversity of livestock, such as the **Fogera cattle breed**. Supported by the Fogera wetland, this breed is an important gene pool for crossbreeding to improve milk production of indigenous cattle. Other local livestock with good feed conversion traits include the Dangillie & Washerie sheep and Tilli chicken breeds (IFAD 2007: 15).

Areas identified as important due to their high biodiversity regarding wildlife and birds are indicated on Map 6. For further details on the assessment refer to the *Protected Area Potential Assessment In and Around Lake Tana* by BoCTP (2009).

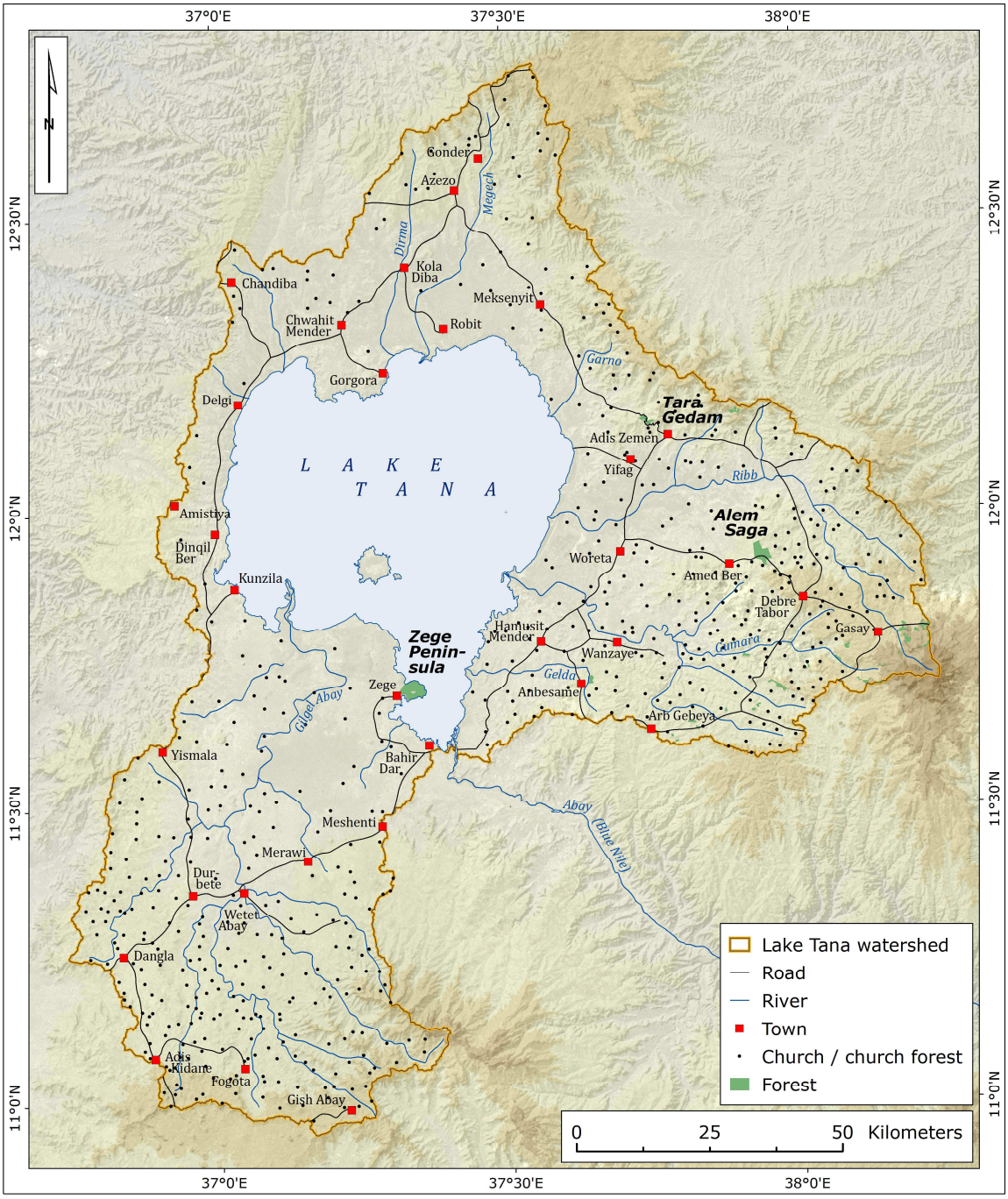
Between the outlet of Lake Tana and the Blue Nile Falls (**Bahir Dar Blue Nile Millennium Park**) a detailed assessment of the wildlife was conducted (cf. Marye 2010, Marye 2009). The presence of following species needs to be highlighted:

- Riverine ecosystems (with various islands):
- Vast number of **indigenous tree species**;
- Due to the inaccessibility of the islands some 14 mammal species could be recorded. The river course is rich in fish, reptiles, amphibians;
- The Park is home to large **mammals** like the Common Hippopotamus (*Hippopotamus amphibius*), Savanna (common) Baboon *(Papio cynocephalus anubis)*, Vervet (Green) Monkey *(Ceropithecus pygerythrus)*, African Civet *(Civettictis civetta)*, domesticated duiker, Tree squirrel (*Xerus erythropus)*, bushbuck, crocodile, Nile Monitor, hare, Anubis baboon (*Papio Anubis)*, python and Columbus Gureza;
- Moreover, more than **160 bird species** were observed in the park, including wetland birds, water fowls, riverine and woodland birds. Given the park´s habitat diversity, 3, 25, 37, 41 and 10 bird species were rare, uncommon, frequent, common, and abundant respectively (Marye 2010: 27);
- Dry upland montane forests: dominated by Wanza, Besana, Lafdie (Yekolla Wanza), Abalo, Kuwara, Bamba, Warka, Zegeta, Wonahi and Dedeho;
- Riverbank wetlands: *Pilla* and papyrus;
- 12 forest patches dominated by natural vegetation of riparian and riverine types with more than 10 islands of which 6 are densely forested;
- 140 species of woody plants were identified (Marye 2009) of which 14 species are use indicators, and 13 are endemic that require special attention for conservation and rehabilitation;

- Molla (2010) identified additional 28 species of woody plants and 62 species of herb and grass species;
- Natural areas in the park also provide wild fruits and other forest products for different purposes, like edible wild fruits such as *Mimusops kummel, Cordia Africana, Syzygium guineense* and *Diospros mespiliformis*. *Mimusops kummel* also has a medicinal value against stomach parasites and healing amoebic dysentery (Marye 2010).

3.3.4. Church forests – islands of biodiversity

The high number of churches and monasteries with their culture to protect the surrounding environment and forest vegetation contributed to a high biodiversity in these so called church forests (see Map 7). Forests like Zegie Peninsula and Tara Gedam Monastery may be the only habitat patches with primary forests remaining locally. On Zege peninsula alone 113 woody plant species were documented and 67 species were confirmed in one of the relatively undisturbed dry evergreen afro-montane forests of Tara Gedam Monastery. They host several endemic and endangered species, which were destroyed completely in other places over the last decades. They are buffers against depletion of genetically adapted local species and biodiversity from deforestation and species loss and can serve as in-situ conservation sites. They are also source of seeds for rehabilitating degraded areas (IFAD 2007).



Map 7: Forests and church forests in the LTW (design. S. Busse, MSF 2011)

A high forest biodiversity is an insurance against various environmental risks. Continuance of natural forest life enables all elements of the system to permanently specialize and adapt. Natural regeneration occurs permanently whenever the conditions are favourable. Low entropy is a characteristic of primary forests. They are well organized as mainly self-sustaining systems with minimum imports from surrounding systems. Several scientific studies demonstrate that the consumption (and demand) of nearly all wooden products can be reduced by at least 50 % by substitution, economizing, recycling and technical improvements (Fähser 2006).



Picture 5 and 6**:** Church forests are confined to small remnant patches (© M. Succow)

3.4. Cultural significance: cultural landscapes and elements of conservation

Lake Tana has 37 islands and 16 peninsulas with 21 churches and monasteries, dating back to 14th century. They are important cultural and religious heritages as well as tourist destinations. Out of seven world heritages in Ethiopia, three are located in the Amhara Region: Lalibela, Gondar and Simien Mountains National Park. Despite its unique cultural and natural resources, Lake Tana has not yet become a world heritage site.

Vast areas of the LTR are transformed human landscapes that emanate from long-standing, traditional land-use systems and strong social-ecological linkages. These landscapes are manifestations of the long-term interaction between man and nature (Man and the Biosphere) and never less contain key natural assets, or in other words ecosystem services. Land-use and the (agri)cultural practices by which they are determined are closely linked to the existence and absence of important habitats and species. Traditional land-use practices and the vast indigenous environmental knowledge that local communities have employed for centuries have been an expression of the adaptation to the local specific environmental context, in other words relative sustainability. In order to conserve specific habitats or species, traditional mechanisms that have a conservation effect or do not overexploit resources need to be part of the conservation rationale. In the context of Lake Tana these elements include:

- Church forests as a safeguard for conservation (see chapter 3.3.4);
- Natural forest protection through cultivation of coffee;
- Role of indigenous knowledge for conservation;
- Extensive forms of wetland use (papyrus boats, etc.).

Ethno-ecological linkages – the role of indigenous knowledge

Indigenous knowledge (IK) on the environment and skills can play a key role in the sustainable utilization of resources. IK can refer to variations in vegetation, soils, hydrology and geomorphology, the use of medicinal plants, agricultural practices, and is part of local people's decision-making on resource management. Neglect of IK and local knowledge systems has led to the degradation of natural resources in many cases. In the LTR indigenous knowledge is a ubiquitous resource passed from

generation to generation as a manifestation of the local people´s thorough experiences with living in very context-specific environmental settings. Examples are knowledge on:

- The use and dosage of medicinal plants on Zege (see Teklehaymanot & Giday 2007) and in the wetlands;
- The conservation and use of shaded wild coffee in church forests and Zege peninsula (Moreaux 2011);
- Agro-forestry with multipurpose trees;
- Land management practices like fallowing.

These forms of knowledge can contribute considerably to conservation of ecosystems and biodiversity. It should be developed and used to deal with pressure on the environment by both local people and external actors. As IK is based on past experiences, it might not be up to date and in some cases it can be too limited to deal with the environmental and socioeconomic constraints locals face, such as inter alia climate unpredictability, labour shortage, pests (Dixon 2001: 57). To cope with these constraints, IK needs to be further developed into new management practices through a) external technical assistance or b) advice and developing their own solutions. To conclude, the analysis of important habitats and elements for conservation should include those traditional land-use systems that support conservation values (e.g. wetland use, fisheries).

3.5. The socioeconomic context of the Lake Tana Region

About 3 million people live in the LTW (2009), which is 12.7 % of the total population of the Amhara Region. It has 4.9 persons per household and 158 per km². 89 % of them live in rural areas engaged in agriculture. The regional **economy** is mainly subsistence-based with mixed forms of agriculture as the key economic pillar, particularly crop production, and secondly livestock, which alone contribute 40 % to the agricultural GDP.

Livelihood systems are very traditional. With 43 % living in extreme poverty in Amhara and corresponding with the occurrence of food insecure periods, many people have no alternative but to over-utilize the natural resources through e.g. overfishing and deforestation to meet their fuelwood demand, papyrus reed harvesting and farmland encroachment on slopes and wetlands.

Besides crop cultivation and livestock the main off-farm activities are: cottage industries (blacksmithing, carpentry, tailoring and weaving) and sale of goods (such as papyrus, petty and souvenirs). Alternative livelihoods which are still marginal are fishery cooperatives and bamboo processing (in the highlands).

Box 5: statistical outline of Lake Tana Watershed
(data refer to all Woredas covering LTW, source: BoFED 2011)

- 15 rural Woredas, 2 major town and 5 smaller town administrations
- Altogether 429 Kebele
- 22.3 % is urban and 77.7 % is rural workforce respectively
- Age dependency ratio 0.93 %
- Population density: 179/km² (with high spatial variations)
- Population growth rate: 1.8 %; urban: 4.2 %, rural: 1.5 % (2007)
- Primary education coverage: 88.7 %

Micro- and small-scale enterprises (MSE) represent a main source of employment opportunity. According to BoFED (2011), the establishment of 17,360 enterprises has created an employment opportunity for 44,491 people (21.6 % of the region) from 2006 to 2008 (90 % youth 37 % females). There is a growing sector of small and micro-enterprises in urban areas (leathering, carpentry, hotels and restaurants, food and beverage processing), which is completely dependent on the inputs from agricultural products from rural areas indicating strong rural-urban linkages. Trade and investment activities are at a low level but in a rising trend. They focus on raising production by creating market opportunity and can help to strengthen rural-urban linkages.

Energy: Biomass is the main source of energy (firewood, cow dung and crop residues), which leads to an alarming depletion of biomass resources from the cycle and contributes to considerable amounts of carbon emissions. So far there are few alternatives applied like fuel saving stoves (as disseminated by the GIZ). Only 18 % of the rural Kebeles are supplied with electric power. As a counter strategy and to meet the future energy demand the government of Ethiopia is promoting the construction of hydroelectric power stations for electricity supply for the growing urban centres like Bahir Dar. In the LTR the **Tana-Beles hydroelectric power station** has been installed, which annually diverts approximately 2985 Mm³ of the lake water into the *Beles watershed* through an 11km tunnel to generate 460 Megawatt (Atanaw 2011).

Infrastructure: The transport sector plays a key role in strengthening rural-urban linkages by e.g. facilitating transportation of agricultural products to the market, communication and other socioeconomic activities. With 52 km/1000 km² and a road network in ANRS of 5,950 km (only 571.29 km gravel road), the road density is fairly low. The very poor rural transportation network is a limiting factor for economic development. Transportation is mainly constrained by (a) poor quality of vehicles, (b) limited number of vehicles and (c) sparse road network. The airports of Bahir Dar and Gondar facilitate economic activities by exporting products and creating access for tourists to various attractions. The lake is used for transportation by ships and boats (e.g. for sand mining from the shores or the lake itself for construction sector) (BoFED 2011).

Gender inequality: Only 35 % of civil servants are female. The role of women in economic activities include livestock management (milking, milk processing, dung preparation, feeding, marketing and selling livestock products, manure management) and wood collection (IFAD 2007: 22).

Migration: The economic development of towns with the expansion of urban settlements and education sector become pulling factors for rural-urban migration. As a last resort, especially young and landless farmers migrate to the cities or other parts of the country.

As a main center of development activities, the LTR has a total of 412 development projects (307 in the production and 105 in the construction sector respectively) and 1,678 investment projects (2003-2008) with a total budget of ETB 15 Million. BoFED expects this to create job opportunities for 262,319 employees. Agricultural projects take the larger share with a focus on crop production. For a list of projects related to environment, biodiversity conservation and sustainable development see annex VII.

3.6. Summary: natural and cultural potentials and their threats

Potentials

The Lake Tana Region is endowed with a high number of valuable ecosystems and habitats that are high potential for biodiversity conservation as summarized in Table 5.

UNESCO designation criterion	Potential in the Lake Tana context
"*Major biogeographic regions (gradation of human interventions)*"	• Dry evergreen montane forest and evergreen scrub ecosystem • Aquatic ecosystems • Wetland ecosystems • On higher elevations: • Alpine/sub-afroalpine ecosystems • Montane grassland ecosystem • Vast areas of (agri)cultural landscapes
"Significance for biodiversity conservation"	Important ecosystems: • Wetlands and papyrus stocks around LT • Remnant (church) forests as islands of biodiversity and gene pools, wild coffee • Aquatic ecosystems • Freshwater of inter-regional importance (Blue Nile) • Important bird areas of global significance
Cultural "significance for biodiversity conservation"	• Church forests as a safeguard for conservation • Indigenous knowledge • Trad. land-use practices with conservation benefits

Table 5: Potentials for biodiversity conservation in the LTR.

Threats to ecosystems

The LTR is exposed to a set of interrelated environmental problems induced by land and water use, notably deforestation, erosion, sedimentation, water level reduction, erratic rainfall, excessive flooding of the wetlands, competition for water resources, pollution, introduction of alien species affecting local species´ gene pools (Dejen 2003). One of the major underlying forces that endanger the ecosystems and biodiversity around Lake Tana is population growth exerting further resource-use pressure. This goes along with for example overgrazing and horizontal farmland expansion (formal and informal), cultivation of marginal lands like wetlands, encroachment of communal land and massive vegetation removal to meet demand for food, feed and fuel wood. Other underlying causes that threaten biodiversity and forests in particular are: limited governmental, institutional, and legal capacity; land degradation; weak management of protected areas; and deforestation (USAID 2008).

As outlined in previous chapters the various ecosystems and the ecosystem services they provide are under severe pressure from following major processes:

- **Land degradation** caused by deforestation, overgrazing, unsustainable agricultural practices and wetland degradation. The lakes buffering capacity to deal with stress is reduced from sediment loads and conversion, destruction and encroachment of important natural buffers like wetlands. Despite this high diversity of fauna and flora several of the existing species are endangered due to **loss and fragmentation of habitat**. In particular the degradation of forests and wetlands has caused severe habitat destruction for both flora and fauna. As a result, various species are very few in numbers and are at the risk of, at least, **local extinction**;
- **Risk of eutrophication**: from an increasing use of fertilizers and pesticides in agriculture, from construction material from Bahir Dar triggering macrophyte growth and phosphorus level rise. Rooted macrophytes and alien species (such as water hyacinths) are favoured by the muddy sediments and an alkalinity of 50 mg/l $CaCO_3$ arising from construction activities in Bahir Dar (Teshale et al. 2001: 40);
- **Environmental pollution**: the lake is a sink for dumping municipal, industrial and domestic wastes of a growing urban population (Bahir Dar). Solid wastes and effluents from homes, factories and hotels reach the lake untreated, enhanced by an urban run-off from paved surface. This increases the risk of toxification;
- As a consequence of **reduced water quality**, irrigation with freshwater from the lake during the dry season would be not possible in the future (Teshale et al. 2001). There are also increasing signs of stress from local **algal blooms** and pollution-induced fish decline. Fishermen become increasingly marginalized by the ongoing environmental changes;
- The decline rain fall amount for the *Kiremt* season (June-September) is estimated to be 14 % (Marye 2010: 3). Besides global climate stressors, the main driving forces in decline of precipitation pattern are mainly the changes in land vegetation cover. The regional climate seems to show an increasing trend in rainfall variability that causes **droughts** and **floods** around Lake Tana. During the 2003 drought, the lake surface level dropped by two meters reducing the surface area by 35 km². During the 2006 flood, 15,000 ha were inundated, 10,000 people displaced, 2,500 domestic animals killed and many houses demolished (World Bank 2008: 3). The World Bank (2008) states that there is an urgent need to protect the wetlands and reduce the vulnerability to devastating floods;
- Resulting from the massive alteration of the hydrological regime from water development activities (irrigation schemes and hydropower stations, see 4.2.2), the lake water level is lowering considerably, while its total water depth is continuing to shrink due to massive input of sediments from the watershed.
- **Climate Change:** Some species are particularly at risk by climatic stress, like *Cordia africana, Olea europea, Juniperus procera* and *Hagenia abyssinica*, due to patchy habitats, low population numbers, limited climatic ranges and restricted habitat requirements like *Labeobarbus* in Lake Tana (IFAD 2007). Montane centres are the ecosystems most vulnerable to temperature increase due to their isolation, which leaves no option for horizontal or vertical migration

(forests). The recorded temperature increase also has an effect on the length of the growing period and a shift in agro-ecological zones. It thereby reduces agro-biodiversity of barley, pea and faba bean varieties having declined in the cooler parts of the watershed, while in the medium and lower elevations traditionally grown teff, sorghum and noug varieties have already disappeared (IFAD 2007: 18). It is also likely that livestock productivity will be further undermined by climate impacts on the quantity and quality of forage as well as by the spread in internal and external parasites.

The above mentioned processes and threats illustrate that ecosystems and biodiversity are at risk by numerous human activities (related to land-use and urbanization). This in turn undermines the resource base which the vast majority of the population heavily depends on. As a result household income and land productivity will decline and eventually poverty will increase unless resources and its ecosystems are managed more wisely. Therefore chapter 4 focuses on how human economic and land-use activities across all relevant sectors hamper or promote sustainable regional development and draws conclusions for a potential biosphere reserve.

4. Dimension II: The context for sustainable economy and land-use – "nothing begets nothing"

UNESCO designation criterion:
"Opportunity to explore & demonstrate approaches to sustainable development on a regional scale" → **development function**

The characterization of the region's ecological settings, the cultural and socioeconomic context with their potentials and threats of chapter 2 provides a basis for the context in which economic activities and various forms of resources utilization are embedded. Against this background this chapter will give an overview of the key economic sectors that are strongly related to land and water resources consumption – their activities, practices, approaches and trends.

Given that "Man" with all the resource-related forms of human (economic) activities, such as land and water use, is at the centre of a biosphere reserve (development function), it is necessary to examine the region's economic activities in terms of their implications for sustainable regional development; i.e. how forms of land-use are adapted to the capacity of the ecosystems to provide these "ecosystem services" in the long term, because "nothing begets noting". This so called ecosystem-based approach is based on the notion that any kind of resource-consumptive activities needs to be adapted to what ecosystems can provide. Policy is often based on the assumption that environmental protection hampers economic growth. However, as shown by many studies environmental concern is not conflicting with sustainable economic development but an essential component of it that provides the inputs.

As model regions for sustainable development (according to Agenda 21), BRs should open up pathways for sustainable regional development and a Green Economy in order to operationalize Agenda 21. Agenda 21 from the Rio World Summit highlights the need to prioritize local concerns and initiatives to meet national and global concerns likewise: "*act local, think global*". These initiatives should address specific local needs and circumstances and are based on open, transparent and participatory decision-making systems. This completely matches with the objectives of a BR.

The overarching factor that determines current and future economic trends in the region is population growth, because it is driving the demand for resources such as land, water and energy. This national trend corresponds with the regional growth. The LTR is mainly based on a subsistence-oriented economy with limited market access.

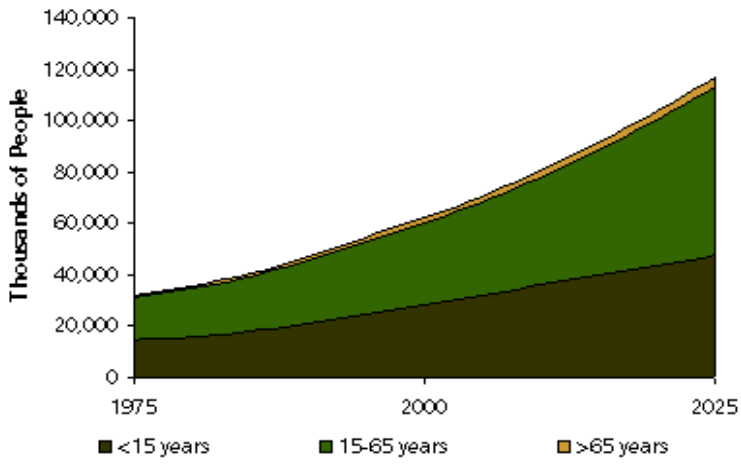


Figure 4: population trends in Ethiopia (source: UN/*DESA*, Statistics Division 2011)

However it has a significant agricultural growth potential. As the land-use cover data indicate, vast areas of the region are under cultivation. Besides agriculture, other sectors and forms of resource use, which provide a basis for local livelihoods and generate income, are livestock production, fisheries, forestry, tourism and enterprises for processing and marketing products.

4.1.1. Agriculture

Box 6: **key data agriculture**
(data refer to all Woredas covering LTW, source: BoFED 2011)

- Cultivated land: 903,000 ha;
- Agricultural production (2009): 27,824,282 qt., planned (2015) 94,253,658 qt.;
- Main commercial crops: pulses, oil seeds, spices, vegetables, rice;
- Irrigation agriculture
  - Modern irrigation: 1719 ha (2009);
  - Planned: 141216ha (2015);
  - Tradit. irrigation: 42,719ha (2009)
  - Planned 281216 ha (2015);
  - Current Production 1,320,880 qt;
  - Planed production 33,745,920 qt.
- Livestock - total number:
  - 1716274 cattle;
  - 630,688 sheep & goat;
  - 200,931 equine;
  - 2,450,035 hens;
  - 159,450 honey bee;

Agriculture is the most dominant and important economic sector which is key for food security. The agricultural production is basically based on smallholder agriculture with livestock. Securing food supply is an overall objective for agricultural activities (Box 6 summarizes the key socioeconomic data). Livestock accounts for 40 % of the average household income.

Wetlands play an important role for food security, because they provide a wide set of ecological and socio-economic benefits for local livelihoods (see chapter 3.3.2), particularly in dry seasons and drought periods, including: water, sedge, fish, fodder, craft materials, medicinal plants, and support of crop and livestock production. The conversion of wetlands often creates benefits for small segments of the community, while destroying the resource base of poor households and women.



Picture 7: Stocking density of livestock is high in large areas (© MSS 2011)

a) Land-use systems in wetlands

Land ownership determines the management of wetlands and can be divided into the following types (EWNRA 2005: 60): (a) Individual holdings of cultivated wetlands; (b) communal grazing wetlands with free access as a common pool resource (see Box 6) and (c) state holding: large swamps and lakes. Cultivated wetlands are small pockets for thatching and fodder grass managed by individual, groups and public institutions (schools, churches). On communal land there are some management committees of local community that protect the papyrus stocks and surrounding forests from illegal clearing (Yibab Chencher Kebele Bahir Dar Zuria Woreda).

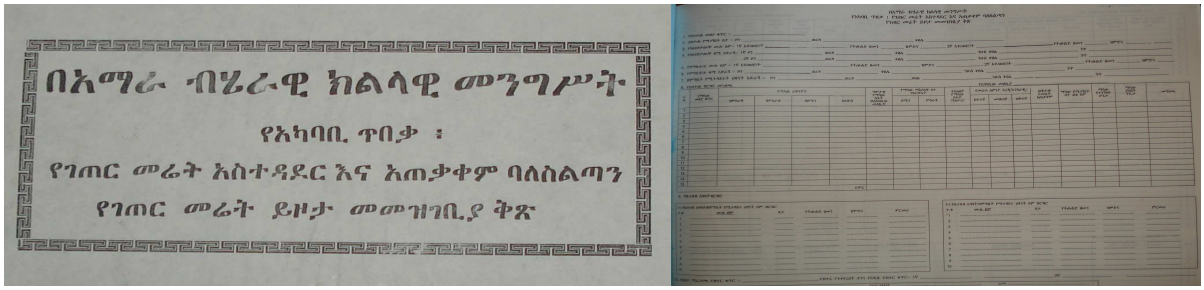
b) The land tenure system

By Maxi Springsguth

Land as a resource belongs to one of the most sensitive topics triggered by farmer's concern about land, land tenure insecurity and unclear land tenure and land use rights.

Land Redistribution and the Registration and Certification Programme: The last land redistribution in the Amhara Region with the incentive to distribute land equally to the growing number of people took place in 1997. In Fogera and Libo Kemkem Woredas, land redistribution took place during the dry season. The boundaries set during this redistribution process create the basis for the land registration and certification programme that started in Amhara in 2002 (in Fogera and Libo-Kemkem around 2004/2005). In the course of this registration and certification programme, undertaken by the Bureau of Environmental Protection and Land Administration and Use (BoEPLAU) and the Woreda office for Environmental Protection and Land Administration and Use (WoEPLAU), farmers have been issued temporary certificates for their land holding based on the demarcation made in the field. In Fogera 24 % of the households and in Libo Kemkem 0.8 % (of the 38,154 registered

households) were issued temporary certificates. Primary certificates, official documents provided after the field data are entered into the Land Registry Book, were issued to 75 % of the households in Fogera and 99.2 % of the 38,154 registered households in Libo Kemkem. Secondary certificates based on a detailed cadastral survey have not been issued so far. Cadastral Surveys have recently been completed for the command areas of the Ribb Irrigation and Drainage Project in Fogera and Libo Kemkem only and were hampered by the annual flood in 2011 and land use conflicts between landholders. In Fogera 1 % of the households did not receive any certificate. In Libo Kemkem the number of households possessing neither a temporary nor a primary certificate must even be higher. This is due to the fact that protocols of the 2004 registration became lost so that only documents with the boundaries from 1997 do exist. In Tez Amba people highly encroach into communal land, illegally settle in the communities and replicate social documents so that issuing certificates becomes unfeasible.



Picture 8: The land registry book with names of landholders and plots (© M. Springsguth)

The handing over of the “Green Book" or “Book of Holding" to the farmers including the primary and secondary certificates enhances land tenure security and provides a greater strength of evidence in court in case of land disputes. The “Book of Holding" also states measures and regulations for sustainable land use that have to be implemented by the farmer. But so far a monitoring system for the duly compliance to the regulations has not become operative. A land use plan for Fogera and Libo Kemkem Woredas will probably be created after the completion of the registration or cadastral survey, respectively.

Constraints to the Registration and Certification of Land as mentioned above, land use conflicts and lack of effective mechanisms for settling boundary disputes at various levels hamper progress of issuing and upgrading certificates. Moreover lack of staff in BoEPLAU and WoEPLAU, limited budget and poorly equipped Woreda offices with accurate GPS are an impediment to the whole process. Farmers await the upgrade of their certificates eagerly.

Registering recession farmland: Farmers have followed the receding Lake Tana for many years. Recession farming is done according to common law. Anyway the land tenure status of recession farmland varies from Kebele to Kebele and sometimes even from village to village. Does recession farmland belong to the lake and is therefore held by the state? Is recession farmland private land cultivated by a farmer for his whole life? Even officials are confused by the holding rights of recession farmland. In some villages recession farmland is not registered, in some villages it is. In some villages it is registered as communal land, in some villages as private land. Before 2004 recession farmland was held communally in Libo Kemkem until the administration of a Kebele decided to allocate this land to people. Thus, during the land registration process in 2004, it was registered as private land.

Registering and Delineating Wetlands: The same is true for wetlands: The land tenure status and even the definition of wetlands are unclear. Farmers regard wetlands to be communal holdings. For officials the answer is not that simple. One official argued that wetlands could not be defined as communal lands (according to the Revised Amhara National Regional State Rural Land Administration and Use Proclamation No. 133/2006). Therefore, wetlands did not have to be plotted for registration. Practically, wetlands are registered in some Kebeles as communal land, in some others they are freely accessible to all people. Besides, a delineation of wetlands by the Department of Environmental Protection within the WoEPLAU remains to be done. Sometimes boundaries between wetlands and adjacent land are unknown. For this reason, there has to be a clear, consistent definition of wetlands taking into account the various wetland types.

Box 7: In-depth excursus on Wetland and Common Pool Resource Management
By Maxi Springsguth

Apparently, there has not been a need for the evolvement of wetland and communal land resource management strategies and regulations in the villages and communities visited. In former times the research areas were less densely populated, cattle grazed freely, grasses and other resources were abundant. In the Fogera Floodplain people lived as nomads driving their livestock to the plains during the dry season.

Today the unregulated access to wetland and other common pool resources leads to the degradation of these resources. According to our observations in the research areas, a management system has either not been established or is confined to freeing cattle or selling of crops as a penalty for illegal encroachment into communal land. In some villages, people are fined for the conversion of communal land to private farming land.

In contrast, we found a more developed wetland resource management system in one village of Agid Kirigna Kebele. There is an agreement achieved by the residents to avoid intensive use of and stop driving cattle into the wetland in the rainy season. Cattle should be fed with rice residuals and graze on fallowed private farming land during this period of the year. Landless people should buy crop residuals or rent land so as to use the residuals of this land. The cut and carry system is promoted. Besides there is a discussion on the reduction of number of livestock. Fishing is not a common practice in the village but intended for the future. A “community police", guards selected by the people, was established to protect the wetland from encroachment (by landless youth) and grazing activities which are not conform with the agreement. Wetland conservation has been made a subject of further discussion.

Fishing is done by almost all communities visited along the Eastern shore of Lake Tana. Typical fish species caught are *Oreochromis niloticus* (Karasso), *Clarias gariepinus* (Ambaza or African Catfish) and *Labeobarbus spp*. Fish resources are hardly managed. Overfishing has become a severe problem due to improved fishing skills, the use of modern equipment and technologies, the increasing number of fishermen and the destruction of aquatic vegetation in general and specifically this year's flood and the associated food insecurity. We have met only one self-organised fisher's association in Tez Amba Kebele having adopted regulations such as the prohibition of fishing from June to September or using gill nets with a mesh width of more than 8 cm to preserve fish stocks

The Role of the Government: According to the opinions of farmers, key informants and Woreda experts, the government promotes wetlands as a source of water through drainage and the conversion of wetlands for cultivation. On the other hand, on the regional level it is believed that lower government levels falsely interpret the government's promotion of agricultural modernisation and technological progress with the need to convert wetlands. Obviously, there is still confusion about and lack of communication and understanding of governmental strategies and plans on various levels.

Constraints to a Functional Wetland and Common Pool Resource Management

As constraints to a functional management of natural resources, farmers mentioned the unregulated implementation of regulations and the unregulated enforcement of penalties. In some cases Kebele and Woreda officials do not even impose sanctions upon transgressors.

As long as corruption decides over the distribution of resources, land as an example, a sustainable management system cannot be effective. Inequitable power distributions within the communities make poorer people helpless and affect social life (people become suspicious and afraid).

Besides, farmers do hesitate and are afraid of discussing land tenure and use issues like the distribution of communal land with the Kebele administration showing that farmers may feel a discomfort related to this sensitive topic and act with circumspection.

In Fogera and Libo Kemkem Woredas, Kebele administrators and selected peasants (model farmers) were trained in wetland management by the Woreda Environmental Protection and Land Administration and Use Offices (WoEPLAU). But the outputs and outcomes of such training and awareness creation programmes on the community level are not monitored. Thus, questions whether information is disseminated to the community or whether the trainings and programmes bear fruits and bring about desired changes remain unanswered. Indeed, farmers complain that information does not circulate and knowledge is not shared in the community. Discussions on natural and common pool resource management in the communities are unusual or have not been raised at all.

People perceive themselves to be powerless and without rights to manage natural resources they make use of. The power and responsibility to manage wetlands and communal grazing lands rest within higher instances such as the state or the Kebele.

More general constraints to development and change which do also apply for resource management are the following: The adaptation of new technologies or unknown agricultural practices by peasants can sometimes be very dragging. Lack of market accessibility and absence of small traders (especially in Woreta, Fogera) as well as insucient storage facilities can foster an unsustainable resource use. For example, since many shes get spoiled in the heat on the long way to the market, more fishes are caught to substitute the loss of income from spoilt fishes. As explained by women in Wagetera Kebele, families with numerous children are traditionally more respected and gain more reputation than families with a few children. Of course, with this cultural belief it could be very difficult to slow down population growth. Family planning, as the women continued, is done by poor people only.

Environmental dynamics of the shores of Lake Tana and the Fogera Floodplains

itself can induce constraints to functional resource management from time to time. Thus the flood of 2011, staying until a time during which recession farming should have already started, imposes even higher pressures on fish stocks and adjacent dry pastures. And although local people expressed their wish to live a good future life with enough food to eat, short-term intensive exploitation of natural resources of wetlands and communal lands cannot be averted in such a dynamic environment. Anyway, this year's flood is assumed to be man-made and a result of the regulation of the lake level for hydropower generation.

Land and resource use conflicts can be seen as another obstacle to an efficient wetland and communal land management.

Conflicts in the research sites exist between:

- Poor and young farmers as well as landless with the intention to cultivate communal lands on the one hand and richer persons and graziers with the intention to maintain communal grazing land on the other hand;
- Peasants encroaching communal land and the Kebele administration;
- Different ethnic groups (the Negede ethnic group in Agid Kirigna and the orthodox community over fish resources).

Settling Conflicts: Land and resource use conflicts are settled either according to the church in discussions, by the Kebele elders, Kebele or Woreda courts.

Constraints

The prevailing constraints for agricultural production relate to:

- Limitations in the supply of inputs (fertilizer, improved seed);
- Poor technology and farming practices;
- No storage facility for crops and water;
- High post-harvest loss;
- Poor management and low productivity in livestock (disease, poor feeding, low productivity of the local breed).

Against the background of the above described land-use and land tenure systems**,** the land- and resource-use conflicts in agricultural land among various interest groups arise, notably:

- Among neighbouring communities over communal grazing land, with implications for overgrazing;
- Between up- and downstream users over water resources;
- Over water utilization for irrigation in the wetlands (e.g. Fogera);
- Expansion of individual plots for Eucalyptus plantations;
- Between locals and road construction companies.

4.1.1.1. Conclusions, recommendations and visions

Agriculture on wetlands

By Maxi Springsguth

The saying that wetlands are perceived as wastelands has partially to be revised and looked at more critically. Actually, wetlands are seldom valued for their ecological functions. The relation between a functioning wetland ecosystem and sustainable use of wetland resources needs to be explained and emphasized. And even though this has been done earlier, the information and knowledge gained by a few community members through awareness creation and training programmes have to be communicated to the farmers and other wetland resource users.

Peasants raised the urgent need of participation in decision-making processes, conferences and trainings from the bottom up. They recommended that people participating in any training should be selected by the community itself rather than by Woreda officials and that after trainings, meetings on the relevant topic should be held in the community.

Fishermen of the ethic group of the Negede claimed that natural resource management had to be approached through community-based management systems since some issues could be discussed and solved more effectively by the community or village residents than the whole of the Kebele. The case of the Negede is a special one and needs to be taken into account when it comes to the development of resource management strategies and wetland conservation efforts.

Besides, there were claims that some Kebeles were too large in area to be governed successfully. Governance scales have to be revised for a functional management of natural resources. Government strategies and plans, proclamations and regulations need to be communicated to all government levels and interpreted consistently between different institutions on various levels. Fields of duties and functions of various institutions have to be assigned clearly. Definitions of terms and phrases require clarification so as to avoid confusion, for example about land cover and use types.

Moreover, land cover and use types need to be delineated and mapped accurately, including surveying the wetland areas during the dry and the rainy season to plan land use, to minimize land use conflicts and to create detailed maps of areas important for conservation (delineation of a buffer zone around Lake Tana). (Cadastral) survey focuses on the command area of the RIDP but has to be extended to all lands as soon as possible.

The issuing of land holding certificates to individuals and collectives makes people feel as if the land was theirs although it is state-owned. For communal lands such an “ownership” feeling resulting in awareness and responsibility for the resource is missing very often. Although most communal lands are used by a restricted number of village or community residents their utilization almost exclusively lacks rules and regulations. Land tenure issues have to be dealt with cautiously, especially when it comes to the zonation of the potential Biosphere Reserve Lake Tana. Despite the issuance of certificates, farmers are still suspicious and easily become afraid of being

deprived of their land through any intervention. For private lands, tenure security needs local enforcement, while communal lands which are potential buffer or core zones require management regimes based on local consent.

Penalties for unsustainable resource use and the breaching of regulations have to be inflicted unitarily and applied fairly. Farmer's reluctance concerning the use of chemical fertilizers opens a niche for organic food production in the research areas and leaves space for the hope that the adverse impacts of agricultural intensification on the environment could partly be alleviated. Eventually, one has to bear in mind that the livelihoods of rural people depend upon wetland resources.

Agricultural Production

The conservation of the topsoil should be a high priority within the biosphere reserve to improve or maintain land productivity. Therefore, sustainable land management (SLM) as already implemented in the watershed needs to be enhanced and especially focus on both areas with a high vulnerability to soil erosion (upstream) and cropland areas affected by sedimentation and floods (downstream such as Fogera and Dembia Floodplains, Gilgel Abay Delta).

The design and planning of agricultural activities should follow the principle „factor 4“, i.e. aim at a twofold reduction of raw material consumption and the improvement of effectiveness of technologies and processes to improve resource effectiveness twofold. This rule of thumb should guide the way towards realizing a green economy at large.

The production of agricultural goods should be needs-oriented based on what local communities really need instead of only promoting cash crops by all means. Markets, commodities and the transport of cash crops need a stronger regionalization instead on focusing only on export because of following reasons:

- Creation of higher rentability in the face of future increases in the fuel price;
- Strengthening regional economic cycles (as alternative to export), which can on the long-term generate domestic or regional demand for products;
- Support of local markets can secure regional labour force;
- Reducing the dependence on external inputs (regarding distribution, mobility and monetary reasons) and thus enforcing regional nutrient cycles (through e.g. composting).

The intensification of agriculture should go along with diversification of crop varieties and agricultural products (e.g. developing improved as well as old crop varieties).

Instead of overcoming traditional land-use practices and replacing with completely new modes and techniques of production, these practices should rather be optimized by better building on and utilizing the indigenous knowledge resources that local farmers have.

With overgrazing as a major driver for land degradation and with respect to future population increase, the livestock production sector should shift from quantity to quality by investing more in measures to add value to animals and developing by-laws to reduce the stocking density on communal land (for example through cut- and carry systems and breeding of the Fogera cattle breed need processing and quality awareness creation to yield higher market prices).

To conclude the chances of the agricultural sector to be a driver rather that inhibitor for sustainable development following suggestions and visions can be formulated:

- Growth corridors are currently being operationalized and programmes such as the Agricultural Growth Project (AGP) and the large irrigation schemes are still in the planning period. This is a chance to reconsider strategy of the Ministry of Agriculture and the Ministry of Water and Energy towards ecosystem-based approaches, supported under the United Nations Development Assistance Framework (UNDAF);
- Decreasing Reducing need for fossil fuels, decreasing dependence on artificial fertilizers and saving expenditures on inputs by locally generated inputs (organic fertilizers, labour, bio-pesticides, etc.). This regionalization and decrease in dependency from product markets create macro-economic benefits. Capacitating of small-scale farmers to adopt modern methods of **regenerative agriculture** can contribute to increase productivity;
- Drawing on local knowledge and varieties in designing programmes and activities helps to use untapped potentials and diversify economy and create a higher social and ecological adaptedness to specific local contexts. Instead monocultures need to be avoided to reduce risks of crop failure, pests and unilateral market dependence. Being open to suggestions and being flexible to meet the local needs and utilize their knowledge, e.g. methods for restoring water balance. Experiences from the successful Tigray Project "Ecological in Ethiopia" can be drawn, which based farming on ecosystems, ecosystem services and climate-resilient practices (SSNC 2008);
- Using the national delivery system and learn from the SLM experience for the implementation of watershed rehabilitation and conservation efforts as well as training and supervision. For example by using the training system, counterpart staff at regional level are trained and become trainers for the Woredas and Kebeles levels. For physical and biological watershed rehabilitation measures, the Kebele-based Development Agents are used and not project-paid staff. Using this system will contribute to longer-term impacts (GTZ 2011: 24)

a) Climate mitigation and adaptation in agriculture

A large proportion of greenhouse gases (GHG) emissions originate from conventional agriculture. In this context UNCTAD (2011: 32) concludes that a "*further chemicalization and industrialization of agricultural production that cannot but reinforce this trend are therefore steps in the wrong direction.*" There is also a huge potential to create carbon sinks by changing agricultural practices and land-use in general. Agriculture can produce energy and replace fossil fuel. Agriculture can therefore be **part of the climate change solution** by addressing agriculture´s multifunctionality: climate change, poverty, equity, poor health and nutrition and environmental sustainability are interlinked. This calls for a holistic approach that sees farmers not only as producers but as managers of agro-ecological systems. Mitigation and adaptation needs to be integrated with questions like biodiversity, ecosystems services, water management and social issues (UNCTAD 2011). Agricultural adaptation and mitigation have low or negative costs, create developmental co-benefits and can draw on local resources, skills and knowledge.

Conservation Agriculture is a widely acknowledged practice which proved to be a highly potential approach to create a triple win between improving biomass productivity, climate adaptation through soils resilience and GHG mitigation. Additionally, it increases the capacity of soils to recuperate and support biodiversity. For further reading on the potential and constraints in introducing conservation agriculture refer to annex IX.

Agriculture and income generation

A lot of resources have already been invested in improving agricultural productivity. Irrespective of its importance, the promotion of commodity chains (processing) and marketing systems have long been neglected and if, little attention have been given to the adaptation to the smallholder context. In order to reduce pressure on the land and water resources, processing various agricultural as well as non-timber forest products will help to add value and improve the income generation. As a best practice the Ethiopian company ECOPIA plc.[10] has already in other parts of the country successfully supported local communities in establishing their own micro-enterprise to process and market coffee, cosmetic, medicinal and food products. By extracting resources from sensitive ecosystems without harming them a double benefit can be created: income generation for local communities as an economic incentive for conservation.

4.1.2. Forests and forestry around Lake Tana

The dominant forestry activity in the LTR is **farm forestry** – in the form of homestead and boundary plantations, roadside plantations or woodlots. The **indigenous agroforestry** practice of keeping naturally regenerated trees dispersed on cropland is a common tradition. These **multipurpose tree species** are consciously retained and taken care of by the farmers because of their multiple benefits, including *Croton macrostachyus*, *Cordia africana*, *Faidherbia albida*, *Ficus thunninghii*, *Ficus sycomorus* and *Acacia seyal*. **Eucalyptus** woodlots in high density stands and with short rotation periods are increasing in the LTR, especially in the south and south-east. Eucalyptus species are dominant in these privately owned **plantation** forests (*Eucalyptus globulus* and *Eucalyptus camaldulensis*) (IFAD 2007).





[10] www.ecopia.de

Picture 9 and 10: Eucalyptus transport and plantation around Koga dam (© MSF 2011)

There are no statistics on current rates of **deforestation** in Ethiopia, ANRS or the LTW. At national level a figure of equivalent to 150,000-200,000 ha/year loss of natural forest has been quoted in several reports. Few **remnant natural forests** are located in the LTR; most of them are disturbed due to pressure exerted by the local people – with the exception of those surrounding monasteries and churches. Long-term clearing and loss of woody plants will continue to significantly increase greenhouse gases and **aggravate climate change** at regional and global level. Changes in species biodiversity have also an impact on climate change, by changing the structure and functioning of ecosystems and their interaction with water, carbon, nitrogen, and other major biogeochemical cycles (IFAD 2007: 14). Myth of too high demand of woody mass: According to the results of the inventory of the Woody Biomass Project (Sutcliffe 2006), the annual potential supply of woody biomass in 2000 was 77 million t, while annual consumption, including wood and charcoal, was 54 million t. The unsustainable yield of "only" 10.7 million t was taken from woody biomass. Contrary to the common assumption, this leaves a "surplus" of 66.2 million t. Sutcliffe (2006: 3) concludes that "*land-clearing and fuelwood removal are two very different processes that cannot be directly compared*". However, it should be considered that these national figures do not necessarily reflect the strong spatial differentiation.

Box 8: Deforestation on Zegie and in Tara Gedam Forest
By Renée Moreaux

The beginning of the deforestation on Zegie has been dated back in the PRA discussions to the mid-60s. The harvests of the farmers had been affected by severe storms. Timber became increasingly important in order to generate additional income and to offset the crop losses. The causes of deforestation mentioned by the local communities are poverty and low incomes. One reason is irregular and partly bad coffee harvests. The rainfall declined in the last 20 years and shifted seasonally. In addition, there is no irrigation system for agricultural activities on Zegie. As an additional income generation firewood and timber are taken illegally and sold in local markets. Progressive deforestation is accelerated by infrastructural measures, such as expansion of the road from Afaf to Ura and Yiganda. The local people mentioned loss of shade, soil erosion, climatic changes with temperature rise and reduced rainfall, drought, famine and migration as possible consequences of deforestation and visions of the future.

The beginning of the deforestation in Tara Gedam has been dated to about 1990. Because of the political conflicts in the political transition from the Derg regime to the present government it was given little attention to the protection and development of the forests. The growing population was dependent on additional income and land for agriculture. Gradually the state forest was cut down at its external borders and firewood and timber were extracted illegally. Despite the hiring of guards who protect the state forest, illegal logging was very high until 2007. About four years ago the government increased the number of guards, with a better control over the forest ever since. Furthermore, a problem is the low wage of the guards (280 Ethiopian Birr/month) by the Woreda office in Addis Zemen, Department of Natural Resources. The motivation of the guards is often not so high and they have to do other works to maintain their livelihood. The forest is therefore often not adequately protected.

Indicated causes of deforestation are the strong population growth and the proximity to the settlements (Kebele Tara Gedam) and cities (Addis Zemen and Yifag) to the forests. Due to unemployment additional income is needed by selling timber and expanding agricultural land.

As another cause mentioned, livestock eats young trees, seedlings and grass and damages the soil by trampling. Lack of awareness of the forest as a habitat was cited as a general cause of various actors.

The locally perceived consequences of deforestation are climatic changes with rising temperatures and (seasonal) fluctuations of rainfall and drought. It is believed that in the future poverty and food insecurity will occur due to poor harvests, health problems (such as malaria because of rising temperatures) will emerge, death and migration of people and animals of the forest increase.

4.1.2.1. Functions of the forests for local communities[11]

By Renée Moreaux

a) Social functions

"*Forests are like houses, you cannot live without them*" (PRA session, 18.10.11), said a young man from Zegie peninsula. The forests on Zegie are perceived as a living space. Local people identify themselves with their forests and have a sense of responsibility, because they are living in and from the forests.

For the people from Zegie as well as Tara Gedam the forest is a place of relaxation (shade-giving), satisfaction and happiness. The natural aesthetic is highly valued. From a religious perspective the forest is seen as spiritual space and a place of praying for the monks and priests. The forest is conserved for its own sake (it has an “existence value”). It is also a living space for saints in the form of ghosts. People believe that the saints can only live in the forests. If the forest is cut, the saints will disappear.

b) Ecological functions

Many people on Zegie and Tara Gedam are aware of the ecological functions of forests. The forests provide shade, moist and fresh air (oxygen production by photosynthesis) and precipitation. The litter will decompose as a natural fertilizer. The forests prevent soil erosion and are important in regulating the water cycle. Thus, on the shoreline of Zegie peninsula on Lake Tana trees of *Syzygium guineense* are conserved and planted. This species is particularly important for the stabilization of the shoreline and for water storage. Likewise, the forest is a habitat for wild animals.

The local people are aware of endangered species (Cordia africana, Ficus vasta, Juniperus procera, Olea africana, Podocarpus falcatus). Indigenous species are preferred for new plantations, particularly Cordia africana, Olea africana and Croton macrostachyus. In Tara Gedam Cordia africana is planted even on privately leased land, in order to preserve the species and to sell it as high-quality timber on local markets. Particularly degraded land can be banned from use in a joint decision of the whole community (Area Closure). The acceptance of this Area Closures in the whole community is very strong. As indicated by the knowledge about endangered species and the acceptance of Area Closures e.g., it can be concluded that the awareness of the local population for the value of the ecosystem services of forests is clearly present.

[11] From two case studies based on PRA sessions and expert interviews: Zegie Peninsula and Tara Gedam Forest

c) Economic functions

On Zegie peninsula the forest is the main source of income for the people. **Coffee** (*Coffea arabica*), **gesho** (*Rhamnus prinoides*) for producing local "Talla" beer and various **fruits** (*Carica papaya*, *Citrus aurantium L., Citrus aurantifolia, Mangifera indica, Persea americana*) are grown. Traditional and modern **beekeeping** is practiced in the forest. In addition, grass can be harvested on **Area Closures** (sites which are banned from intensive land-use) as fodder (Cut and Carry System) but also to cover roofs. With permission of the Kebele administration, certain individual trees can be used as firewood or timber. Large-scale clearing, even on privately leased land, is not allowed.

The marketing of natural products (coffee, honey, cosmetics, medical devices), so-called **non-timber forest products** (NTFP), is a promising possibility for alternative income generation of the local communities. The Ethiopian company Ecopia plc gave a training on Zegie to demonstrate the possibilities of producing and marketing non-timber forest products (20./21.10.11). The reactions of the participants in the Kebele Ura were very positive. Further trainings will be very important for a successful and sustainable process. This is confirmed by negative examples from other past projects. Particularly for young, landless people the sale of natural products could be an important source of income. A better financial situation of the local people would moderate illegal logging.

In Tara Gedam the use of the forest is forbidden for the local communities. The people benefit only indirectly from the forest with fresh air and provision of rain. The people can only use trees from their privately leased land with the permission of the Kebele administration, as well as the harvesting of fruits and beekeeping. The church forest is used by the monks and priests for the production of handicrafts, beekeeping and harvesting of fruits.

Several social functions are also mentioned by the local people in Tara Gedam. However, the people cannot identify themselves strongly with the forest as their living space. Different from Zegie people do not live directly in the forest. The use of the forest is forbidden, so they also have less relation to the forest in economic terms. Thus, they have a lower sense of ownership for the forest. Nevertheless, there are people in Tara Gedam who appreciate the forest for its own sake (existence value). An old man with profound ecological knowledge said, that he would preserve the forest to leave to his grandchildren and future generations (bequest value).

4.1.2.2. Forest rehabilitation

By Renée Moreaux

In terms of rehabilitation deforested and degraded forest areas must be particularly taken into account. On deforested and degraded communal land, where any other use is no longer possible and where the local people are convinced that natural resources must be protected, a rehabilitation could bring long lasting results. If public acceptance for protected areas exists, it is possible to exclude these sites from use, such as livestock. It is possible to establish **Area Closures** (Picture 13) around the

borders of existing forests. On the one hand, these sites were already part of the forest in formerly, which have been converted to agricultural land without permission. On the other hand, Area Closures serve as a buffer zone around the forest.





Picture 11: Newly planted seeds on communal land. Picture 12: Area suitable for agro-forestry around Addis Zemen (© M. Succow 2011).

As a buffer around the Area Closures fruit trees can be planted for an agro-forestry use. When the forest on the Area Closures is rehabilitated, this "agro-forestry belt" serves as a buffer zone where limited harvesting of fruits is allowed. For the zoning of the potential biosphere reserve in the Lake Tana region, the sites described above could play an important role for the establishment of the buffer zones.

Suitable species: Particularly on degraded areas where a dry micro-climate exists, it is advisable first to plant pioneer species such as Acacia and Albizia. Particularly Acacia enriches the soil naturally with nitrogen. The pioneer trees create a shaded microclimate with more nutrient-rich and moist conditions, so that it will enable other species to grow. In subsequent generations, valuable species can be planted (e.g. *Cordia africana, Olea africana*). The final objective of planting could be to create a *Juniperus procera-Podocarpus falcatus*-forest. Both native species would restore the original character of the forest and also provide very valuable timber (M. Succow, L. Fähser, pers. commun.). Eucalyptus should always be the last solution for reforestation if there are no other alternatives. Then eucalyptus should not be planted block-wise on land which could otherwise be used for agriculture. The planting of Eucalyptus is acceptable on degraded sites on which any other use is no longer possible and also as boundaries of land, roads and streets.

In combination with other tree species and crops Eucalyptus can be used in different planting scenarios, for example in alternating rows of cereals, fruits and other useful tree species (e.g. *Acacia, Grevillea robusta*). The agro-forestry cultivation of crops is promoted by the regional Bureau of Agriculture. It is recommended to combine *Acacia, Croton macrostachyus, Cordia africana, Juniperus procera* and *Sesbania sesban* for example with barley (*Hordeum vulgare*), finger millet (*Eleusine coracana*), teff (*Eragrostis tef*), wheat (*Triticum*) and with fruit trees (e.g. *Carica papaya, Mangifera indica*). Following tree species are recommended for forest rehabilitation:

Species	Purpose/benefit
Acacia	pioneer species, fodder, nitrogen enrichment of the soil, firewood, timber, honey flower
Albizia	pioneer species, honey flower, firewood
Arundinaria alpina	alternative to Eucalyptus, soil protection on slopes, construction timber (e.g. pales), fibres, roofing
Cordia africana	honey flower, valuable timber
Croton macrostachyus	fodder, firewood, timber (e.g. furniture, pales), honey flower, shade
Ficus vasta	construction timber for the church
Grevillea robusta	fast growing, firewood, timber, fodder, honey flower, shade
Juniperus procera	valuable timber
Olea africana	valuable timber, shade
Podocarpus falcatus	valuable timber
Sesbania sesban	soil protection on slopes, fodder

Table 6: Recommended tree species for forest rehabilitation (source: Moreaux 2011)

Constraints for rehabilitation: One cause for local problems of afforestation is water shortage. If no irrigation systems are available, seedlings may not be supplied with water and no local nurseries can be built. The fewer forests there are, the less seed sources are available from which new seeds and seedlings can grow (Eshete 2007). Especially with native tree species there is the problem of shortage of seedlings and seeds for planting. The biodiversity in the nurseries is often very limited. Sources for seeds are the church and state forests and privately leased land with rare species. An important source of income for farmers may be the sale of seeds. However, it requires training of farmers in order to achieve a successful breeding of viable seeds. In the context of the *Federal Research Centre of Forestry* (Addis Ababa) being the only official institution for seed breeding in Ethiopia, this is a very important fact. In addition, more nurseries must be established in order to grow seeds to seedlings and young trees. It is criticised by some experts that there is no governmental institution which is responsible only for the rehabilitation and preservation of forests. Capacity in the *Bureau of Agriculture* and the *Woreda* offices to analyse local problems and for the long-term care of rehabilitation is also very limited. Similarly, one problem of rehabilitation is the weak monitoring of newly planted seedlings.



Picture 13: Area Closure near Addis Zemen (© M. Succow 2011)

4.1.2.3. Evaluation of forestry for a potential biosphere reserve

By Dr. Lutz Fähser[12]

The intention of this contribution is to describe impressions from a field trip and local discussions in the Lake Tana Region in 2011 in view of a potential Biosphere Reserve. It will not describe the general situation of nature, forests and forestry in Ethiopia.

a) State of knowledge in the region

There is a realistic chance to base the feasibility study mainly on already existing national, regional and local information, scientific descriptions, reports from NGOs and from foreign development organizations and on experience of administrations, communities and local people. There is neither a lack of problem awareness nor of the adequate knowledge for problem solving, but a lack of survey, evaluation and coordination of existing information, as well as measures for a future development of the region under the conditions and chances of a Biosphere Reserve. Furthermore, many persons in the region are ready and educated both in theory and in practice, to build up a Biosphere Reserve.

b) Situation of forests and forestry in the region

Forests, all of them public forests, have disappeared almost completely in the region and specifically in the catchment area of Lake Tana forest cover changed from

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perhaps 40 % or more to less than 1 % within the last 50 years. The reasons for this rapid deforestation are mainly social ones: overpopulation, poverty, degradation of former fertile soils etc. Most of the forest residuals, mainly small patches, are located around churches and monasteries, in their function as sacred groves. The majority of them are impoverished with regard to tree, plant and animal species, but still dominated by natural species resp. by natural associations of vegetation. What is unique in the world and important for men and biosphere in Ethiopia is the natural and autochthonous “Coffee Forests” with coffee bushes under the canopy of the high forest. In the Region there are only few coffee forests left with exception of the Zege Forest on a peninsula near Bahir Dar.

About 50 years ago a new type of forests began to grow as plantations consisting of introduced exotic Eucalyptus trees as man-made monocultures in species and age. Since then, harvesting of single trees and of small clear cuts has occurred repeatedly. These Eucalyptus stands are common in the vicinity of single houses and settlements, on small areas of less than one hectare up to mostly not more than 2 hectares. They are cut in short rotation periods of only 5 to 15 years to grow small dimensions for firewood and house construction. But along with the rising needs to generate some financial income these plantations turn more and more from a commons into a cash crop, sold to people in the growing towns and cities, like Bahir Dar with more than 200.000 inhabitants and a strong tendency to grow rapidly.

In areas around Bahir Dar and other bigger cities there are plantations of larger extent, more than 1.000 hectares each, as a type of commercial forest solely, managed by public or private professionals. Recently, in 2010, a State Forest Enterprise was founded with many objectives and tasks to enhance and support forest management activities, including the production of new wooden products for pulp and paper and for timber industries, being in the pipeline of State and Region authorities.

The present situation of forests is extremely poor. The ecological consequences are obvious and even officially no longer denied: water and wind erosion, soil degradation, sedimentation and siltation in water bodies, extreme droughts and inundations etc. Social and economic decline is to a considerable extent driven by the absence of the former maintaining and cost-free producing forces of forest nature. The negative effects of deforestation are the more destructive, the more vulnerable the denuded soils are. One important criterion for vulnerability is the inclination of the surface. The Amhara Region and the Catchment Area of Lake Tana are areas with steep slopes, with hills and valleys and with vast areas of inclination in direction towards Lake Tana. This proves that forest cover is a key criterion in the Lake Tana region for ecological, social, cultural and economic prosperity (or poverty).

c) Forests and forestry in the face of a future biosphere reserve

Forests, especially natural forests, are sources of self-generating, self-adapting and cost free “ecosystem services”. To a certain extent they are the pre-condition for the welfare of humanity and its natural environment. The conception of a Biosphere Reserve is based on this nature-and-men interconnection. Forests are indispensible functional foundations for ecological, social, cultural and economic development and prosperity. Applied to the Lake Tana Region, this means the need for rebuilding and recovery of a certain quantity and quality of forests in the future. In the long run, for a sustainable functioning of the Biosphere Reserve there will probably be a need of at

least **10 % forest cover as a minimum,** depending on the final outer delineation of the Lake Tana Reserve, and even more forest land for the advantage of the area.

Parts of the forests have to fulfill mainly ecological functions, e.g. protective function in the high mountains, on steep slopes, along river banks and lake shores, furthermore in the few remaining ecological "hotspots" with high biodiversity or specific biological or cultural values. These are the forests for and in the **"Core Zone"** of the Biosphere Reserve. They do not underlie an economically motivated management, but a management with protective and/or developing objectives.

Other parts of the forests can serve for several functions and objectives in the same area and at the same time. These include ecological aspects as well as economic or cultural aspects depending on the local very specific circumstances. If they are part of the **"Transition Zone"** of the Biosphere Reserve, geographically and functionally they lie as a buffer between the highly protected "Core Zone" and the more intensively managed outer "Development Zone". This buffer has to keep off any endangering influences from the protected close-to-nature or still natural forests, but shall at the same time allow economic and other activities in those forests, generally to be managed under ecologically sound, nature-oriented concepts. The forests will consist of stands with a mainly natural tree species composition, afforestations with mainly natural tree species and of Eucalyptus forests in transition to mixed forests with natural species.

In the **"Development Zone"** forests may continue under the common management concepts, for the supply with firewood or for industrial purposes, including the existing Eucalyptus plantations. But even these forests must be considered as ecosystems with inherent natural productivity, which will be lost immediately if the management activities ignore their biological needs. Forest management in a Biosphere Reserve has always to assure a sustainable development, which means the existence of forests in good conditions for the future generations, forever.

d) Adequate forest management concepts in a biosphere reserve

Land use in general and forest management in particular are both possible and successful under an **ecosystem-based approach**. It is furthermore an **adaptive management** which identifies and recognizes the specific local and regional needs and challenges in ecological, economic, social, cultural and other fields. Going more into details a best practice forest management concept should include at least the following **principles**:

I. The starting point for a concept is to identify the **potential natural forest association** which originally, perhaps a very long time ago, dominated the area. These natural compositions, structures and functions of forests are the expression of a perfect adaption over millions of years, to the local living conditions for forests. The comparison to the actual situation (degraded forest, agricultural land, waste land etc.) shows the difference to the former natural and probably ecologically more functional condition. To rehabilitate the area into its natural or a similar state is the objective of a nature oriented forest management. Scientific and empiric information are available in this field, such as the "Atlas of the potential vegetation of Ethiopia" (Friis et al. 2010) and local soil and vegetation surveys from several forest and agricultural projects.

II. Beside other aspects the management plan of forests includes the expected **yield in timber** (m^3 per hectare and year), the annual cut. This expected output from the forest must be **adapted and restricted to the capacity of the potential natural forest association** as a "sustainable annual cut". If the harvest exceeds this "natural" volume it will degrade or even destroy the forest, it is not sustainable. The same applies to other forest products including non-timber products like berries, mushrooms, fresh water, and animals for hunting.

III. All management activities, impacts on the forest ecosystem, buildings for infrastructure etc. shall be considered and performed under the **principle of minimum impact** (input, costs) and the **precautionary principle**. Both principles are adequate management strategies in highly complex living systems which do not allow anticipate the real effect of activities in the future. It seems logical that through minimum operational costs and minimized violations and repair costs in the vulnerable ecosystem these principles are highly economic.

In analogy to the forest criteria all the other related ecological, social, cultural and economic aspects of forests and forestry should follow the same above mentioned **principles** of:

i. Relating to the natural/original/traditional system;

ii. Limiting the expected yield/products/services to the natural/cultural/social capacity;

iii. Performing all activities with a minimum of impact/destruction/costs.

This means not to change everything immediately with the latest technical, chemical, commercial and other "modern" measures, but to base everything on proved natural, traditional, socially sound and ethically accepted solutions. The wellbeing of the local people and their community (Kebele) and the safety/sustainability of their subsistence should be the starting point of all developing (forest) management projects in the Lake Tana Region.

e) Specific problems and possible solutions for forests and forestry

The **rehabilitation of forests** in the Lake Tana Region is a common demand, to be initiated and integrated into innumerous plans, projects and activities in the Region. A Biosphere Reserve is mainly an overall philosophy to harmonize the complexity of ecological, social, cultural, economic and other needs, demands and supplies, rather than a physical or financial project. That is why the philosophy of forest rehabilitation

in a sustainable, nature oriented way should be easy to understand, it should be accepted through insight and simple to carry out.

Several different **measures for the rehabilitation** of forests are already being practiced in the region and suitable to teach the lessons learnt by experience: Area closures mostly on top of hills or mountains to keep grazing away; afforestation on waste land with natural tree species and introduced exotic species; enrichment of degraded forests with natural and exotic tree species, especially enrichment of coffee forests to strengthen the upper canopy layer as shade for the coffee bushes underneath; agro-forestry on agricultural land as a combination of large forest trees with shade tolerant crop plants underneath; technical protection against erosion of soil; tree nurseries for the supply with seedlings; extension of, and advice for, forest related activities like protection, natural regeneration, planting, tending, thinning, final cut of trees and selling of wood.

The measures within a Biosphere Reserve will vary with the type of "zone" in which the present or future forest grows. But on the whole all the above mentioned principles are valid for the entire area: nature-oriented; ecologically balanced yield; minimum impact.

This means to protect and rebuild forests dominated by indigenous tree species. The various "fuel wood and small timber gardens" of **Eucalyptus trees** near the settlements however, have already been introduced into the technical and cultural cycle of people's life. It seems possible to integrate those small exotic patches into the landscape as long as they remain subordinate to ecologically balanced vicinities.

A big problem will be the existing industrial **Eucalyptus plantations of large extent** with thousands of hectares each, and further plantations in the stage of planning, for the supply of **pulp and paper and other timber industries** near Lake Tana. Ecological sustainability will be endangered if such future plantations are not grown as mixed forests with a larger, risk reducing proportion of adapted local tree species. In addition, further aspects, problems and chances of those big technical constructions have to be taken into consideration, such as land competition with local food production, adapted working places for the region, water pollution, effects of extended road infrastructure and heavy transport systems etc.

The principles of adaptation, limitation and minimizing negative impacts would rather lead to **small scale economic activities** with local timber yards, small sawmills, value adding manufacturing based on the existing skill of the rural people, on their short distance transport systems (mostly donkeys) independent from roads, on small central places for markets and exchange, adapted to people's lack of cash. Beside fuel wood, timber for house construction and other wooden products such markets could supply non-timber forest products like fruit, coffee, herbs, and medicinal plants. The forests themselves provide "ecosystem services" like wilderness, biodiversity, fresh air, beauty, recreation etc., which can be transformed into income through tourism. Some commercial activities like this have been established, e.g. on Zege Peninsula near Bahir Dar. Within forests in the area of a Biosphere Reserve tourism has to be qualified as "**Ecotourism**". There are various aspects of landscape, forests, history and culture which can be elaborated as attractions for ecotourism. On Zege Peninsula these aspects are the wild coffee (coffee Arabica) in the forest, the waterfront and beaches, local culture with specific houses, food, fruits and handicraft, adventure trails through the forest, churches and monasteries in the forests. Ecotourism will affect the attractions to be maintained or protected. These are the wildlife, the silence of the place, the cleanliness of land, water and air, the attitude of

local people and the local culture. Even in tourism one can apply the above mentioned principles: the respect to the close-to-nature/culture atmosphere; modest demand to forest and local or tribal people; minimum interference with, and impact on, the objects.

Churches and monasteries are of extraordinary importance for the protection, the rehabilitation and the maintenance of forests. Priests and monks are highly respected by the people. Forests are essential for the terrain around the churches. Church forests are Noah's Ark for indigenous tree species, for forest related biodiversity. The possibilities for the rehabilitation of forests strongly depend on the commitment and support of the church in the Lake Tana Region.

The other key players in the countryside are the leaders of the **communities** (Kebeles) and the local people themselves with their traditional knowledge and ability to live in and from forests. No idea and no project will have a chance to succeed if it is not accepted and promoted by these people. The Biosphere Reserve has to be based on a strong bottom up approach.

4.1.2.4. Summary: recommendations for forests and forestry

Forests are productive resources, renewable within defined limits, defined by nature itself. If management and harvest exceed or violate the limits of sustainable life in forests they lose the cost-free productivity of natural systems. They do not lose only timber productivity, but they lose at the same time all other beneficiaries and basic life conditions which forests offer for all elements of the eco-system, one of which is humankind. The limited factor nature produces its goods free of charge and forever – if treated wisely. Ecological health is the basic precondition for economic success. Forestry is an excellent example for a possible perfect harmony of economy and ecology, an inborn win-win system for elements of the same eco-system in the spaceship earth (Fähser 2006). To conclude from the insights on forestry, following recommendations can be made:

- Despite sound ecological knowledge of local people and their awareness of forest protection, **trainings** on sustainable forest management are required. Even if awareness is present, forests cannot be preserved in the long term as long as the people are forced to take trees from the forests for economic reasons. Thus, **Alternative sources of income** must be generated;
- The **Development Agents** (DAs) as local consultants must be involved in the process of rehabilitation of forests. They are the communication interface between the local people, the Woreda offices and the Kebele administration;
- Promote an integrative approach towards natural forest associations (indigenous, adaptable tree species) which create benefits for both conservation and use;
- For **eucalyptus** only small-scale plantations on marginal lands should be promoted, which do not compete with valuable cropland for food production;
- In order to reduce dependence on Eucalyptus as an energy source, new and **renewable energy technologies** need to be developed (e.g. fuel-saving stoves, solar cells);

- Forestry should not focus on industrial use and high mechanization but only on **small-scale forms** of using trees adapted to local skills to guarantee employment;
- Local markets for timber and non-timber products should be promoted, which are accessible within “donkey-reach” to create benefits for local communities;
- **Agro-forestry** as a form of adapted and diversified land-use needs to be extended (with at least 1 % of the area covered by fruit trees);
- The forest cover target for the LTR has to be >10 % to safeguard the provision of ecosystem services (e.g. soil rehabilitation, erosion and siltation control, pollination, gene pools, climate regulation like cooling, rainwater budget etc.);
- Expand tree nurseries and improve monitoring and care of its seedlings;
- Promote **Area closures** for forest rehabilitation to create multiple benefits (climate sinks, biodiversity, gene banks and siltation buffer) in combination with community-based by-laws for its use, such as cut-and-carry-system;
- **Plantations only of small areas** but not as a substitute for forests and not as effective carbon sink, rather maintain old growth forest, help regenerate naturally and to manage forests in a nature-oriented way. Such rich and healthy forests are as a CO_2 sink 10 to 20 times more effective than young plantations. Moreover, old growth forests store CO^2 over a much longer period of time, since wood products from plantations, like pulp, paper, chips and fuel wood, have a short life cycle and return CO_2 after only a few years;
- **Forest management** should consider (Fähser 2006):
    - Maintenance and regeneration of native species and natural associations of flora and fauna;
    - No clear cuts, increases the risk of floods and erosion and poor economic results;
    - Managed forest must in the long run approach the composition, structure and functioning of **natural forest associations**;
    - Naturalistic and economic targets must be set in accordance to the **potential productivity of the natural eco-system**;
    - The economic principle is only to be achieved by **minimizing the input** (and not by maximizing the output);
    - Economic targets need to be in accordance with the potential productivity of the natural ecosystem.
- Operationalize the new paradigm **adaptation to nature:** acknowledge **natural processes** in forests as an essential production factor;

Measures: To balance the rational demand and supply of **wood products** for the future it is necessary to take a package of responsible measures, e. g.:

- Avoid, reduce or substitute wood consumption;
- Increase recycling rates;
- Improve the technical effectiveness of cookers, stoves and heating systems;
- Introduce sustainable forest management to the existing commercial forests;

- Replant and restore 1 billion hectares of degraded former forest land;
- Stop the loss of about 20 million hectares of forest per year in the world;
- Utilization and marketing of non-timber forest products (NTFP), like medicinal plants: 'conservation through cultivation'.

One of the burning issues in the country in general and in ANRS's forestry sector in particular, is how to improve the ownership of local communities for the remnant forest resources. It is widely agreed amongst forestry experts that the only way to conserve these resources is to **share management responsibilities and benefits** with the communities living in adjacent to the forest. So the **Participatory Forest Management (PFM)** system is one potential alternative forest management option for patches of natural forests, like Zegie, Tara Gedam, Alem Saga, Kulkual Ber (IFAD 2007). Therefore PFM should be introduced and adapted to the context of church forests based on following principles (GIZ 2005):

- Local people are capable of managing their forests if given adequate rights and duties;
- As forest resources are scarce, primary target groups need to be identified;
- As forests are under use pressure, exclusive use rights need to be given to dwellers in order to conserve forests;
- Local indigenous knowledge needs to be respected;
- To guarantee forest conservation user groups need tangible benefits.

4.1.3. Fisheries

Fishing and associated businesses are a source of life for many communities living around Lake Tana. It serves as a supplement to the daily diet, employs local people and provides them income (Dejen 2008). According to the BoFED (2011) 150,000 qt./year of fish is estimated to be produced from the water resources of the lake. Another 50,000 qt. of fish is estimated to be produced from the rivers, ponds & dams.



Picture 14: Fisherman on a reed boat transporting papyrus (© M. Succow)

Traditionally fishery was done with papyrus boats and subsistence-based to fish tilapia. 450 reed boats made from papyrus are estimated. Historically it was not an important income activity because Ethiopians are meat eaters and fish is mainly eaten during the religious fasting periods (Dejen 2005). However, with the growing urban population, tourism and changing diets in bordering Sudan, the demand for fish is increasing. Through the introduction of motorized fishery on open water in 1986, fishery became commercial and fish catch of Lake Tana has increased from 39 in 1987 to 360 Mt in 1997 to meet the increasing demand particularly from Addis Ababa. One-third of the catches represent each

Labeobarbus, tilapia and catfish respectively. Traditional fishery of catfish by spear in the night, traps, hooks and lines are common in Shesher and Wolela ponds in the Fogera Floodplain for income generation and nutrition.

There is an estimated potential for fish production of 13,000 t/a, including *Tilapia* breed (BoFED 2011). However, the real production has declined significantly in 2000 caused by market and ecosystem dynamics. However, market prices for fish have declined. The potential for fishing small barbs is 4,000 tons per year. Fishing at the river mouths during the main spawning period August-September account for 50 % of the total annual catch.

Constraints and threats

The production of fish in the region is constrained by a lack of fingerlings (small fish), hatchery and storage facilities. Pollution from waste disposal and effluent discharge pose increasing pressure on the fisheries sector and livelihoods of fishermen. They find it harder and harder to catch fish along the shores so that they go with their papyrus boats (*tanquas*) to the middle of the lake consuming more valuable time and increasing safety risk. The fish breeding sites are being destroyed by the removal of vegetated shores and river mouths along the lake. Dangerous fishing techniques (gillnet) threaten *Labeobarbus* having caused a 75 % stock decline in the 1990s (while catfish and tilapia are not endangered). River regulation by dam constructions will lead to environmental degradation and further decline of the fish stocks.

Recommendations

Following measures and actions should be taken towards making the fisheries sector more sustainable (see EWNRA 2001, Dejen 2005):

- Given the trophical specialization of fish species, there is a need for a species-specific management;
- Promote fish farming in ponds and dams (carp, tilapia, catfish);
- Develop water law and rights
- Use a holistic and multidisciplinary approach for planning water resource use
- Fisheries regulation to restrict fishing near to river mouths and upstream spawning grounds during the main breeding period (July-October)
- Local enforcement of the fisheries regulations of Amhara
- Control fishing with gillnets and other adverse fishing methods

4.2. Land-use dynamics, trends and challenges

4.2.1. Soil erosion, land degradation and siltation

Land degradation is one of Ethiopia´s most severe problems, which was documented in many studies. With the Lake Tana watershed being a highly populated and cultivated area with its highland topography and slopes, it is also exposed to alarming

rates of degradation expressed by soil erosion on the on hand, and siltation (e.g. of the lake) on the other. The annual loss of cultivated land is by far greater that the gain. Setegn et al. (2009) identified the soil erosion hotspots in the Lake Tana watershed: 18.5 % of the area has high erosion potential (sediment yield >30 ton/ha). As a consequence the deltas of the main tributaries are growing from the high sediment yield. Between 1986 and 2010 for example the Gilgel Abay Delta increased by 586.1 ha (49.8 %) and Gumara River Delta by 101.6 ha (218.4 %) respectively (Marye et al. 2011: 70) (see Picture 15 and 16). The soils are highly susceptible to erosion, including agricultural soils, with a high rate of surface erosion. The usually fertile topsoil is transported into the river systems and consequently causing sedimentation of the lake. 91 % of sediment accumulates in the lake which mainly originates from human-induced soil erosion on arable, grazing and forestlands in the catchment.



Picture 15 and 16: Gilgel Abay Delta and Gumara River Delta growing from sedimentation (© M. Succow).

Causes for land degradation

The soil erosion is basically caused by poor land use practices, improper management systems and lack of appropriate soil conservation measures (IFAD 2007), notably:

- Traditional cultivation practices: **plowing** the land several times before sowing, combined with a steep topography and the torrential erosive rainfall contributes to the removal of the fertile topsoil;
- Inadequate application of **organic** as well as **inorganic fertilizer** (average application rate is 28 kg/ha) causes soil fertility depletion;
- Excessive **removal of nutrients** from crop residue and dung due to shortage of fuel wood and animal feed impedes nutrient recycling;
- Absence of **fallowing** and cereal-legume crop rotation due to a shortage of farmland driven by population growth.

Threats and consequences of land degradation

Shortage of improved crop production technologies, lack of demonstrations and up-scaling services, and inadequate seed supply has enforced farmers to follow **horizontal expansion** of new cropland at the expense of natural forests and grazing

lands. In turn this aggravates soil erosion through deforestation and **overgrazing**. The existing rain-fed crop production system with low inputs requires extensive areas for cultivation. Together with a considerable population-induced reduction of the average landholdings (<0.5 ha per person) the **cultivation of marginal lands like wetlands and encroachment of communal land** becomes inevitable (IFAD 2007).

The traditional **open access grazing system** (communal land as a common pool resource) with no restrictions for livestock numbers has led overstocking and thus severe degradation of grazing lands. Soil compaction reduces the infiltration capacity and increases surface runoff so that areas where pastures are under communal property, the **risk of overgrazing** is particularly high.

These land-use changes articulated in the **tragic 2006 floods** as a result of a rainfall-induced peak run-off, which was unique: traditionally never inundated areas were hit by the waves (three persons killed, 35,900 people homeless, over 6,650 ha of cropland inundated, more than 320 beehives destroyed, a school and several water points damaged, stored seeds spoiled, large volume of gravel and sand on farmlands deposited).

Sediments as well as organic and inorganic fertilizers from the agricultural fields that enter the lake by runoff may result in local **eutrophication** of the lake. As a result of soil loss, especially topsoil, the overall biomass productivity including crops and fodder is being reduced, undermining the overall ecosystem integrity as well as crop diversity. This in turn affects food production and income for farmers exacerbating poverty.

4.2.2. Growth-orientation, growth corridors and water development

a) Outline: shortcomings within the economic development context

Box 9: Socioeconomic constraints in the LTW (World Bank 2008: 3)

- 22 % live in electrified areas
- 6 % have an electricity connection
- 13 % have access to sanitation
- High dependency on food aid
- Tremendous inflation in recent years associated with high food prices, enlarging the trade deficit (import growing faster than export)
- Widespread poverty: annual per capita income $ 125 with 43 % of the 3 million residents in absolute poverty

The huge natural resources in the LTR have not yet been used effectively to reduce poverty and the rapidly growing population. The economic growth potential has not been realized. The overall economic growth is considerable but still being challenged to meet the Millennium Development Goals (MDGs) on halving poverty by 2015. Given the subsistence-oriented economy based on smallholder rain-fed agriculture under erratic rainfall conditions, agriculture is extremely vulnerable to weather fluctuations. There is also a lack of available arable land and other production factors such as fertilizers and seedlings exacerbating the low level of human development and infrastructure, regarding nutrition, literacy, primary school enrolment, road density and market access. Development is constrained by a profound lack of capital for basic physical infrastructure and human skills. The **cattle population** is a vital part of the ox-plough agricultural production system. As cattle dung is commonly used as a source of fuel in the context of lacking fuel wood, there are high numbers of livestock resulting in overgrazing. As a result of declining fodder

resources and scarcity of land, livestock is increasingly grazing on marginal and communal land further exacerbating land degradation.

The efficient use of water resources plays a central role in fostering agricultural productivity. Despite the abundance of vast water resources (from the lake, its tributaries and the groundwater springs), the minimum water requirements for agricultural production are not satisfied due to the erratic rainfall regime and lack of necessary water infrastructure.

According to the World Bank (2008) the LTW has an enormous potential for accelerated economic growth because of its endowment with:

- Land, water, livestock, fishery and forest resources;
- The rich cultural heritage and natural assets;
- Urban centres and settlements, good roads.

The World Bank proposes that these **potential** could stimulate growth of commercially-oriented smallholder agriculture agro-industry, tourism, fisheries, livestock and energy.

b) Agriculture Development-Led Industrialization (ADLI) strategy

Due to its important role in the country´s economy, agriculture is a primary national priority. The Plan for Accelerated and Sustained Development to End Poverty (PASDEP) seeks to broaden the equity-oriented support of smallholder farmers by public investments and policies to better take economic growth advantages of each agro-ecological zone (World Bank 2008).

In the face of the above mentioned shortcomings in development, the Government of Ethiopia issued the **Agriculture Development-Led Industrialization (ADLI)** strategy as part of the Comprehensive Africa Agricultural Development Programme (as mentioned in chapter 2.2) to foster economic development in so called **growth corridors**[13]. This export-oriented development strategy focuses on using *"labour-intensive methods to increase output and productivity by applying chemical inputs, diversifying production, utilising improved agricultural technologies*" (UNESCO 2011: 35). Tana and Beles sub-basins have been designated as one of five growth corridors in Ethiopia designed to **enhance commercialization and diversification** of agricultural production. These growth zones are envisioned for multi-sector investments in infrastructure, basic inputs and agricultural technology in order to increase productivity and improve market systems for high-value crops for local and **foreign markets** (export orientation).

Under the ADLI strategy growth corridors are currently being operationalized. It builds on the *National Food Security Programme* which aims at reducing dependence on emergency relief based on three pillars: (a) increasing availability of food through domestic production, (b) ensuring access to food for food deficit households, (c) strengthening emergency response capabilities, including voluntary resettlements to underutilized land. The **measures** that are envisaged to reduce variance in crop production and food availability are (UNESCO 2011: 35):

[13] "*A growth corridor refers to a geographical region, such as a sub-basin rather than a single rural and urban centre, which generates economic activities well beyond regional administrative boundaries. Growth corridors facilitate integrated development by creating value chains within and across regional Boundaries*" (UNESCO 2011: 35)

1) Irrigation projects and water control
2) Maintaining macro-economic stability, expanding off-farm employment and income generating opportunities
3) Improving credit markets, health services and nutrition
4) Innovative measures, such as experiments with crop and weather-based insurance mechanisms

ADLI is based on following objectives:

- Commercialisation of smallholder agriculture through product diversification
- A shift to higher-valued crops;
- Promotion of niche high-value export crops;
- Support for the development of large-scale commercial agriculture;
- Effective integration of farmers with domestic and external markets;
- Tailoring interventions to address the specific needs of the country's varied agro-ecological zones.

Around Lake Tana there are an increasing number of ad-hoc investments such as (World Bank 2008: 4):

The construction of a water **diversion tunnel** between the western shores of Lake Tana (near Kunzula) and the Beles sub-watershed for **hydropower generation** (with an installation capacity of 460 MW, see Map 8), which diverts a large proportion of the current outflow, i.e. 2,985 Mm^3/year (SMEC 2008);

Small- and large-scale **irrigation infrastructure**;

- Agricultural extension and main roads;
- Investments in large-scale storage-based irrigation;
- Other private investments in agriculture, agro-industry, micro-enterprises, hotels, tourism around Lake Tana;

A floriculture site of 700 ha for export is under construction envisaged as a replication of floriculture investment around Addis Ababa.

c) Water development: irrigation, dams and hydroelectric power

As the vast water resources are not efficiently used, only 30 % of the population has **access to potable water** aggravating the occurrence of waterborne diseases. The watershed has a total of 1,946 water sources, of which 1,135 (58.3 %) are hand dug wells, 735 (37.8 %) are springs, 63 (3.2 %) are shallow wells, and 13 (0.7 %) are boreholes (IFAD 2007: 14).

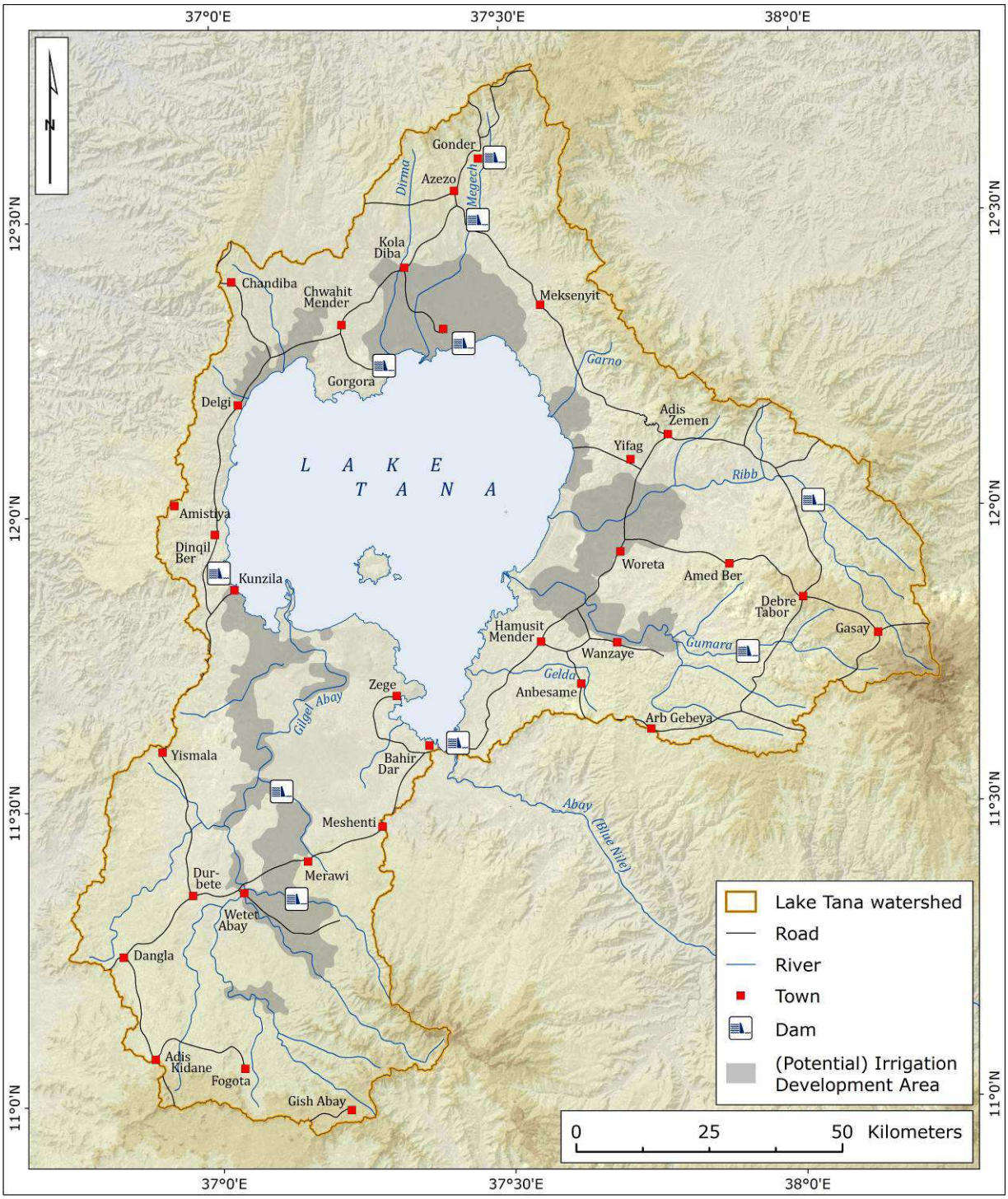
As already highlighted in the Water Resources Assistance Strategy from 2006 there is a need for investments in water infrastructure. The proclamation no. 534/2007 sets the legal basis for the establishment of River Basin Organizations (RBOs) such as the Tana Sub-Basin Organization (TASBO) in charge of water resources planning and management. Despite the **vast water resources** in the Lake Tana Region as part of the Nile River system, they have by far not been sufficiently developed or managed. The LTW has significant share of the country's` irrigation and hydropower potential with an **irrigation potential** of 250,200 ha of which currently only 4 % is

used. Therefore most of the food and cash crops are produced from a single rainfall season. With the scarcity of land farmers are enforced to expand their cropland to marginal lands in order to produce adequate amounts for their subsistence.

In the context of ADLI the Lake Tana Region is currently under tremendous change from water development interventions. Large irrigation dams along the lake´s tributaries are being constructed or planned, namely Koga, Ribb, possibly Gilgel Abbay, Gumara and Megech (see Table 7 and Map 8). Large-scale surface irrigation schemes are also under construction: **Megech pump scheme** and **Ribb irrigation schemes**.

No.	Irrigation scheme	Irrigable are (ha)	Status
1	Gilgel Abay	12,852	Feasibility study completed
2	Gumara	14,000	Feasibility study completed
3	Ribb	19,925	Feasibility study completed
4	Megech	7,300	Feasibility study completed
5	Koga	6,000	Under construction
6	Seraba Pump	5,254	Under construction
7	Robit Pump	6,000	Under construction

Table 7: Planned irrigation schemes (adapted from Alemayehu et al. 2009: 8, Atanaw 2011).



Map 8: Planned irrigation and hydropower sites (design: S. Busse, MSF 2011; source: Alemayehu et al. 2009: 5)

The Blue Nile Falls (*Tis Issat*) located 30 km from Lake Tana is one of the most popular tourism attractions. Its water flow variations are regulated by a **hydroelectric power station**, which is only occasionally operational since its substitution by the Tana Beles hydroelectric power plant (diversion tunnel), which generates power for the region.

Alemayehu et al. (2009) applied a Water Evaluation and Planning (WEAP) model in the watershed for a 36-year period. The simulation results indicated that 548 Mm³/year water could be supplied and 2207 GWh/year could be generated (see Figure 5).

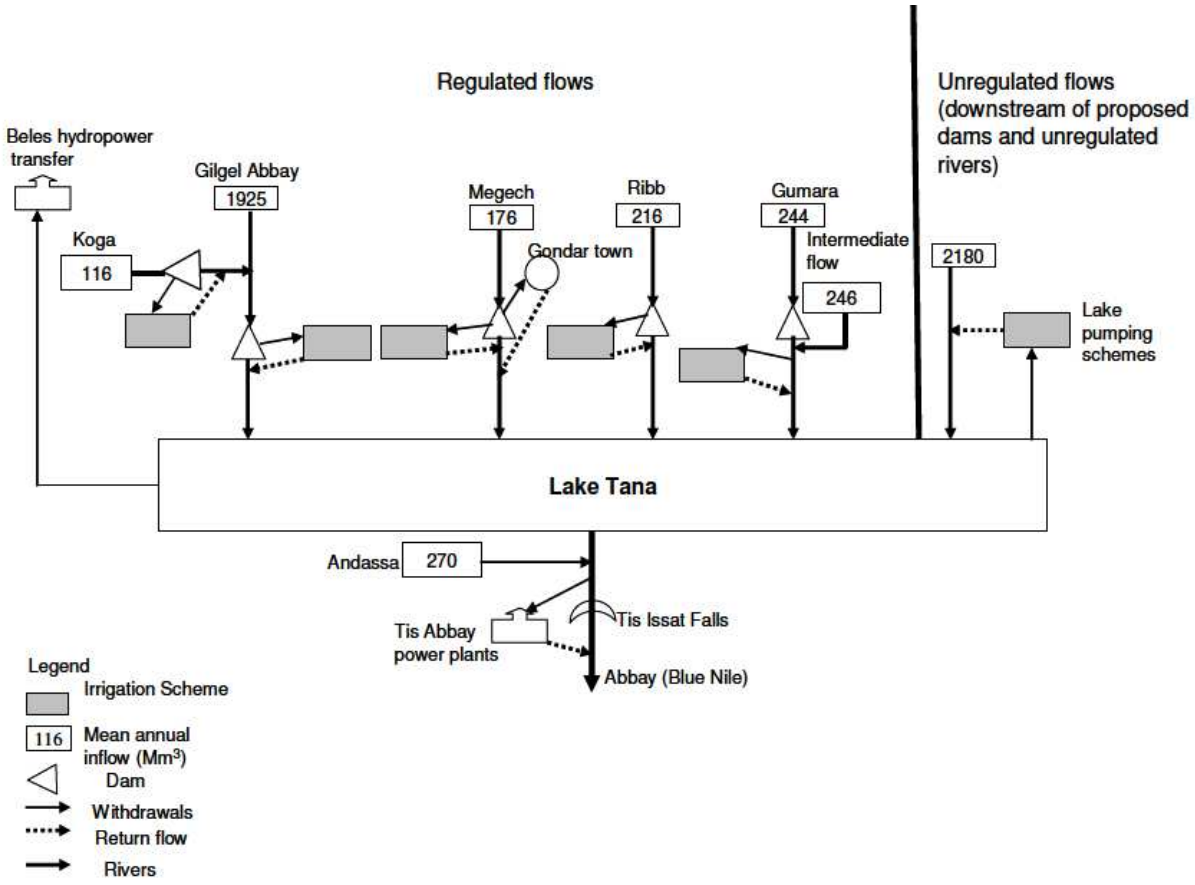


Figure 5: Scheme of existing and planned water development schemes (source: Alemayehu et al. 2009: 9).

Box 10: In-depth excursus on Ribb Irrigation and Drainage Project (RIDP)



By Maxi Springsguth

People in the Fogera Floodplain are experienced users of small-scale irrigation. Participants of PRA sessions and group discussions in Shina Tsiyon and Awa Kokit Kebeles were informed about the future large-scale irrigation scheme. Awareness creation programmes and trainings with the Kebele administration, Kebele experts and Development Agents (DA) on the RIDP were carried out by Woreda officials and the Ethiopian Nile Irrigation and Drainage Project (ENIDP).

Communities were also trained after attending church on Sundays. According to various statements, people within the command area of the scheme were consulted before conducting the feasibility study on the project and for discussions on the detailed design of the scheme.

Hopes associated with the large-scale scheme

With the use of small-scale irrigation, two crops can be produced per annum. With the use of large-scale irrigation, peasants hope to crop three times annually. In future the production of cash crops such as tomato, onion, garlic, potatoes and oats will be promoted.

Farmers believe that food security will be enhanced. With an increase in income from high-value crops children can attend school, medicine can be bought, electric bulbs can be used and new houses can be constructed. People await the promotion and improvement of health and social services. The expenses from renting motor pumps for irrigation from farmers cultivating land along the rivers' banks will be reduced. There is the idea that farmers themselves can become traders in future so as to minimise the dependence on markets. Since one unit of irrigable land one farmer can cultivate is smaller than one unit of land cultivated by rain, landless and youth hope to receive a plot of \surplus\ land within the command area by renting it from other farmers.

Concerns associated with the large-scale scheme

Farmers are overwhelmingly concerned about land redistribution associated with the construction and operation of the irrigation and drainage scheme. Soil fertility of the future allocated land is a crucial and critical point. Nobody knows whether the land will be fertile. To compensate farmers for infertile and unsuitable lands, a land levelling and fertility management fund will be granted by the World Bank through the ENIDP. Until today it remains unclear for which period the fund for soil fertility management will be granted, and the idea to grant the fund for more than one year (since the improvement of soil fertility may require a longer time period) is just new. Potential conflicts over fertile land which may arise during the redistribution process could be settled by sharing the fertile land equally among all land users, as suggested by one member of the Shina Tsiyon Kebele Land Administration Committee. (The feasibility and practicability of this idea could be discussed further.) During the initial stages of the project, some farmers believed that their land will be given to investors. Trust building and awareness creation was necessary to convince people that the project will be beneficial for the community.

The mechanisation of agriculture is another concern raised by the peasants. Farmers are afraid that tractors will substitute oxen (symbol of wealth and traditionally ploughing the arable land) and that, thus, cattle will vanish. The intensive agriculture with three times of cultivation per year is supposed to reduce soil fertility. The long-term application of chemical fertilizer (for eight to ten years) will make the soil concrete, like cement, as believed by the people. Therefore, farmers prefer to use natural fertilizers such as compost, dung and urine and leguminous cover crops to restore soil fertility.

Market structure and access need to be promoted to add adequate value to farm produce. Besides, residents wonder how to deal with the future fuel shortage caused by the reduction of livestock providing dung and the prohibition of Eucalyptus plantations in the command area. (Farmers argued that the government will prohibit Eucalyptus planting due to the high water demand of the tree and that Eucalyptus will be replaced by Acacia.) Participants expressed the need to preserve communal lands and trees in the communities.

The future plans will also affect the social life within the community: Large-scale Irrigation agriculture has a tight schedule and people will be deprived of their time for communication, games and refreshment, one farmer was concerned about.

Conflicting and benefiting parties

The acceptance of the RIDP increases with increasing distance from Ribb River: Farmers cultivating land along the river banks and using motor pumps for irrigation have been benefiting from the sediment load of Ribb restoring the fertility of their land from year to year. Arguments are put forward by those farmers that sedimentation will cease due to the

construction of the Ribb dam. Adversely affected by the reduced sediment load are also youth and other community members of Awa Kokit Kebele. Their income relies on sand mining. The conflict between the government which is blamed for taking no account of the youths' needs to search for alternative income sources and the young people has not been settled yet.

The already existing conflicts over water use between up- and downstream Kebeles (Bura, Shina Tsiyon and Bambiko) during April to May require a solution. People with a larger number of cattle will lose benefit from the irrigation scheme. The reduction of communal grazing land may require selling of cattle. Additional sources of fodder have to be found and produced requiring more time and labour force. Despite the aforementioned, people always emphasised that the RIDP was a benefit for the whole community.

People which must be resettled prior to the construction of the dam reservoir upstream have the chance to receive irrigable land in the command area. But due to unknown social structures of the new residential area they hesitate to move downstream. Thus, more land in the command area can be rented to other interested persons (e.g. landless and youth).

Rain-fed producers and other people residing adjacent to the command area may benefit indirectly for various reasons. (1) Their nutrition may be improved since vegetables produced in the command area can be consumed. (2) Produce can be purchased for reasonable prices. (3) Crop residues as fodder can be purchased because of high fodder production in the command area. (4) Infrastructure can be used and may improve accessibility and mobility. (5) Knowledge and modern technologies can be exchanged.

Yewah Abbat - Fathers of Water

In Shina Kebele no clear schedule and provision on the distribution and use of water exist. The Water User Association does collect financial penalties for overuse of water. But the group of participants did not know where the money flows to. In Awa Kokit Kebele the water resource seemed to be better regulated by the “Father of Water" providing orders how to distribute and use the water. Modern Water User Associations which will be established in the command area should develop clear regulations and schedules so as to avoid overexploitation of water resources and conflicts between different users.

Impact of the RIDP on Wetlands

So far an environmental impact assessment of the RIDP on wetlands has been done for Shesher and Welela ponds in Fogera Woreda only. According to a wetland expert, wetlands in the command area may be drained for cultivation. The run of agrochemicals could also influence lakeshore wetlands and its biodiversity. The sum of all irrigation and drainage projects around Lake Tana could have an adverse impact on the lake water budget. Since ecological assessments of lakeshore wetlands have taken place just recently and the construction of the irrigation and drainage project will begin in a few years, it might be unrealistic to complete environmental impact assessments of all wetlands beforehand.

Environmental implications

These ongoing water development interventions have implications for the alteration of the hydrological regime and consequently for ecosystems. The World Bank (2008: 4) itself states that environmental stress is caused by water use and water infrastructure (such as the Chara-Chara weir, the Tana-Beles tunnel for generating hydroelectric power and associated dams and irrigation).

- Annually some 2,985 Mm^3 are being diverted through the Tana-Beles diversion tunnel (SMEC 2008) and approximately 3,400 Mm^3 of water will be diverted for hydropower and irrigation if all projects are implemented. The mean annual water level will be lowered by 0.33 m and an average surface area of the lake will decrease by 23 km^2 (2,300 ha). This is likely to have significant impacts on the ecology of the lake and on navigation (Atanaw 2011, Alemayehu et al. 2009).
- The World Bank (2008: 2-3) suggests that agro-processing opportunities could be spurred *"through a large and consistent supply of agricultural inputs*". The increased application of fertilizers, envisioned to boost agricultural production in combination with the degradation of wetlands which loose their filter functions, is likely to further affect the quality of the lake water and consequently the fisheries sector inter alia.
- Large-scale irrigation schemes will modify the wetlands around Lake Tana by changing the hydrological regimes and the flora and fauna that are adapted to the fragile ecological settings of wetlands. The ecological and social wetland functions and benefits (chapter 3.3.2) can be undermined. Of these the economically vital assets are the huge ecotourism potential (e.g. bird watching), the fisheries resources and the papyrus stocks for construction.
- To avoid another history repetition, lessons learnt from Lake Victoria, Lake Chad and Aral Sea need to be incorporated in the planning (World Bank 2005): the lake surface of Lake Chad has shrunk since 1963 (from 25,000 to 1,350 km^2) partly due to an increased use of water for irrigation. This has resulted in a disappearance of vegetation and the occurrence of sand dunes. Similarly, the water level of Lake Victoria was reduced by 1.5 m partly due to water withdrawal for hydropower generation. And the Aral Sea has almost disappeared due to water diversion for upstream irrigation. There are also examples from Ethiopia: Lake Alamaya, Lake Abiata and Lake Ziway were severely impacted by siltation due to vegetation clearing.

Recommendations

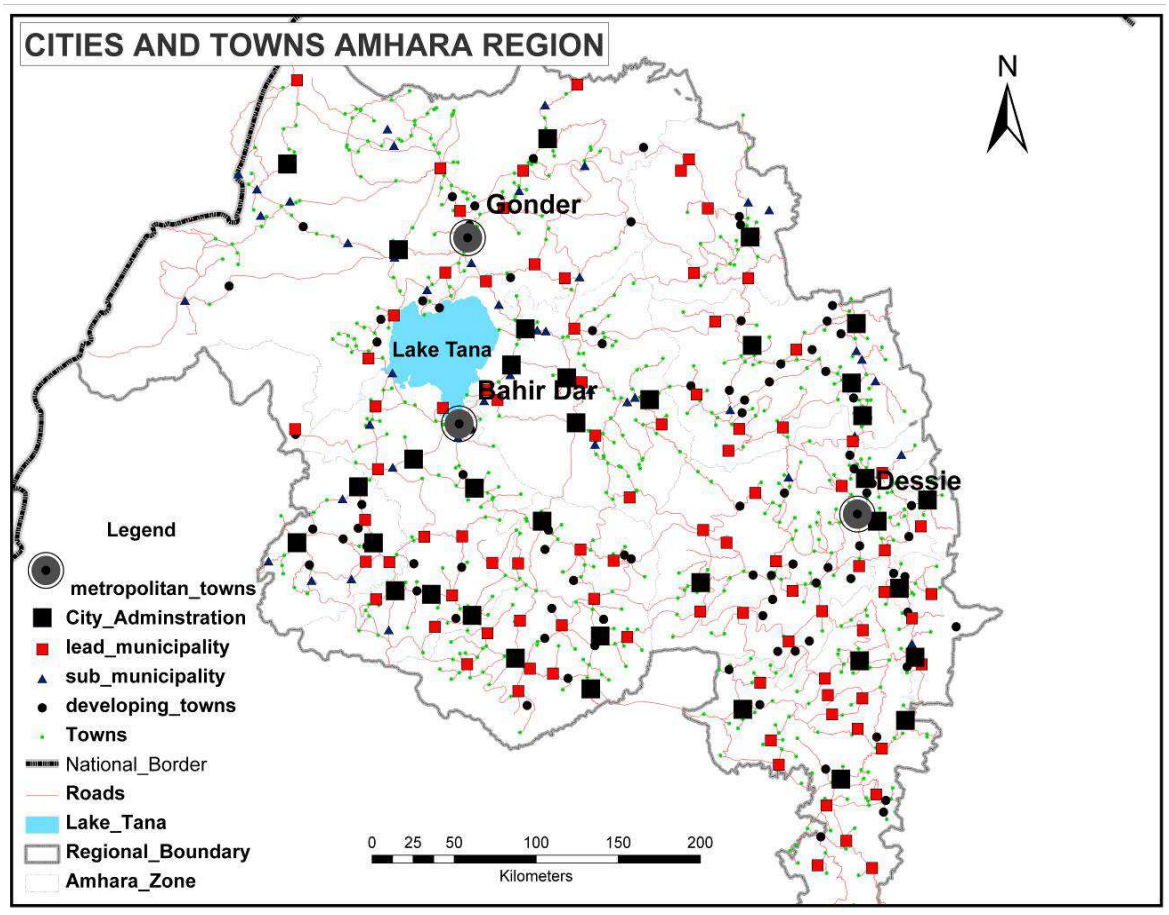
In accordance with the recommendations for the agriculture section (chapter 4.1.1.1), following recommendations are made for the design and implementation of water development in the growth corridor:

- Valorisation of fragile ecosystems that are perceived as not vital and compared with expected benefits from water development investments;
- Avoiding the use of external inputs that create further dependence and pollute the lake and instead promoting local modes of nutrient recycling (e.g. composting);
- Maintaining those wetlands that are important for buffering pollution and siltation;
- Agriculture: farming with nature;
- Focus on the functioning of ecosystems that the poor and hungry directly depend on;

- Preserve ecosystem services such as water purification, natural pest control and maintenance of soil fertility → Millennium Ecosystem Assessment;
- Influence the operationalization of growth corridors towards the ecosystem approach;
- The ecological fragility of Lake Tana needs to be considered in any further planning to ensure the protection of its natural and cultural resource base;
- Strengthen the enforcement of environmental impact assessments;

4.2.3. Urbanization

With its high population density, the Lake Tana Region is undergoing significant urbanization processes. Bahir Dar (with a population of 257,537), Gondar (with a population of 239,757) and Debre Tabor (with a population of 63,221) are the major town centres connected with all-weather roads. Located on the south-eastern shores of Lake Tana, Bahir Dar is also the regional capital of the Amhara Region with all the regional administrations, institutions and a university. Particularly along the main road between Gondar and Addis there are also small towns such as Addis Zemen, Wereta, Merawi, Dangila creating a suitable environment for market connectivity to different regions outside the LTR. The Regional Urban Planning Institute (RUPI) defines a city by having a minimum size of 2000 inhabitants.



Map 9: Cities and towns in the Amhara Region (source: Regional Urban Planning Institute 2011)

Economic growth of Bahir Dar started in the 1950s when it became a regional capital. German experts developed a comprehensive master plan in 1958. Population has grown rapidly in recent years. Since several years there has been an increasing number of investments in hotels and factories. The construction sector has developed considerably and provides many jobs.

In an international workshop on urbanization in the Lake Tana Region[14] held in Bahir Dar in 2011 following urban features and trends in urbanization were identified (Läpple 2011):

- The emergence of the **Bahir Dar city region** from city-based urbanization to regional urbanization patterns;
- The **Urban Development Corridor** is an emerging spatial phenomenon found as well in the LTR, indicating that urban and semi-urban systems are structured along the major economic arteries of agglomerations, extending over long distance;
- In the future Addis Ababa cannot absorb the rapid urban population growth, therefore intermediate cities (with a population below 500,000) like Bahir Dar will be centres for urban growth;
- Urban population in East Africa is expected to double between 2007 and 2025. This will have severe implications for housing, services and jobs and poor urban dwellers. With an annual growth rate of around 5 %, Ethiopia's urban population is 17 %, comprising 927 cities and only ten with above 100,000 inhabitants. The questions are at hand, where the growing number of people will live and what is needed to integrate them in the cities;
- The problem of Bahir Dar and other cities is that urbanization is not driven by economic growth (industrialization-led socioeconomic transformation) but a poverty driven economic survival strategy. There is a lack of access to adequate housing and basic infrastructure like water, sanitation, electricity and roads because urbanization is based on uncontrolled, informal and often illegal spatial development. "*With urban populations growing faster than the urban economies, food security has become a major concern*" (Läpple 2011). **Urban agriculture** is increasingly practiced by the poor to mitigate food and income insecurity;
- **Urban informality**: Informal or self-help settlements are not slums. Migration to cities to escape the rural decline will increase slum population, expressed by an "*urbanization of poverty*". Urban informality is not a problem as such but an economic asset of social adaptability and creativity and thus a mode of development (Läpple 2011), including vital micro and small enterprises;
- The changing **rural-urban-interface**: There is an increasing interdependence of urban and rural systems. Distinctions between rural and urban are becoming blurred as urbanization spreads forming "urban archipelagos";

The Bahir Dar Integrated Development Plan (BDIDP) identified a number of **opportunities** that rural-urban linkages in the Bahir Dar city region can create:

- Availability of agricultural surplus production;

[14] International Scientific Workshop "Lake Tana Region – Prospectives of Future Urbanization", 17-19 February 2011, Bahir Dar University, Management Institute, Bahir Dar.

- Existence and expansion of higher-level service providing institutions;
- Supply of labour force;
- The Agricultural development led industrialization (ADLI) strategy designed for both rural and urban areas;
- Small urban centres exist that can be integrated into the urban economy.

Urbanization creates opportunities but also **social and environmental problems**:

- Urban expansion on farmlands and displacement of rural communities;
- Environmental problems related to urban and industrial activities;
- Disruption of rural traditions by urban lifestyles and increasing costs for life;
- Increasing demand of wood for construction and as an energy source exerts further pressure on the environment (degradation);
- Inefficient transportation systems between rural and urban areas;
- Lack of laws and regulations to face the reality of rural-urban linkages (e.g. administration, administrational disconnection, responsibilities and master plans limited to urban and rural areas likewise).

Conclusions and recommendations

According to Läpple (2011) the Lake Tana Region has outstanding potential for urbanization because of its urban nodes, its transport, energy and research infrastructures, its economic assets, the high fertility of the land, its cultural heritage. He proposes the **Lake Tana City Region** to include Debre Tabor, Bahir Dar, Gorgora and Gonder up to Semien Mountains, which could develop along the key logistics connections such as inter-city highways and rail- and waterways such as the road between Bahir Dar and Gondar. These can be utilized to geographically better spread urbanization and its benefits to avoid metropolitan congestion.

According to Schmidt-Kallert (2011), urban planners know little about rural areas, because there is a strong organizational **divide between urban and rural development**. Consequently rural-urban linkages are neglected in planning. Rural development projects did not prevent rural-urban migration as the **rural-urban interface** is often neglected. Thus, a shift towards a more integrated view is necessary as addressed by the World Habitat Day and the Food and Agriculture Organization (FAO). Urbanization processes have to be integrated in the regional planning to address aspects like rural-urban migration, pollution and waste water treatment and infrastructure development. Densification should become a guiding principle in urban planning in order to reduce pressure on arable land.

To improve regional planning an **actor-oriented** perspective is necessary. Rural-urban migration is dominantly non-permanent with seasonal variations that depend on the agricultural cycle. It is to create survival options in the informal urban sectors while still retaining the cultural ties to the rural life. From the actor-oriented perspective the rural-urban interface is characterized by **dual-locational households**, i.e. a household split and reciprocity of financial (economic) and in-kind support (social), of knowledge and values between urban and rural life. Local people developed livelihood strategies that take advantage of both rural and urban

opportunities. By extending from the urban to the regional scale in the LTR, geographically dispersed assets can be better used such as infrastructure and complementary settlements. Thus, the government, city managers, urban planners and other administrations need to act within the regional and not only the local context by creating a **polycentric hierarchy of urban nodes** rather than allocating urban functions in the city alone (Schmidt-Kallert 2011).

Modes of construction that are based on local material and skills need to be encouraged to reduce inter-regional dependency on material supply.

The informal settlements and sector have to be embedded into a clear and binding regulatory framework that acknowledges the existing complex rural-urban linkages (in terms of markets, trade and social interactions). This can for example be achieved by formalizing informal structures such as urban agriculture, housing, infrastructure and land ownership based on local consensus.

4.3. (Eco)tourism and potentials in LTR

The tourism sector plays a key role in Ethiopia and the Lake Tana Region in particular for providing job opportunities and generating revenues for the region. The Amhara Region receives 70 % of the international and 80 % of the domestic tourist flows of Ethiopia. Between 2005 and 2008, the average annual tourist arrivals were 324,664 with average annual revenues of 167 million dollars. Within this period the sector had an annual growth rate of about 21 percent tourists and 19.5 percent of revenues (Marye et al. 2011).

Tourism and community-based eco-tourism (CBET) in particular can be an important vehicle for promoting and vitalizing biosphere reserves in many ways:

I. Creating awareness and appreciation for the value of nature and biodiversity of both tourists and locals (educational aspect)

II. Creating job opportunities not only in hotels, for tour operators and guides, but also for local communities (employment aspect)

III. Creating economic incentives for the conservation of natural (and cultural) assets by monetary valorisation (conservation aspect)

IV. Reducing land degradation through taking people off the land (conservation aspect)

The Lake Tana is endowed with a high number of tourist attractions. Most of them are cultural sites including the churches and monasteries on the islands and peninsulas on the lake (for further details see Marye et al. 2011). Apart from the Nile falls being one of the main tourist attractions in Amhara, the enormous potential of the landscapes and natural assets have not at all sufficiently been exploited for ecotourism. Among many others the main potential natural tourist attractions in the LTR include:

- Natural (church) forest with indigenous tree species (including shade-growing organic coffee);
- Wildlife like hippopotamus;
- Papyrus bed wetlands;

- Important bird areas of key global species (nesting, feeding and roosting sites);
- The Bahir Dar Blue Nile River Millennium Park (BDBNRMP) (cf. Marye 2010).

The regional **Bureau of Culture, Tourism and Parks Development** (BoCTPD) is striving to develop diverse tourism products in various destinations and facilitate development options with effective guidelines, which is addressed in the *"Tourism Destinations Networking Management Plan for Lake Tana and its vicinities"* working towards following objectives (Marye et al. 2011: v):

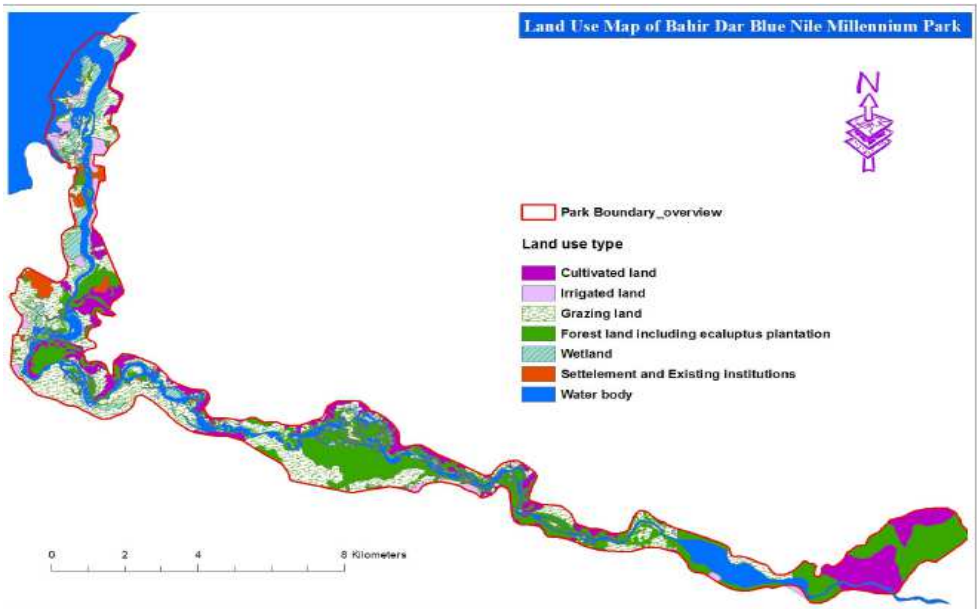
1. Delineate principal attractions and tourism products in various destinations
    - Sort out natural, cultural and historical tourism resources;
    - Evaluate the status of tourism facilities, accommodation, investment, services and benefits;
    - Indicate mechanisms of heritage rehabilitation and maintenance for sustainable tourism.
2. Develop networking maps and circuits of destinations with unique features (see Map 19)
3. Identify development programs, strategies and actions with implementers
4. Delineate sustainable livelihood options of the local communities and the contribution of tourism

A regional five years (2003/2011-2007/2015) tourism development strategic plan has been developed to enhance sustainable biodiversity, natural habitats, historical and cultural heritage conservation and sustainable tourism development in the region by attaining these three target areas. BoCTPD has developed **eight destination circuits** (Marye et al. 2011: 102, see annex IV).

4.3.1. Linking tourism and conservation: Bahir Dar Abay River Millennium Park

The Bahir Dar Abay (Blue Nile) River Millennium Park (BDBNRMP) was established by the ANRS government based on a regional regulation (no. 59/2008) in 2008. It is designated as category IV of the IUCN protected area system (wildlife reserve). Covering an area of 4729 ha which stretches from the outlet of the Blue Nile to the Blue Nile Falls, it contains the following **ecosystem types** (Map 10).

- Riverine evergreen ecosystem (river courses, island fragments, water ways);
- Dry upland montane forests (upland dry forest composition) dominated by seasonal defoliation and removal of green leaves in winter;
- Riverbank wetlands (wetlands near to the river watercourse and mixed forests of sewage grass and shrub undergrowth, beneath huge evergreen riverine trees) largely dominated by river water, plant and animal species



Map 10: Land-use map of the Bahir Dar Abay River Millennium Park (source: Marye 2010: 29)

There are seven vegetation-based habitats namely, mixed wooded land, wooded upland, open grasslands, grasslands with igneous rocks, wooded land with igneous rocks, dense forest, and riverine wetlands.

The development of a strategic management plan for BDBNRMP for 2010 - 2014 integrated the conservation of biodiversity and sustainable tourism. Based on this, tourism facilities are planned as potential opportunities to develop adaptable attractions and recreation, as well as a zoning concept for the benefit of the community. The park was delineated on a legal basis and equipped with an office, manpower and a budget.

Due to its proximity, it is an ideal site for visitors from Bahir Dar, because it facilitates affordable recreation and the connection to urban transportation. It has a high attractiveness to visitors due to its isolated patches of natural areas with impressive biological and scenic beauty diversity, which can offer a variety of activities. There is a low interest by the community to use dense island forests for cultivation due to their inaccessibility.

However, the park's natural vegetation cover is only fragmented in escarpments. The removal of natural forests, expansion of settlements and farmland for stimulant crops (chat) exert a high pressure on these natural sites. Overgrazing and extensive use of vegetation (papyrus and wild fruit) prevails. In the course of the urban expansion there is an increased competition between farming and building construction. Encroachment from settlements and chat plantations constrain conservation, because of a lack of stakeholder communication, involvement and consensus. Consequently, there is limited community awareness of the park's benefits and limited access to new experiences. Public and private infrastructure is inadequate and visitor-resident interactions are limited. The park lacks tourism investments, such as professional (certified) guides and trainings. Tourism and conservation are not yet fully linked in an integrated approach.

Despite these constraints the BDBNRMP has a potential to make use of its diverse habitats and landforms for tourism by linking it to the established tourism destination Tis Issat (Blue Nile Falls) and Bezawit (monument in Bahir Dar). Bahir Dar envisaged

as the new conference and workshop city in Ethiopia, could attract business tourists to pay a combined visit to the nearby park. Professionals and institutions to contribute expertise already exist (Bahir Dar University, BoCTPD, ARARI, EPLAUA, ORDA, Bureau of Agriculture). Water sports could be combined with recreational tourism development (SWOT analysis conducted by the Park Office, Marye 2010: 16).

4.3.2. Ecotourism in Lake Tana Region – potentials for the implementation of community-based ecotourism

Two case studies: Zege Peninsula & Tis Issat Falls

By Christian Sefrin 2011

Ecotourism can be seen as an instrument for sustainable development trying to contribute to sustainable development's three main concepts: ecotourism claims to initiate economic developments particularly for local people, to improve their social situation and to allow ecological sustainability and biodiversity conservation. However, in practice many ecotourism projects fail to meet these standards. It is highly questionable, if implemented ecotourism measures establish a stable additional income for local people, if they are able to reduce destructive measures on the environment and if awareness for biodiversity is created. Thus, ownership development with this kind of projects remains difficult especially within highly vulnerable societies where sustainable actions suffer under the daily life struggles. There is no doubt, however, that income is generated through tourism activities but it often happens that this is kept by only a small proportion of the local community. In addition, it needs to be considered for which reasons the money is reinvested. For example, if communities spend their income on increasing the amount of livestock, it can easily contradict with nature conservation goals.

In the case of Lake Tana Region in Northwestern Ethiopia no such ecotourism developments are established so far. Indeed, it is the plan of the government to become one of the ten leading tourist destinations in Africa up to 2020 offering ecologically friendly tourism services with local communities mainly benefiting through income generation. Furthermore, Ethiopia's tourist numbers are increasing from year to year and undesirable tourism developments can still be regulated by early interventions. Therefore community-based ecotourism (CBET) could be an approach to improve people's livelihoods in Lake Tana Region.

The community-based ecotourism approach means different things to different people. But the accepted consensus sees the approach as an extension of the three mayor concepts – economic development, social well-being and biodiversity conservation – by a participatory component. Local communities shall not only be the main beneficiaries of economic developments but also engaged in the whole planning and management process of tourism in their region. Thus, the CBET approach has the vision to empower communities to a self-determined management of their environments and can be seen as a form of community-based natural resource management.

However, this kind of understanding of CBET requires specific conditions at site to make the approach successful. The aim of the research was to analyze relevant factors for a successful implementation of CBET in Lake Tana Region.

1) Findings

Tourism potentials are of multi-dimensional scope. The research was actors- as well as resource-oriented. Actors and resources can be seen as the central assets for tourism development.

Actors have divergent interests, skills and motivations to participate in tourism. These interests, skills and motivations play a central role in success or failure of tourism strategies. A detailed analysis and understanding of central actors behaviors and their interactions can help approaching them and improving their weaknesses or utilizing their strengths to form a sustainable future solution in tourism.

Resources are meant to be a second important pillar to monitor a locations' applicability for touristic utilization. They can be summarized into two clusters of structural and classical touristic resources at the location. Structural resources implicate all structures and processes relevant for tourism development e.g. policy rules and regulations, national and regional tourism trends, transport and health infrastructures, safety situation but also cultural features or obstacles for visitors. Touristic resources are natural, cultural or historical points of interest at the location with a high recreational value e.g. particular flora and fauna, cultural practices and history.

Altogether, actors and resources need to be analyzed carefully to evaluate the existent tourism mechanisms and judge on planned tourism development measures. Throughout this, the potential analysis gets a temporal component and might also contribute to a revision of prospective developments. Existent strategies might be questioned and new tourism concepts and ideas might arise out of the current stage and anticipated prospective strategies.

4.3.3. Stakeholder analysis

I. The national and regional levels

Several development plans already exist and try to support prospective tourism development on national as well as regional level (e.g. Growth and Transformation Plan, Lake Tana Tourism Destinations Development and Networking Plan, Tourism Destination Development Plan for Zege and its Vicinities). Especially on the national level tourism plans remain ambiguous and sustainable ecotourism development is not well defined. Regional and local management plans seem to some extend too ambitious and illusionary. Planners orientate themselves by taking examples from different regions all over the globe, sometimes not considering the realities at their planning sights. To sum up, strategies aim towards a commercialization of farmers' culture which at the same time could decrease culture because people change their livelihoods. The risk is that culture becomes something static which needs to be preserved because of its touristic and mainly its economic value but in reality culture is something vibrant changing within daily interactions. And culture is also one of the main potentials on Zege why tourist visit this place and changing it tremendously can have a negative impact on tourism (see also chapter 2.2.2.1). Right now tourism

developments dominantly focus on investigative measures but locals' access to financial capital is limited and willingness to run into debts is low. In addition, access to micro-credits for individuals is not possible and only associations can apply for them.

Stakeholder analysis: the local level

I. Zege Peninsula

Zege Peninsula is located approximately 11 km northwest of Bahir Dar and accessible by boat as well as by bus (30 km, approx. 1.5 hours). On the peninsula dense coffee forests hide little settlements and old monasteries which offer beautiful scenery for visitors. So far, the only tourist attractions are three out of seven medieval monasteries and churches located close to the landing places for the ferry and private boats. Hitherto, out of the approximately 7.000 inhabitants only a small amount of the local community can directly or indirectly benefit from the current tourist flows. Roughly thirty households along the trails up to the monasteries try themselves as souvenir or coffee shop owners and can hardly gain an income out of it. Monthly earnings are consistently low and selling is only acceptable during the tourist high season from October to February.

On Zege stakeholder problem settings are manifold. Access to tourism services is highly differentiated on the local level. The biggest share of tourism earnings flows directly to the monasteries and hence to the Orthodox Church's head institution located in Bahir Dar. So far, there have been almost no return flows for the communities' well-being and instead the money is spent for construction and renovation purpose and medieval building fabric is getting removed without any proper heritage conservation strategies. Due to high valuation of church the local community is not questioning this kind of management and income sharing or investments in social infrastructures of the entrance fees is not seen as an appropriate solution to increase local peoples' well-being. This can be seen as the main obstacle for the vision of a prospective revenue sharing. On the other hand the church has a central role in stabilizing peoples' behaviors and attitudes towards visitors with an increasing tourism. For a future planning church officials need to be involved and trained how tourism mechanisms work to forward this information to the community. They are authorities within the society and opinions will be respected. At the moment church is the main actor in access to financial capital and the most important tourism regulator. Unfortunately, tourism specific knowledge is low and tourists' focus while visiting Zege peninsula lies on the religious heritage and natural as well as cultural points of interest remain unutilized.

Another group with good access to the tourism market on Zege peninsula is the local tour guides meanwhile organized in an association. The foundation of the association clearly regulates guiding fees and completely abandoned hassles for tourists arriving at the landing places. Income is equally shared among the members and quite reasonable. Furthermore, guidance quality increased because the associations' members train themselves on a learning-by-doing basis. However, guiding access is limited to a small amount of privileged youngsters with language skills in English and so far only 18 guides are registered. Still, the offered services are limited to guided visits of the monasteries and other potentials are not developed yet and guides awareness and knowledge e.g. about flora and fauna is low right now. If these would be developed the amount of guides also need to be improved.

Local community must be divided into two clusters of tourism engaged and non-engaged individuals whereas in general one can say that tourism engagement cannot always be understood as an improvement of livelihoods. All actors valuate tourism as an important means of exchange with tourists and appreciate them as guests within their environment. Hence, this kind of exchange can be seen as an upgrading of human capital in terms of language whereas at the same time cultural values especially within the younger generation attenuate. But, in general, important human capitals for tourism like business or language skills and innovative ideas are less pronounced and primarily contribute to the low tourism income schemes of the community. This leads to an undervaluation of tourism services. Still, the livelihoods are mainly dominated by coffee farming and the biggest share of farmers' income relies on coffee production. Tourism is seen as side activity to generate additional income whereas main priority is given to farming. This explains the low motivation to invest more in tourism services and farmers scepticism to professionalize their businesses related with high initial debts. On the other hand peoples' traditional livelihoods are still maintained due to this fact and can be a tourist attraction by themselves. Especially for the increasing amount of international tourists experiencing culture of daily life could be a major attraction while visiting Zege Peninsula. Farmers are proud on their culture, conversations are dominated by this topic and guests are always welcome to participate, but up to now it is not seen as a non-investigative means of income. At the moment, farmers' understanding of tourism is related to small businesses offering souvenirs and coffee. Mechanisms which trigger these developments are only a reproduction of neighbouring households' services and strategies which increase competition among the sellers. So far, ethical values abort open conflicts but incomes are decreasing because supply and demand are not in equilibrium anymore. Establishment of associations to group the sellers also failed because incomes were lowered even further and people become demotivated and neglect their membership. But ethical values also decrease hassle and guests are still treated with a lot of respect and care but so far, tourists contact to the local community is too weak and this strength is not seen as a potential for tourism. In general, all local stakeholders' potentials for self-organization to develop sustainable management plans for future tourism seem hardly established. Only the local tour guides association is working on a vision plan to steer tourism development in their interest.

II. Tis Issat Falls

The little town Tis Abbay (10.000 inhabitants) is located approximately 30 km southwest of Bahir Dar and accessible by gravel road. The main attractions are the Nile waterfall which drops down 50 meters into the Nile gorge and the Old Portuguese Bridge once back in time an important part of an old trade route between the provinces Gojam and Gondar. Nowadays, visitors can hike along a circuit starting in Tis Abbay passing the bridge, the falls and finally the Nile River by boat in approximately three hours. Along the trail the visitor will pass little villages and walk through fields and experience some of Ethiopians daily life besides the natural beauty of the landscape. Farmers out of the two Kebeles Tis Abbay and Dasera make their livelihoods mainly out of cultivation of sugar cane and fruit crops and some small businesses in Tis Abbay town. According to the Kebele administration tourism reaches only 700 people and partly contributes to their livelihoods.

At the Nile falls tourism has already experienced a higher degree of institutionalization. Most of the participants are already organized in associations.

There are sellers, tour guides and ferrymen associations assembling people to small groups up to ten to assist opening their businesses. But incomes highly differentiate within the associations. To some extent, the low investigative businesses were the profitable ones and participants can quickly benefit out of the revenues. Tour guides and ferrymen were already endowed with specific assets even before tourism began to flourish. Language skills and cultural knowledge or ferries were already existent and it took almost no new inputs to run a small scale business. Whereas, sellers started up from the scratch and investments were comparatively high and tourism-relevant human capital was low. In general, people are forced to begin their business with high debts and no proper business skills. So far, microfinance options exist for investigative businesses under several application criteria. But the developed small scale business plans lead the businesses in initial debts of up to 80.000 ETB without any guarantee that the business will be successful. Due to the problem of a diversified supply shops mushroom everywhere along the trails and competition increases. It can be questioned if new start-ups will really contribute to poverty eradication around the Nile falls.

Tour guides and ferrymen somehow benefit from the institutionalization of their businesses because it reduced hassles and conflicts within their community and due to the rule that tourists need to take a local tour guide if the group is bigger than four and taking the ferry is also obligatory as there is no other way across the river, consecutive revenues are guaranteed. Whereas sellers face the problem that many tourists don't buy anything while visiting the falls and missing language skills make communication difficult. The problem setting is similar compared to Zege peninsula and the status of benefit from tourism mainly depends on the job itself and human capital of the actor. It becomes more popular to let the children manage the selling because of their better communication skills to decrease at least the lack in communication. On the other hand hassle becomes a reality and Kebele regulations were not successful to curtail it, so far. Compared to Zege peninsula the hassle is much more and can be explained through the irrelevance of the church for tourism. Whereas the main tourist attractions on Zege are the monasteries, the falls are the dominant one at Tis Abbay. On Zege clericals have a high interest in regulating communities' behaviors because it is in their own interest to improve tourist numbers. In church, attitudes and behaviors are always discussed and people listen to them because religion is a main part of their lives, whereas at the Nile falls churches are not involved into tourism at all.

A major problem is the networking and information exchange between the different stakeholders. In general, information exchange is lacking top down but also bottom up. Locals feel pretermitted and develop fears and rejection against new ideas. For example, several investments for lodges around the falls are planned or already done without proper discussions with the community. Scepticism is big, many rumours circle within the community because people fear to lose valuable grazing land for their animals without any compensation. Making strategies more transparent and finding compromises with the locals could mellow the situation. But on the other hand, local actors do also not try to manage deficits to improve their situation. It seems like help is understood as something from the outside and cannot be developed within the community itself. Conflicts between sellers and tour guides are evident but the groups did not manage to discuss with each other.

4.3.4. External resources analysis

General tourism trends in Ethiopia and Lake Tana Region

Tourist arrivals in Ethiopia are consecutively increasing over the last two decades and even crisis like the war against Eritrea between 1998 and 2000, upheavals after 2005 elections or the famine in 2011 didn't hinder tourists to visit the country. A good thing when focusing on tourism development is a major goal of Ethiopia's government.

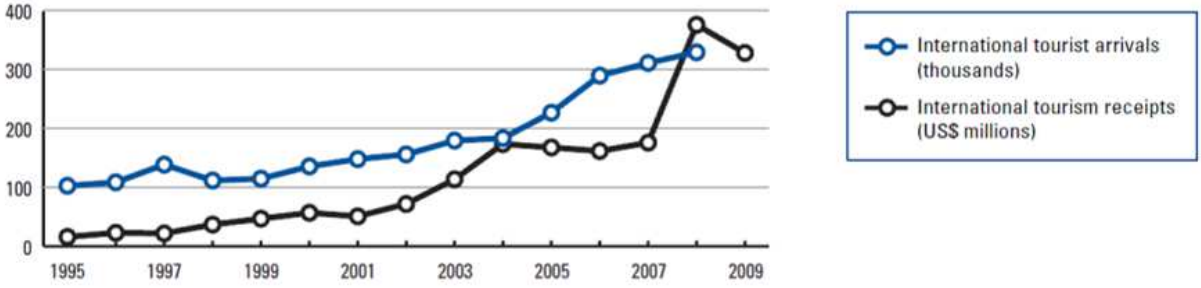


Figure 6: Ethiopia's international tourist arrivals and tourism receipts 1995 to 2009 (source: UNWTO 2011)

Out of the 330.000 international visitors almost 12.000 visited Bahir Dar in 2008. Hence, Bahir Dar and its vicinities is the third most visited region in Amhara State after Lalibela and Gondar and one of the main tourist attractions all over the country.

So far, tourism revenues are very low on the local level and mainly business people from Bahir Dar or even Addis Ababa profit. For a sustainable tourism development in Lake Tana Region a balanced supply-demand relationship is important. Therefore, a more specified classification of tourists needs to be done to meet visitors' interests with the offered activities. The research questionnaire analysis will be a first step towards equilibrium in tourists' demands and sustainable ecotourism supplies.

I. Zege Peninsula

Basic structural resources are already developed on Zege peninsula to supply tourists although the vicinity of Bahir Dar as state capital reduces the necessity of several structural resources. Besides electricity and access through road and water, telecommunication opportunity is also given. The biggest problem under health and hygiene aspects is the missing access to clean drinking water. So far, farmers supply themselves with lake water and tea and coffee shops also offer it to visitors. For the short term, bottled drinking water could be imported from Bahir Dar (e.g. with the daily ferry) but for the long term a solution to the benefit of all inhabitants of Zege needs to be found. Good medical support (e.g. hospitals and clinics) can be found in Bahir Dar.

The cultural as well as the natural potentials on Zege peninsula are attractively high. So far, potentials are not well developed. Cultural and historic hotspots are merely some of the monasteries near the waterfront. Culture of daily life is not yet integrated in the visitors schedule and focus is mainly on the history of the monasteries. But cultural features like the traditional papyrus boats (tankwas), coffee and honey, agriculture and religion are not yet integrated in the existing tourism concept. Integrated concepts connecting culture and nature could be developed. The coffee forest is unique in Northern Ethiopia. Tourists travelling the Northern Circuit (Addis

Ababa, Bahir Dar, Gondar, Makelle, Lalibela) will not experience such an ecosystem elsewhere on their trip. Biodiversity is high and could be integrated in visitors' schedules wherefore only guides knowledge needs to be trained. Hiking on the small trails in the forest visiting different monasteries, families and viewpoints could increase visitors understanding of Zeges cultural and natural diversity and their linkages. At the same time visitors length of stay would be extended and revenues out of tourism for the local community could be increased.

II. Tis Issat Falls

Basic structural resources are also existent at the Nile Falls and the vicinity of Bahir Dar is also given as in the case of Zege peninsula.

At the moment the major attraction are the falls but due to a dam construction at the Nile outlet of Lake Tana further upstream the amount of water fluctuates tremendously depending on whether the sluices are opened or not. In general, the period of high water availability spreads from July to October, whereas tourist high season starts at the end of September. Hence, tourism is a very seasonal business for the local communities and limited to one to two months of high tourist flows throughout the year. As long as Tis Issat tourism is limited on the falls revenues will remain low. The area needs a more multifaceted profile and tourists could come for other reasons. Ethno-tourism and geo-tourism are only two options which could be offered in an environment for recreation.

4.3.5. Conclusions and recommendations

At both research sites trends towards a professionalization of tourism exist. Planners already developed a broad set of measures and ideas on the basis of other African tourist destinations like Kenya, Tanzania or South Africa, although it can be questioned if their strategies are sustainable in a sense like this study sees it or if locals are supporting this kind of measures. In the end, locals are the ones implementing and participating in tourism and ownership development is unrealistic if measures are far beyond their scopes. On the other hand, if measures and ideas are appropriate for implementation in a specific locality, actions need to follow. Unfortunately, in a developing country like Ethiopia budgets are short and proceedings become postponed easily. At the research sites institutionalization seems like this kind of promising step towards professionalization which makes tourism manageable whereas, at the same time, people refusing it due to the fact that it disadvantages them.

In general, the lacking tourism development can be explained as a set of actors' access problems to several tourism-relevant assets. Classical assets are human, financial, social, natural and physical capital.

The biggest problem at the sites is access to human capital whereat information, language and business skills can be seen as the most relevant for tourism. At the moment local actors don't know how to approach tourists and what kind of affections and wishes come with the visitor. Locals live in a completely different reality with a very limited access to information about foreign and even local tourists' reality. It is questionable if awareness creation and information on "What is a tourist?" is desirable because it can easily be imprecisely and reduced to simple categories

which forms an image of “the” tourist. But a classification of tourists is not possible and everybody is different. Furthermore, it is the question if sustainable tourism should be an adaptation of locals to visitors’ expectations or if it needs to be seen as something where visitors want to experience the real and broaden their understanding through exchange with locals and vice versa. But language is still the main obstacle for the personal exchange and business. Locals are dependent on the help of a translator. Guides could operate as translators but some are not really interested in assisting local businesses. Besides language, general business skills of some sellers are missing. Simple calculations for purchasing and selling goods are difficult for sellers with a low educational level; promotion of goods is weak and competition too high.

Another characteristic of tourism activities in general is their dependency to a specific locality. They do not occur on community level but within micro corridors around the sights. Businesses do only develop along specific axis where tourists pass (e.g. trails, landing points, etc.) where demand for goods is high or services can be offered i.e. only people with access to land along these corridors can participate in tourism markets who are not naturally the most business-minded. Opening new corridors could be an option to let others participate as well. But to prevent rising competition, activity diversification needs to be considered.

Tourism development plans always come along with investments in businesses or other infrastructural improvements whereas at the same time actors’ access to financial capital (e.g. micro-credits) is limited. Anyhow, it is highly questionable if tourism development only comes along with investments or if especially in the case of Lake Tana Region with its high cultural and natural potential. Alternative ways of tourism development would work more sustainably and efficiently for the purpose of nature conservation, if visitors could experience people’s daily life as well as wildlife. Hence, necessity of financial capital could be reduced as well as the access problem.

Access to tourism is not only structural but also relational. Tourism is influenced by manifold divergent stakeholder interests causing problems for a frictionless visit at the sights. Tourists’ expectations about services and payments differ from them of the guides, sellers complain about the missing support from governmental administrations and so on. Access to stakeholder exchange and information could be easily achieved by increasing the communication between the different stakeholders. Chances for success are realistic due to previous successful agreements on stakeholder level.

Especially in the case study on Zege peninsula access to authority becomes a thriving force for tourism. Other actors’ space of actions becomes limited through the influence of church and religion in general. This reality needs to be considered for further planning because not all measures will be successful because of the church’s’ authority.

As mentioned above the concept of community-based ecotourism does not only imply that communities benefit from tourism but also that they develop and manage their own projects. However, the complexity of the web of access as well as actors’ asset endowments do not yet seem ready for this challenge. Especially under the notion of nature conservation leaving local actors alone with planning their own ecotourism projects would be problematic. To conclude, CBET needs to be transformed from a bottom-up to a top-down approach with a participatory as well as a pro-poor component.

For the establishment and promotion of community-based ecotourism marketing, infrastructure and access to information need to be developed. Thereby, provided information on the tourist attractions should be target group-specific and communication reciprocal through establishing feedback mechanisms for perpetual improvement of services. Accessibility to eco-touristic attractions needs infrastructure that is based on targeted visitor direction through bus trips, car rents or bicycles. The potential tourist sites become more attractive by putting them into scene through improving activity facilities (coffee ceremonies, reed boat rental etc.). The suggest strategies for the ANRS Bureau of Culture, Tourism and Parks Development (BoCTPD) are: target group orientation and defining focus areas (profiles), such as indigenous knowledge, bird watching and ethno-ecological tourism.

5. Dimension III: Stakeholders and participation

5.1. Institutional set-up and relevant stakeholders

A biosphere reserve involves a wide set of stakeholders from the public and private sector, governmental and non-governmental institutions to civil society and local communities spanning across diverse sectors. Table 8 lists the key sectors and types of stakeholders relevant for managing a BR in the LTR.

Key sectors / fields of activity	Types of stakeholders and their roles
Agriculture and livestock	National institutions: policy-makers
Water development and energy	Regional: technical support and coordination
Forestry	Public authorities: legal, technical, logistic and decision-making roles
Fisheries	Local community representation
Tourism	Private sector (investors, brokers, traders, tour operators, hotels, productions)
Environmental protection	Project coordinators and development cooperation (NGOs, GOs)
Research and monitoring	Religious leaders
Education and capacity building	Universities and colleges

Table 8: Key sectors and types of stakeholders necessary for BR management in the LTR

For the planning and management of a BR in the LTR the existing institutional set-up was mapped out by listing those institutions and stakeholders on the national, regional and local level that will or should play a role in the BR context (Table 9). In the following the key stakeholders' roles will be analysed.

Institution	Role and mandate within the BR context
National level	
Ministry of Science and Technology (MoST)	▪ Coordinating the Ethiopian MAB Programme and MAB Committee ▪ Overseeing BRs and BR initiatives in Ethiopia ▪ Setting national MAB strategy and BR guidelines ▪ Conducting stakeholder workshops
Environmental Protection Authority (EPA)	▪ Focal points for the CBD and the NAP ▪ Coordination of ministries and agencies on environmental issues
Institute of Biodiversity Conservation (IBC)	▪ Implementation of the CBD ▪ Upgraded status by the Government of Ethiopia
Ministry of Agriculture (MoA)	▪ Conservation and utilization of forest and wildlife resources ▪ Food security program ▪ Water harvesting and small-scale irrigation ▪ Monitoring effects on agricultural development and operation of early warning systems ▪ Market-oriented agricultural development ▪ Guidelines and procedures for agriculture ▪ Distribution of agricultural inputs ▪ Establishment of training centres for agriculture and rural technology ▪ Implementation of the Convention on International Trade in Endangered Species of fauna and flora (CITES) ▪ Activities against deforestation, land degradation, unsustainable land-use, crop and livestock production, alternative livelihoods
Ethiopian Road Authority (ERA)	▪ Planning, construction, administration and maintenance of road constructions
Ethiopian Electric Power Corporation (EEPCO)	▪ Energy generation and distribution ▪ Environmental Monitoring Unit since 2002 to manage environmental impacts of hydropower and energy transmission projects
Ministry of Water and Energy (MoWE)	▪ Planning and management of water resources for irrigation and drinking purposes ▪ Taken reforms on challenges and opportunities in the water sector ▪ Principles: Integration, participatory approach, decentralized management, comprehensiveness
Ministry of Finance and Economic Development (MoFED)	▪ Approval of all development programs in Ethiopia ▪ Environmental Planning Unit ensures clean and healthy environment aspects of the programs
Higher Learning Insitutions (HLI)	▪ Post-graduate study program in environmental sciences of Addis Ababa University ▪ Bahir Dar and Gondar Universities (6.1)

Regional	Role and mandate within the BR context
ANRS Bureau of Culture, Tourism and Parks Development (BoCTPD)	▪ Establishment proclamation 167/2001 (2009): "…*mandate to deal with three major target areas of development in culture, tourism and wildlife resources and provisions, including the development of attractions, ensuring the benefit of the people and provision of quality services for tourists"* (Marye et al. 2011) ▪ Designated authority for BR administration and management ▪ Coordination and implementation of BR activities: management plan, business plan, zonation, advisory boards and steering committees, monitoring and evaluation, establishment of a management team ▪ Integration and concertation with other regional, local and national institutions ▪ Promotion of (community-based) ecotourism ▪ Wildlife conservation and protected area management
ANRS Bureau of Environmental Protection, Land Administration and Use (BoEPLAU)	▪ Established by proclamation n. 47/2000 ▪ Ensure that development activities protect peoples livelihoods and protect and utilize natural resources ▪ Focal institution for the implementation of environmental conventions ▪ Branch offices in each district and zone ▪ Setting the legal status for BR zones and developing legally binding land-use plans ▪ Formalizing informal land-use in the wetlands ▪ Developing community-based land-use regimes for the communal lands
ANRS Bureau of Agriculture (BoA)	▪ Supervising programmes and projects related to agriculture, forestry, livestock, fisheries ▪ Implementation of the SLM, agricultural growth project, irrigation schemes and export orientation ▪ Controlling agricultural extension up to Kebele level → community participation ▪ Forest rehabilitation (tree nurseries, Area Closures) and erosion control
ANRS Bureau of Water Resources Development (BoWRD)	▪ Planning and implementation of water related interventions (small- and large-scale irrigation, water infrastructure) ▪ Safeguarding the sustainable utilization of the water resources (the Lake, tributaries, wetlands)
ANRS Bureau of Finance and Economic Development (BoFED)	▪ Mobilization of internal and external resources for community-based integrated resource management ▪ Facilitate the engagement of NGOs in the BR

Bahir Dar University (BDU)	▪ Teaching (Institute of Land Administration and the Maritime Academy, College of Agricultural and Environmental Science, Biology Department) ▪ Research: VLIR project to study the sediment and water balance of Lake Tana; Blue Nile Water Institute established ▪ Community Services
Amhara Regional Urban Planning Institute (RUPI)	▪ Established in 2008 ▪ Personnel (March 2011): 42 surveyors, 10 urban planners, 9 socio-economic, 7 supportive staff ▪ Provide planning for sustainable urbanization
Amhara National Regional State Agricultural Research Institute (ARARI)	▪ 3 research centres; 5 multiplication centres for large and small ruminants, poultry; 2 rural technology multiplication centres ▪ Conduct applied research on crops, soil and water, forests and livestock to provide solutions to existing land-use problems
Ethio-Wetlands and Natural Resources Association (EWNRA)	▪ Dissemination of information, awareness creation, capacity building, technical material dissemination, testing sustainable wetland management practices
Local level	**Role within the BR context**
Zonal and Woreda Administrations	▪ Offices for Agriculture, Environmental Protection, Culture and Tourism
Kebele offices: leader and development agents (DAs)	▪ Agricultural extension, forestry, afforestation, marketing, SLM measures
Elders of the local communities	▪ Enforcement of values and education (for wise use of resources)
Religious leaders from Orthodox and Muslim communities (zonal, Woreda)	▪ Enforcement of (Conservation) values and education (for wise use of resources)
Community-based organizations (CBO): ▪ Tour guide and seller associations ▪ Water-user associations ▪ Wetland user groups ▪ Producer associations (coffee, honey, fruits etc.)	▪ Representation of interests ▪ Development of grassroot initiatives ▪ Participation in zonation and implementation of management plan ▪ Development of by-laws
Bahir Dar City Administration	▪ Planning of urban processes, promotion of green economy and green model city (waterfront), tourism development, etc. ▪ Coordinate urbanization processes and align with the BDBNRMP and environmental aspects
BDBNR Millennium Park Office	▪ Management of the BDBNRMP and implementation of the strategic plan 2010-2014 ▪ Showcase for conservation, env. education

Table 9: Institutions and stakeholders and their roles within BR management in the LTR

5.1.1. Stakeholder analysis

a) National institutions

The national level government institutions in Ethiopia generally play a role in the LTR BR by shaping the policies that facilitate the realization of sustainable development of the region in the key sectors mentioned in Table 10, through laws, regulations, strategies, allocation of budgets, showing political will and delegating mandates to regional authorities. The MAB programme and the Ethiopian MAB Committee coordinated by the Ministry of Science and Technology (MoST) is the pivotal point in steering this process.

A national Workshop on "*Linking Knowledge and Sharing Experiences within the Ethiopian MAB Programme*" was held in Addis on 4 and 5 November 2011 and organized jointly by the Michael Succow Foundation, the MoST, UNESCO and the German Federal Agency for Nature Conservation. In this workshop the newly assigned Ethiopian MAB Committee was inducted. Composed of cross-sectoral representatives from both national institutions (ministries and institutes) and regional representatives, it is designed to improve vertical integration between the national and regional level.[15]

The Ministry of Agriculture and the Ministry of Water and Energy are particularly important for the integration into BR planning and management because of their responsibility for implementing the Lake Tana Growth Corridor and the associated interventions (irrigation schemes, ADLI, export orientation, hydropower generation).

b) Regional institutions

On the regional level there are a high number of government institutions whose mandate is crucial for implementing and administering the policies developed on the national level. There is a wide set of so called Bureaus representing each of the key sectors, namely environment, agriculture and forestry, water, economic development, tourism and nature conservation.

In order to improve the management of Lake Tana itself to face the above aforementioned environmental challenges, there is a need for enabling institutional arrangements and capacity for a shared vision for water and natural resource planning and management, with special attention to the ecological fragility of the lake. Still there is a lack of a knowledge base for environmental information, analytical capacity and stakeholder forums for managing resources effectively as well as a lack of capacity to promote, facilitate and regulate private sector investments (World Bank 2008). The shortcoming among regional institutions is a lack of coordination and integration between the regional bureaus and federal institutions and partnerships with academia and other institutions to develop public and private investments and projects that highly call for collaboration, exchange and concertation. This lack in institutional integration hampers the effectiveness of ongoing projects in the region (e.g. Tana Beles Integrated Natural Resources Management Project, World Bank).

[15] The MAB Committee is inter alia represented by the Ministry of Agriculture (MoA), Water and Energy (MoWE), Education (MoE), Environmental Protection Authority (EPA), Institute of Biodiversity Conservation (IBC), Ethiopian Wildlife Conservation Authority (EWCA), Higher Education Strategy Center, Ethiopian Institute of Agricultural Research, regional BR focal institutions, including the ANRS Bureau of Culture, Tourims and Parks Development (BoCTPD)

In the course of this feasibility study project it was observed that it stems from a lack of institutional culture of sharing information and documents as well as a lack of mechanisms to share. There is strong expertise and competence in the respective bureaus, which is not sufficiently shared to exploit synergies. As a result instead, planned interventions bear the risk of counteracting and being counterproductive (e.g. boosting the fisheries sector and the agricultural intensification; conservation and rehabilitation endeavours with irrigation; climate protection efforts and greenhouse gas-intensive rice cultivation).

Bureau of Culture, Tourism and Parks Development (BoCTPD)

The BoCTPD is a highly potential institution with the capacity of sustainably leading a BR in the LTR for following reasons:

- It has a parks development department with staff and experts experienced in biodiversity conservation and protected area management.
- It has highly motivated and committed staff with an interest in linking conservation with creating of community benefits through a BR. It already took initiatives in applying for funds, strongly supported this feasibility study and advocates for the BR idea among stakeholders and the regional government (in workshops and internal meetings).
- Being in charge of developing the tourism sector in Amhara, it can strongly Being in charge of the development of the tourism sector in Amhara, it can strongly exploit the synergies between conservation, participation and economic development through tourism, promoting community-based ecotourism
- As responsible for the regional tourism infrastructure, the BoCTPD could link its efforts with BR marketing to further attract tourists through a homepage and a combined tourist and biosphere reserve information centre. This could also contribute to overcoming lack of coordination and provide orientation for tourists.
- As a member of the regional council of Amhara the bureau head Mulugeta Seid is in a good position to advocate for the political will for a BR.
- Its vice head Berhanu Gebre was assigned to be member of the Ethiopian MAB committee in September 2011. In his double function he will be valuable for regional coordination and BR management as well as liaising with federal institutions (ministries).

The BoCTPD needs further technical and financial support and external expertise in realizing the measures necessary for a BR establishment, such as management plan, financing plan, zonation, capacity building and training etc.

Bahir Dar City Administration and the respective BDBNRMP office are responsible for realizing the objectives of the **Bahir Dar Blue Nile River Millennium Park** (BDBNRMP) and mobilizing development resources for the rehabilitation of natural resources and sustainable tourism development. However, there are weak institutional linkages and capacity of stakeholders of the park at the regional, Woreda and Kebele level. "*The legal and institutional sectors are not clear on their mandates on the management of the park*" (Marye et al. 2010: 58). In November 2011 the responsibility was transferred to the BoCTPD to better manage the park.

Although the BoCTPD is the regional BR focal institution, a BR needs the strong involvement of other respective bureaus. The ANRS **Bureau of Environmental Protection, Land Administration and Use** (BoEPLAU) has a crucial function to provide the rules and regulations that underpin the management of the BR zones. Its land administration mandate and perspective is very important for addressing the problem of informal land-use on communal land (especially in the eastern wetlands). It will be needed for formalizing and putting in place mechanisms for how to sustainably use communal land and wetlands e.g. Having already issued a number of environmental proclamations and regulations, the BoEPLAU has sound knowledge on this side. What is partly missing but goes beyond their mandate is the effective legal enforcement of all the regulations, such as the fisheries regulation, environmental impact assessments and so forth. To improve this, there is a need to either improve cooperation with implementing bodies or to mandate and equip the BoEPLAU with implementing power.

The ANRS **Bureau of Agriculture** (BoA) has a pivotal role in a potential BR management, because it is responsible for the agriculture, livestock, forestry and fisheries sector in Amhara. It is coordinating and overseeing respective projects and programmes that relate to sustainable land management, natural rehabilitation and afforestation, agricultural growth corridor and irrigation, agroforestry etc. Its institutional representation (staff) and chain of command reaches – via the Zonal and Woreda Offices – to the Kebele level with the agricultural extension services provided by the Development Agents (DA). This hierarchical system must be utilized for any “on-the-ground” activities with the local communities related to e.g. the participatory development of a BR management plan and zonation, forming cooperatives and awareness creation.

Similar to the BoA, the ANRS **Bureau of Water Resources Development** (BoWRD) needs to be strongly involved in the BR because of its role in technically guiding the irrigation schemes and dam constructions around Lake Tana. Together with the BoWRD, it needs to be planned how the BR zonation is compatible to the envisaged irrigation schemes and dams by involving them in the entire planning process.

Box 11: Key stakeholders for forest conservation
By Renée Moreaux

The *Bureau of Agriculture (BoA)* is the most important institution involved in the protection of forests. The *Bureau of Agriculture* has been established at regional level promulgating laws and policies and stands above the *Woreda* offices. The *Woreda* offices implement those laws, executing them at their respective level. Under supervision of the *Bureau of Agriculture* the *Woreda* offices perform trainings, raising awareness on forest conservation and their sustainable use by the communities. They further manage and coordinate the *Development Agents (DA)*, which form the interface of communication to the *Kebele*. The *Development Agents* have a very important function, as they have very deep knowledge about the ecology of tree species, problems and potentials of their *Kebele*. They work directly with the rural population and thus get information about the problems of the people. The *Amhara Forest Enterprise (AFE)* was formed in 2010 by the *Bureau of Agriculture* operating under its immediate supervision. It is supposed to take over the long term management of the commercial use of the state forests. It is important to involve the *Amhara Forest Enterprise* in the development of strategies of forest protection, because *Amhara Forest Enterprise* will make all future decisions on tree species and locations in terms of commercial forest use.

The *Organization for Rehabilitation and Development in Amhara (ORDA),* the most important nongovernmental organization (NGO), is working with the *Bureau of Agriculture* and the *Kebeles,* also conducting their own projects for the protection of forests in Amhara. The *Gesellschaft für Internationale Zusammenarbeit* (*GIZ*) has funded several projects in the past to protect the forests on Zegie. In these projects *ORDA* has partially taken over the implementation.

Two other NGOs*, FARM Africa* and *SOS Sahel,* have partnered performing the approach of *Participatory Forest Management* in Tara Gedam. The rights of use of the state forest are transferred to the community, resulting in a sense of responsibility and ownership for the forest and the development of alternative livelihood opportunities through the use of *non-timber forest products*. Thus, the forest will receive a long-term sustainable use. The church acts as another stakeholder, playing an important role in the protection of the forests, especially the church forests, albeit in their own interest. The church as well performs trainings of local people, raising awareness for the protection of the forests. On Zegie the church works closely with the *Development Agents*, conducting those awareness trainings. The advantage is that the *Development Agents* mediate the ecological knowledge and the church has the respect of people to convince them.

At *Kebele* level, there are two actors, *committee for the protection of forests* and *forests guards*, having an outstanding importance for the protection of forests. The committee is appointed by the *Kebele* and the community with representatives from each of the following groups: *Kebele* leader, working manager (assistant of the *Kebele* leader), youngsters, elder people, women, school principal, priests, health centre and *Development Agents*. The committee decides firstly on the procedures to be applied to persons who have removed trees illegally from the forest. Secondly it decides on applications from the local people, wishing to cut down trees. In addition, the committee decides about afforestation and *Area Closures*. The forest guards are employed by the *Woreda* offices*,* ensuring access to forests is limited to authorised people only. Equipped with guns they are on walking patrol. The committee and the forest guards work closely together when it comes to reporting and punishment of illegal forest use.

c) Private sector

The private sector capacity is weak and is lacking good public private partnerships (PPPs), product and financial markets are poor (World Bank 2008). The private sector has often been neglected in many biosphere reserves despite its influence on land and resource utilization but also its potential of playing a role model in creating economic revenues without harming the environment or even protecting it. The ongoing socioeconomic trends in the LTR are to a large extent driven by economic factors so that a sustainable regional development is only possible by incorporating the private sector into the BR agenda and by making it a part of the solution rather than a part of the problem. The principle for this is the creation of economic incentives for ecologically sound behaviour.

This was already demonstrated for the forestry sector (see 4.1.2.3), where economic sustainability of timber production goes along with ecological “health” of a forest. Similarly, economic incentives can be created from processing and marketing natural products, which can only be produced without undermining ecosystem integrity, of a forest e.g. Key private sector stakeholders to be involved in the BR are inter alia:

- Amhara Forestry Enterprise;
- Hotels and tour operators and local communities;
- Producers of natural products (food, drinks, cosmetic etc.) for BR labelling;
- Fish processors and exporters;
- Floriculture industry and other cash crop exporters;
- Real estate investors in Bahir Dar.

d) Local communities

On the local or community level people are represented by the Kebele administration (peasant associations) as well as elders of the community as highly respected people. The DAs are the link between the local level government representation and the community, who are responsible for implementing or executing decisions taken on higher levels and for dealing with the daily challenges of rural life.

In some areas and for some purposes there are so called Community-Based Organizations (CBOs), such as tour guide and seller associations, water-user associations, wetland user groups and producer associations who are organized as interest groups to strengthen their position.

e) Religious leaders

More than any government institution local communities are usually firmly attached to the statements and advocacy of Christian and Muslim leaders, namely priests and imams respectively. The Muslims and Christians are organized in institutions that administer their resources on the Zone level. In their teaching they have an enormous influence over the people’s behaviour, which is widely followed. The moral values that they teach define the people’s relationship to nature in large. As an example the Church forests could only survive due to the appreciation given to the forests and its life (as expressed in pictorial illustration of animals in churches, see

Picture 19). The Ethiopian Orthodox church offers education to children in informal schools, where indigenous environmental knowledge on the forests is handed down.





Picture 17 (left): Priest from Deq Estefanos Island (© MSF 2011). Picture 18 (right): Religious leaders from LTR, stakeholder workshop 14 Nov. 2011 (© R. Moreaux)



Picture 19: Animal paintings at a church near the Chimba wetlands (© MSF 2011)

5.1.2. Existing projects and interventions relevant for a BR

In the light of the aforementioned problems and future challenges, there are a high number of ongoing or completed development projects and measures partly implemented in the LTR that relate to different sectors and problems within the potential biosphere reserve. As a densely populated area with an old cultural heritage (center of the Amhara Region) and large development potentials, many projects focus on the Lake Tana Region with different foci (Table 10).[16]

[16] Refer to annex VII for a list of development projects and interventions that are relevant for the realization of a biosphere reserve in the LTR

Sector/field	Focus
Agriculture	intensification, diversification, improving market access and profitability
Water development	Irrigation, power generation
Sustainable land management	Improving agricultural productivity, ecosystem restoration, land certificates,
Tourism	Development and destination circuits, ecotourism

Table 10: Focus of key development projects and interventions in the LTR

Beyond a large number of governmental and bilateral development projects, the non-governmental organizations (NGOs) play a very important role in addressing prevailing problems in the LTR pertaining to BR issues. Table 11 gives an overview of the NGOs and their relevant field of activity in the Woredas around Lake Tana.

Woreda	NGO name	Field of activity
Bahir Dar Zuria	LEM Ethiopia	Participatory and integrated waste management project
Northern Achefer	ORDA	Water, sanitation and hygiene
	Afro Ethiopia Integrated Development Associations	Ground rural water, sanitation, hygiene
Libokemkem	World Vision	Area development programme (multi-sectoral)
Fogera	Ethiopian Wetland Natural Resource Association	Wetland restoration and alternative livelihoods
	Action for Sustainable Natural Resource Management	to combat land degradation for improved livelihoods and poverty reduction (terminated)
	ORDA	Biodiversity programme in Amhara (all Woredas)
Gonder Zuria and Dembia	World Vision	Area development programme (multi-sectoral)
Debark	Frankfurt Zoological Society	Afroalpine Ecosystem Conservation project
Daimachew and Dembia	SOS Sahel	Insuring smallholder producers in Ethiopia
Dembia	Care Ethiopia, FFTH, World Vision	Joint emergency flood mitigation action

Table 11: NGOs in the LTR (source: ANRS BoFED, NGO Department, 24/03/2011)

5.1.3. Community participation

Interaction among stakeholders can be horizontal or vertical across various hierarchical levels of involvement, from communication to negotiation. For some activities within a BR decision-making is required, e.g. on the zonation and what to include in a management plan, while for other activities communication and

consultation is necessary, e.g. for awareness creating measures or assessment of local people's opinions and knowledge.

To come to a decision – for example on designating an area closure or no-use zones – all relevant stakeholders need to be involved in communication, generating information, consultation of information and opinions, creation of a dialogue among respective stakeholders and concertation on objectives and actions (UNESCO 2006). This bottom-up approach is the fundament of stakeholder involvement in a biosphere reserve.

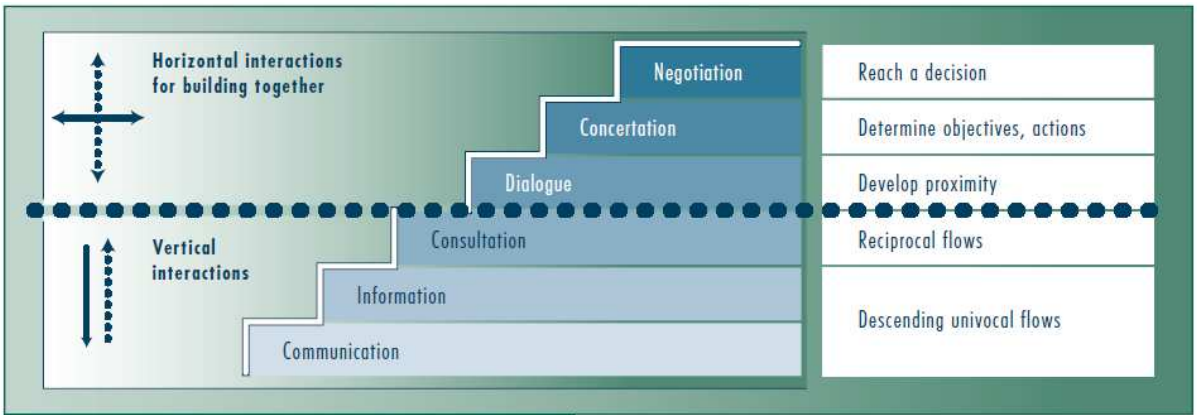


Figure 7: Types of participation in debates and decisions for BR management (source: UNESCO 2006: 12)

Community participation has not received sufficient attention in development interventions. It often remains a buzz word in project planning, but on the ground implementation is still lacking a culture of confidence in local communities to have a say. It is also often based on the assumption that the perceptions, values and preferences of local people are clear when deciding for a development intervention. However, numerous PRA based studies have shown the gap between the realm of development planners and local communities (zur Heide 2010, Eguavoen & zur Heide 2012). Participation also needs a clearer definition, because in many cases it is merely applied as a form of consulting local people rather that actively involving them in decision-making. The success of a BR and the effectiveness of its zonation and conservation regime, however, highly depend on the degree to which local people (as the major agent in the land-use system) are involved and thus are capable of designing and managing the BR themselves. Leaving the conservation mandate to government institutions only is ineffective if not agreed upon locally, because it is uncontrollable. Therefore, if local communities are put at the centre of how to improve land use systems e.g. through by-laws and Community Conserved Areas (Phillips 2003), sustainability can be achieved more easily.




Picture 20 and 21: PRA sessions with farmers to draw on local perceptions (© MSF 2011)

"The Government of Ethiopia realizes that natural resource conservation and sustainable land management issues cannot be tackled effectively unless local communities participate in project planning, implementation and decision-making. As a result, rural communities are increasingly being involved in taking responsibility for projects undertaken in their area" (IFAD 2007: 9). This shift is a slow one but is reflected by an increasing number of projects that are designed to enable local communities to take an active role in implementing measures and deciding on them. In the Lake Tana Region community participation is promoted in a number of previous and ongoing projects. Some examples are:

- Community-Based Integrated Natural Resources Management Project (IFAD);
- Organization for the Rehabilitation of the Amhara Region (ORDA) has long-standing experiences with Area Closures and development of by-laws;
- Participatory Forest Management (PFM) systems, in which local people have adequate duties and rights in managing forest resources (e.g. in Zegie, Tara Gedam, Alem Saga, Kulkual Ber);
- The cascaded agricultural extension system with the development agents as a link to local communities (used for agriculture related projects and the GIZ Sustainable Land Management Program);
- Participatory methods such as PRA (Participatory Rural Appraisal) are applied for wetland management and awareness creation by the Ethio-Wetlands Natural Resources Association (EWNRA) and were part of the research approach for this feasibility study (Picture 20).

5.1.4. Commitment and acceptance of stakeholders for a biosphere reserve

There is a strong willingness of the regional stakeholders to realize a BR in the LTR. This was expressed in many ways:

i. In numerous meetings with regional institutions and experts it became very clear that there is an awareness of the environmental problems that Lake Tana and its vicinities are facing. There is consensus that there is a need for immediate action, because it is a prime concern of stakeholders and citizens (see annex V for a list of meetings).

ii. Two stakeholder workshops on a potential Lake Tana BR were conducted in Bahir Dar on 10 March and 14 November 2011, which signalled the high commitment for addressing the environmental challenges in the LTR through a BR (refer to 9.1).

As an expression of the commitment of the regional institutions, **Biosphere Reserve Focal Persons** (BRFP) in the BoCTPD, BoA, BoEPLAU, BoWRD, Bahir Dar University and the Regional Council of the Amhara Government were assigned, who are mandated to follow and conduct BR related activities and guarantee a constant personnel representation of their respective organization.

In order to improve scientific cooperation on BR related subjects, a **Memorandum of Understanding** (MoU) has been signed between Bahir Dar University, Ethiopian Institute of Architecture, Building Construction and City Development (EIABC) at Addis Ababa University, the BoCTPD and Michael Succow Foundation. The MoU has been the basis for joint research between Ethiopian and German Master and potentially PhD students.

5.1.5. Conclusions and recommendations

Integration of projects and interventions within a biosphere reserve

A biosphere reserve is a framework concept for sustainable regional development which serves as an umbrella for existing and planned interventions matching with the objectives. In this sense it seeks to create synergies with interventions that have to be made explicit and operationalized. Annex VII lists and highlights the key relevant projects and their potential relation to the BR. Major interventions with synergies with a potential biosphere reserve are:

- Tana & Beles Integrated Water Resources Development Project (World Bank);
- Community-Based Integrated Natural Resources Management Project in Lake Tana Watershed (IFAD);
- Sustainable Land Management Program (GIZ);
- Sustainable Resource Management Program in North Gondar (SRMP-NG);
- SIDA-Amhara Rural Development Programme (completed);
- Bahir Dar Abay (Blue Nile) River Millennium Park;
- Bahir Dar Integrated Development Plan (RUPI, Bahir Dar Municipality);
- Flood Preparedness and Early Warning - Phase I and II (ENTRO).

On the other hand, there are activities and projects that threaten to undermine the BR objectives and ecosystem integrity. Some interventions counteract and are contra-productive as a result of lack of integration, coordination and cross-sectoral thinking. For example do some envisaged irrigation schemes in or close to the wetlands bear the risk of undermining the IFAD-project objective of rehabilitating the wetlands (to sustain them as a source of livelihood and to help generate alternative livelihoods). The Tana-Beles hydropower generation decreases the pressure on fuel wood but with the decreasing lake level affects wetlands likewise. The planned intensification of agriculture helps to improve agricultural productivity but may undermine fish productivity and lake water quality.

Therefore, there is a strong need for integration among the stakeholders of all relevant projects to avoid contradiction, conflict, duplication of effort and unilateral benefits with multilateral adverse effects. Establishing mechanisms for integration and coordination among institutions for both planning and implementing interventions could be achieved in the following ways:

Establishment of a **BR advisory board** represented by both relevant governmental and non-governmental institutions and the private sector as well as project owners and coordinators. Regular meetings of the advisory board to

a. Inform and discuss cross-cutting issues pertinent to the potential BR to guarantee transparency
b. Identify synergies and conflicts between various interventions
c. Establish consensus on controversial planned interventions

Conduct **planning workshops** with all relevant stakeholders for planning and modifying interventions prior to decision-making

Cross-sectoral **topical working groups** to link knowledge, map out sectoral conflicts (e.g. between wetlands and irrigation) and create synergies between institutions

Steering committees for BR related projects and interventions

ii. The dialogue and collaboration between the BoCTPD and the private tourism sector (tour operators, hotels) should be improved to develop joint ecotourism activities and infrastructure

Stakeholder involvement

As demonstrated there is a high diversity of stakeholders from national to local level and across all sectors, which are relevant for managing a BR in the LTR. Drawing on their diversity, roles, potentials and shortcomings the further actions are needed:

- Facilitate the establishment and capacitation of community-based organizations (CBOs);
- Actively involve religious leaders in advocating the value of nature through environmental education drawing on indigenous knowledge and in the conservation of Church forests;
- Develop business models to make better use of economic incentives that also provide benefits to the environment and local communities;
- Use the agricultural extension systems with the DAs for community participation;
- Incorporate participatory processes into planning and implementing interventions to improve community participation, e.g. through Community Conserved Areas (CCAs) and by-laws.

6. Dimension IV: Research and monitoring

6.1. Regional set-up for research

The LTR has been already thoroughly studied on a large variety of subjects related to hydrology, wetlands, agriculture, forests, environmental issues and socioeconomic development by both Ethiopian and foreign researchers.

The regional institutional set-up for research has considerably improved in recent years, because of the establishment of Bahir Dar University about a decade ago and a number of regional research institutes. Table 12 lists the major scientific entities involved in research fields relevant to a BR and that can contribute to BR related research.

Institutions	Mandate and focus
Amhara Region Agricultural Research Institute (ARARI)	▪ Sub-branch of the national Ethiopian Institute of Agricultural Research (EIAR) with eight main research centres, five sub-centres and 20 trial sites ▪ Research on livestock, agriculture and crops, forestry, soils and water, natural resource management ▪ Mandate: conduct research on traditional agricultural methods and develop those which are beneficial; organization of research programmes, staff training, information and documentation exchange with institutions ▪ Responsible for executing the 20 year regional research master plan from 2000, following the enactment of the decentralization policy (based on proclamation no 48/2000)
Bahir Dar University Department of Fisheries, Wetlands and Wildlife Management	▪ Provide students with theoretical knowledge and practical skills to deal with problems related to fishery, aquatic resources, wetlands ▪ Create academic and public awareness for the value of aquatic and wetland ecosystems ▪ Enable graduates in interpreting and implementing policies for wetlands, wildlife conservation and management
Bahir Dar University Institute for Land Administration Research and Publications Office (ILA-RPO)	▪ The first of its kind in East Africa, founded in 2008 ▪ Research foci: (1) Economic, cultural and social circumstances relating to land and other immovable artefacts; (2) real estate/land laws, regulations, procedures; (3) land provision, registration, cadastre, conflict resolution; (4) surveying, planning, land use, land valuation; (5) environmental protection and sustainable development
College of Agricultural and Environmental Science, Bahir Dar University	Stated mission: a) Training professionals so as to raise the agricultural skill and knowledge base b) Carry out research that is focused on the nation's

	agricultural problems so as to contribute to increasing production and productivity, protection and management of natural resources and introducing adaptable and appropriate agricultural technologies and management practices. c) Provide advisory and consultancy services for governmental and non-governmental agricultural organizations as well as providing direct and indirect outreach services to the smallholder farming communities, pastoralists and agro-pastoralists in the region. Research programmes for disaster risk management; natural resource management; rural development; water resource and irrigation management; fisheries, wetland and wildlife management; animal production and technology; plant science
Biology Department, College of Natural Science, Bahir Dar University	▪ Focus on training under and postgraduate students in zoology, botany and applied microbiology; ▪ Collaboration with e.g. ARARI, Semien Mountains National Park and ANRS BoWRD, and Amhara Regional Fishery Center.
Ethio-Wetlands and Natural Resources Association (EWNRA)	▪ Ethiopian Wetlands Research Programme (EWRP), focused on Illubabor Zone; ▪ Objectives: dissemination of knowledge on wetlands in Ethiopia; contribute to the sustainable management of wetlands; identified socio-economic forces influencing wetlands and their environmental impacts; develop methods for wetland rehabilitation; local management practices and traditional institutions (regulating resource utilization); dissemination and awareness creation; ▪ Approach: interdisciplinary, holistic and integrated (investigation the overall environmental and socio-economic context) and output-oriented; furthermore case studies, PRA methodology (to explore local environmental knowledge, management practices and skills), use of indigenous knowledge, link with information dissemination, integration of policy research (Hailu 2001, 2005); ▪ Methods: a) natural science: hydrological monitoring, biodiversity assessment and pedological analysis; b) social science: socio-economic surveys, participatory rural appraisal (PRA) and policy analysis.

Table 12: Major regional research institutions in the Amhara Region

Hitherto research on aquatic ecosystems comprises (cf. Dejen 2005):

- Ecology, evolution and fishery of commercially important fish stocks;
- Zooplankton species abundance and composition;
- Taxonomy, ecology and potential for fishery of small barbs.

Wetlands research has been addressed in a number of national workshops (see Table 13). However, the wetlands of Lake Tana have not yet received thorough research attention.

Workshop title	Stakeholders/organizers
2001: Wetland Awareness Creation and Activity Identification Workshop in Amhara National Regional State	▪ Amhara National Regional State Bureau of Agriculture, ▪ Wetland Action ▪ Ethio Wetlands and Natural Resources Association ▪ University of Huddersfield, UK
2005: Second Awareness Creation Workshop on Wetlands in the Amhara Region	▪ EWNRA
2006: First Green Forum Conference Environment for Survival – Taking Stock of Ethiopia's Environment Addis Ababa, 2-4 October 2006	▪ Heinrich Böll Foundation ▪ Seyoum Mengistu and Camille De Stoop
2008: National Stakeholders' Workshop on Creating National Commitment for Wetland Policy and Strategy Development in Ethiopia	▪ EWNRA
2009: National Advocacy Workshop on Wetlands and Climate Change	▪ EWNRA

Table 13: List of workshops related to wetland management and research

6.2. Bird monitoring

The birds of Lake Tana have been intensively studied in a long-standing monitoring (2004-2010) by the Nature and Biodiversity Conservation Union (NABU) and the Environmental Wildlife and Natural History Society (EWNHS), which is partner of BirdLife International, as well as the Royal Society for the Protection of Birds (RSPB). Focus areas of the ornithological surveys were the wetlands as the main habitats for migratory, resident and wintering bird species (see chapter 3.3.3). Special attention was given to water birds such as various crane species (Francis & Aynalem 2007, Aynalem & Bekele 2008). A book about the birdlife of Lake Tana is currently planned to be published.

6.3. Shortcomings and need for research

The major shortcomings in research can be summed up as follows:

In general there is a shortage of skilled and experienced labour at Bahir Dar University and in the regional research institutions. Particularly ecologists and biologists are facing a lack of research facilities. Research is generally constrained by a lack of culture for sharing documents and data for joint endeavours, which can create duplication of efforts.

Most agricultural research is only dominated by crop science but not on issues rural livelihood strategies, indigenous knowledge and local potentials. Ecosystem research is mainly focused on the southern and eastern part of Lake Tana, while ecosystems in the northern part are hardly explored. There are also few long-term monitoring programs on ecosystem dynamics except for those on birds.

In the light of the existing research activities in the LTR, following subjects and fields need further research attention (cf. Woods et al. 2001, Dejen 2005: 45):

- Natural resource management, soil and water conservation, forestry;
- Water management;
- Land-use dynamics, land evaluation;
- Rural technology, fishery;
- Linkages of research with extension services and agricultural economics;
- Agricultural research to be based on agro-ecological diversity;
- Wetland ecosystem functions;
- Wetland resource management: energy flow in the ecosystem through lower trophic levels (phytoplankton dynamics, detritus, bacterio-plankton, etc.);
- The effect of sediment load on the abiotic and biotic factors, its rate and possible measures to combat this problem;
- Community dynamics, e.g. multi-species interactions, predator-prey interactions, parasite-host relations;
- Significance of biodiversity for resilience (adaptability) and productivity of the ecosystem, including molecular and genetic approaches;
- Population genetics of fish stocks;
- Comparison of structure and functioning of Lake Tana with other lakes;
- Aquaculture research.

7. Dimension V: Legal framework

The legal framework comprises all legislations that anchor the nationals legislation so that BR remain under the sovereignty of the state and that enable or disable the safeguarding of the Core and Buffer Zones. As outlined in chapter 2.2. the general policy framework in the Amhara Region is conducive for the establishment of a biosphere reserve in the LTR, because a number of policies, strategies and regulations are in place. This section will not refer to all national legislations as they are comprehensively described in the draft MAB Strategy for Ethiopia (UNESCO 2011). However, there are still some areas that need explicit legal provisions regarding (cf. ÖBf 2009, UNESCO 2011: 40):

- Modalities of public-private partnerships;
- Co-management governance systems;
- National categorisation of protected areas;
- Financing mechanisms for protected areas;
- Resettlement issues for community members;
- Unclear land ownership and land-use rights, which enforces land degradation (USAID 2008).

7.1. National MAB Strategy

The National MAB strategy is currently being prepared (first draft finalized) and is undergoing a validation process by respective stakeholders, including the Ministry of Science and Technology, members of the national MAB committee and relevant BR managers.

The Constitution of the Federal Democratic Republic of Ethiopia has explicit and implicit reference to various environmental aspects and wetlands in particular, including "*the Right to (sustainable) Development*" and the Environmental Right (Article 92), which says that (EWNRA 2008: 42):

"The government shall endeavor to ensure that all Ethiopians live in a clean and healthy environment.

- *The design and implementation of programs and projects of development shall not damage or destroy the environment;*
- *People have the right to full consultation and to expression of views in the planning and implementation of environmental policies and projects that affect them directly.*
- *Government and citizens shall have the duty to protect the environment*"

Nature Conservation is anchored in a number of legislations with relevance for Ethiopia's protected area system and biodiversity conservation (Box 12).

Box 12: Overview of key legislations related to biodiversity conservation and protected areas (UNESCO 2011)

1. Awash National Park Establishment Order No. 54/1969
2. Conservation Strategy of Ethiopia, 1997
3. Environmental Policy of Ethiopia, 1997
4. Environmental Impact Assessment (EIA) Proclamation No. 299/2002
5. Federal Democratic Republic of Ethiopia Rural Land Administration and Land-Use Proclamation, No. 456/2005
6. National Biodiversity Conservation and Research Policy, 1998
7. National Biodiversity Strategy and Action Plan, 2005
8. Plan for Accelerated and Sustained Development to End Poverty (PASDEP), 2006
9. Proclamation for Genetic Resource and Public Rights, No. 482/2005
10. Proclamation for Government Council Ratification of the International Treaty of Endangered Wildlife and Plants Trade, No.14/1989
11. Proclamation to amend the Institute of Biodiversity Conservation and Research Establishment, No. 167/1999
12. Proclamation to amend the Institute of Biodiversity Conservation and Research Establishment, No. 381/2004
13. Proclamation to amend the Reorganisation of the Executive Organs of the Federal Democratic Republic of Ethiopia, No. 380/2004
14. Proclamation to pronounce the coming into effect of the Constitution of the Federal Democratic Republic of Ethiopia, No.1/1995
15. Proclamation to Provide Environmental Impact Assessment, No. 299/2002
16. Proclamation to provide for the Development, Conservation and Utilisation of Wildlife, No. 541/2007
17. Proclamation to provide for the Development, Conservation and Utilisation of Forests, No. 542/2007
18. Proclamation to provide for the Establishment of the Ethiopian Wildlife Development and Conservation Authority, No. 575/2008
19. Regulation to provide Wildlife Development, Conservation and Utilisation, No. 163/2008
20. Rural Development Policies and Strategies, 2002
21. Simien National Park Establishment Order No. 59/1970
22. Wildlife Protection, Development and Utilisation Policy and Strategy, 2005
23. Proclamation no 48/2000 on the 20 year regional research master plan (executed by ARARI)

Legislations pertaining to water and wetlands (EWNRA 2008)

24. Ethiopian Water Resources Management Policy, 1999
25. Ethiopian Water Sector Strategy, 2001
26. Water Sector Development Program, 2002-2006
27. Ethiopian Water Resources Management Proclamation, No. 197/2000

7.2. Protected areas in the Amhara Region

For many years *Simien Mountain National Park* (SMNP) has been the only (legally) protected area in Amhara. Since 2005, the ANRS has been committed to increase the number of protected areas. In 2006, the *Alatish National Park* was established in North Gonder Quara Woreda along Ethio-Sudan boarder covering 2,665.7 km^2. In the mid of 2009, *Borena Sayint National Park* in South Wollo was established, legally gazetted and a workforce and necessary budget was established. The *Menz Guassa community forest area* is currently under legalization process. Protected area potential assessments have been conducted in the Abune Yosef Massif (North

Wollo), Guna (South Gondar), Abay Sheleko (East Goam), Alzeb (West Goam Wonberma), Bagusa (Awi) and Lake Tana (Marye 2010: 2).

The Bahir Dar Abay (Blue Nile) River Millennium Park is designated as the IUCN protected area category IV, legalized through the Proclamation 59/2008. There is a lack of legally binding framework or guidelines for resource conservation and sustainable management to meet the existing challenges, like expansion of farmland, chat production, urbanization etc. "*The makeup and capacity of the institutional and legal framework of the BDBNRMP office is not again in a way it can control and manage the Park*" .(Marye 2010: 57).

7.3. Legislations pertaining to water and wetlands

The *Environmental Policy of Ethiopia* states that before starting any activity that could affect sensitive ecosystems such as wetlands, **Environmental impact Assessments (EIA)** must be conducted and the values of wetlands and other ecosystems must be considered. The Ethiopian Water Resources Management Policy from 1999 demands to, "*incorporate environment conservation and protection requirements as integral parts of the water resources management*" (EWNRA 2008: 44). The Water Sector Development Program (2002-2006) called for a need to conduct EIAs for irrigation and hydropower projects on wetlands. According to the Ethiopian Water Resources Management Proclamation No. 197 from 2000 which refers to the equity sharing aspect: "*All water resources of the country are the common property of the Ethiopian people and the state*".

Policies with indirect impacts on wetlands (Hailu 2001) are resettlements, villigization, surplus producers Woreda policy and the land tenure proclamation. A wetland resolution was issued on the National Wetland Stakeholders Workshop on "Creating National Commitment for Wetland Policy and Strategy in Ethiopia" (see EWNRA 2008: 131 & annex I). A corresponding wetlands proclamation is currently underway for adoption, which has been submitted to the Ethiopian Protection Authority (EPA).

Shortcomings: There is a lack of attention in Ethiopian policy and legislation for wetlands. Ethiopian has not yet ratified the **Ramsar Convention**[17]. Wetlands need legal protection. The Ramsar Convention of 1971 is the first to deal with the protection of a specific ecosystem; it helps to enable financial, technical and expertise assistance; receive prestige and attention; facilitates the implementation of the Convention on Biological Diversity (synergies) (EWNRA 2008). It aims at "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as contribution to achieving sustainable development throughout the world". For Ethiopia to qualify it is obliged (a) to designate at least one wetland of international importance for the Ramsar List; (b) establish nature reserves; and (c) report on the status of wetlands.

The Conservation Strategy of Ethiopia does not consider wetlands as important ecosystems for two reasons: The ecological and social values of wetlands (see 3.3.2) are not sufficiently acknowledged; they are small ecological niches, while policy is only developed for large niches like forests and agricultural land (EWNRA 2008).

With the dependence of Ethiopia on natural resources, conservation must be a top government priority, not only on paper (USAID 2008). For example a Fisheries

[17] For further information on the status on signing the Ramsar Convention refer to Anage A. in: EWNRA (2008)

Regulation has meanwhile been endorsed restricting fishing near river mouths and upstream on spawning grounds during the breeding period to prevent extinction of unique large barbs. However, it is not yet really enforced on the ground. This needs immediate action otherwise there will not be any more unique large barbs in Lake Tana (Dejen 2003, 2008: 69).

To safeguard wetland conservation and wise use Taffa (2008: 36) proposed the following policy measures through:

- Recognizing and appreciating the diverse wetland benefits;
- Evaluating development programmes for possible adverse effects on livelihoods that depend on wetlands and balancing the stakeholders interests;
- A holistic approach of addressing issues threatening wetlands (multi-functionality, social and ecological needs);
- Establishing policies and institutions to guide activities and develop strategies. Develop and implement Environmental Impact Assessment guidelines for the conservation and use of wetlands;
- The adoption of the Convention on Wetlands of International Importance (Ramsar Convention) to receive international support for wetlands;
- Enhancing community-based conservation activities;
- Inventory, monitoring, studies and data base establishment for wetlands;
- Mainstreaming wetlands conservation into the existing programme (SLM).

7.4. Urban planning legislation

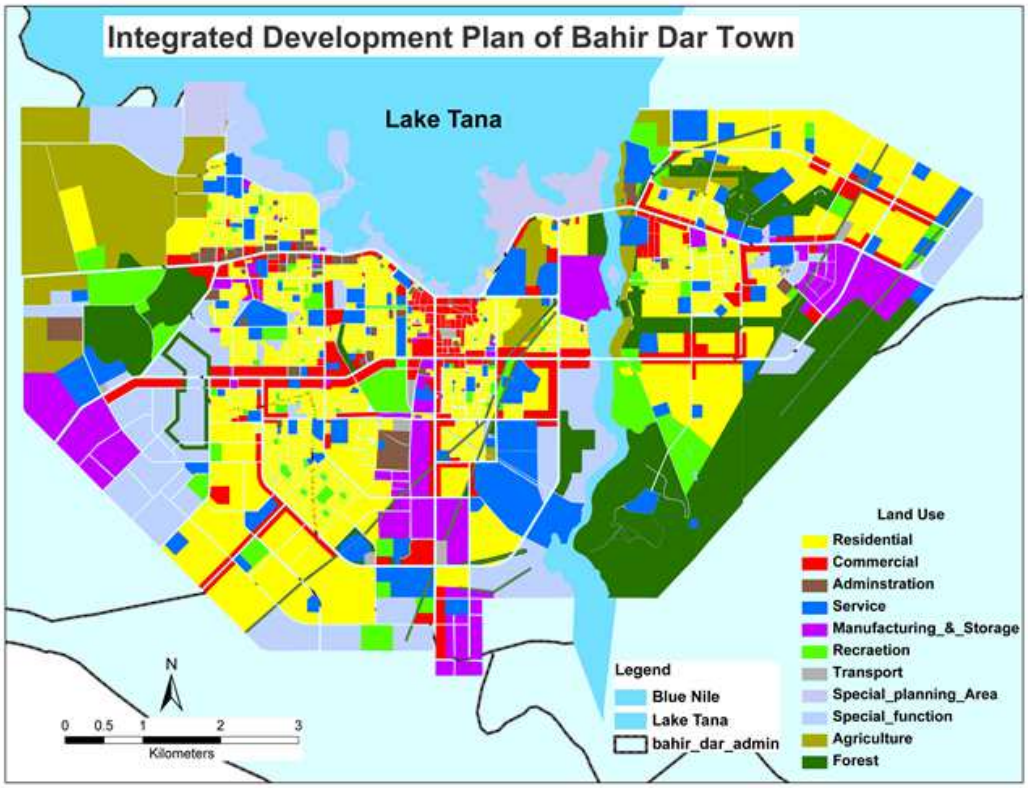
Urban development planning has been non-existent for many years in Ethiopia. Concerning the preparation and implementation of urban plans, proclamation No. 315/1987 defined the principles of regional, metropolitan and urban center plans and institutional framework. Concerning urban zoning and building permit, proclamation No. 316/1987 defines construction permit or modification or change of use of houses, block plans, site plans, detail plans and structural plans with appropriate particulars.

Most of the cities in Ethiopia are expanding following the infrastructure without any future vision to be the center of market, industry, knowledge and others. Therefore, the ANRS prepares a parcellation plan for rural Kebele centers. The developments of regional urban centers are guided by the following types of plans (RUPI 2011):

- Basic plan and master plan;
- Bahir Dar Integrated Development Plan;
- Structural plan;
- LDP/local development plan;
- Integrated development plan;
- Urban plan proclamation 574/2008 (national level).

Now ANRS is on the way to establish regional urban planning regulation (RUPI 2011). The Amhara Regional Urban Planning Institute (RUPI) is addressing in its urban plans aspects such as: historical, socio-economic, some part of environmental

and spatial aspects of the urban center, the rural and urban economy, urban-rural linkage, physical characteristics of its surrounding, land use plan, constraint and intervention map, road network. This is also reflected in the Bahir Dar Integrated Development Plan, which has been prepared in 2011 by the National Urban Planning Institute and the Bahir Dar City Administration (see Map 11).



Map 11: Land-use map for the Bahir Dar Integrated Development Plan (source: FUPI 2006)

8. Vision and objectives of a potential Biosphere Reserve in the LTR

To set the framework for a biosphere reserve, its visions, principles and objectives need to be identified based on the environmental and socioeconomic settings of the LTR and the needs of the people. This will help both operationalize the vague concept of sustainable development in the regional context and to create a common understanding and ground for any activities subordinated to the objectives and the long-term vision. For the national level, the goals of BRs in Ethiopia were formulated in the draft MAB Strategy (UNESCO 2011), i.e. sustainable development (economic, social, biophysical and technical), biodiversity conservation, human well-being, environmental integrity and economic efficiency.

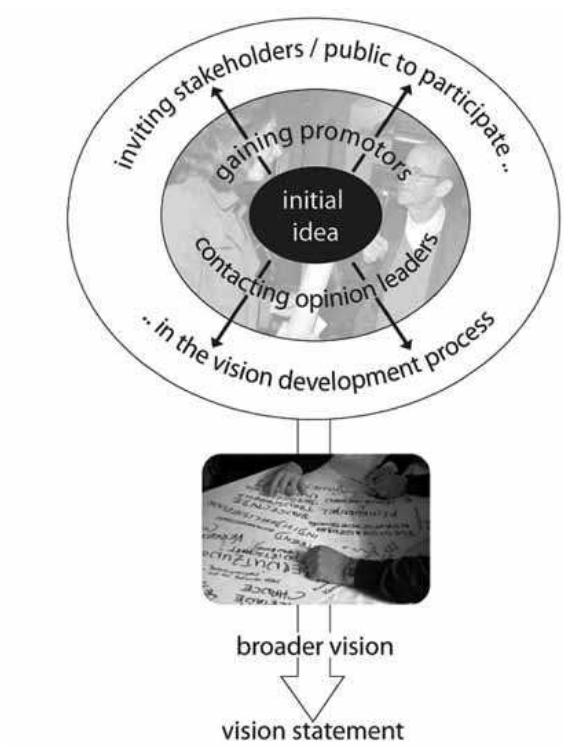


Figure 8: Developing a vision for a protected area (source: Getzner et al. 2010: 64)

At the beginning of the lifecycle of a protected area such as a BR, before any related decisions are made and actions are taken, stands the vision statement. In order to develop a vision, the initial idea of an envisaged BR requires the involvement and consultation of opinion leaders and potential promoters (see

Figure 8). Therefore, in the context of this study, comprehensive meetings and interviews with the key regional stakeholders were conducted to discuss the concept of a BR, its implications for various sectors and their potential roles and commitment play (see annex V).

To involve a broad spectrum of relevant stakeholders and to create public attention, two local workshops were conducted to create a common ground for discussion and identify objectives and visions for a BR.

8.1. Results from the stakeholder workshops

In the context of this project two stakeholder workshops were conducted by the Michael Succow Foundation and the ANRS BoCTPD. The kick-off ***Stakeholder Workshop on a Potential Biosphere Reserve in the Lake Tana Region*** was held in Bahir Dar on 10 March 2011 (see workshop agenda in annex VI). The objectives of this workshop were,

a. to give an overview of the Biosphere Reserve concept, the project outline and the relevant aspects from different sectors in the Lake Tana Region and, based on this
b. to share and discuss ideas and visions related to this concept (to be incorporated in the feasibility study)

In the workshop representatives and resource persons from various domains gave presentations on status, potentials and threats related to:

- Important ecosystems and their biodiversity, in particular wetlands;
- Resource use, including agriculture, forest remnants and water resources;
- Socioeconomic trends and (eco-)tourism potential.



Pictures 22, 23, 24 and 25: Participants of the regional Stakeholder Workshop on a Potential BR in the LTR, 10 March 2011 (© MSF)

Based on the presentations and discussions, the participants of the workshop finally identified their visions and objectives for a biosphere reserve in the LTR (see Figure 9 and Figure 10). The visions express the strong focus on human well-being, especially for local communities, because it was well understood that a BR is to be for the Man and the biosphere (MAB). The stated objectives illustrate the cross-sectoral perspective that a BR should have and the comprehensive mandate of a BR.

This workshop clearly signalled the strong commitment of stakeholders to create a framework or approach to address the urgent environmental problems of and around Lake Tana through a BR. A momentum was created that helped thereafter to advocate for the idea and gain supporters on the regional level. The vision and

objectives statement is a first steps towards stakeholder involvement, which needs further refinement as well as expansion to other stakeholder groups including local communities.

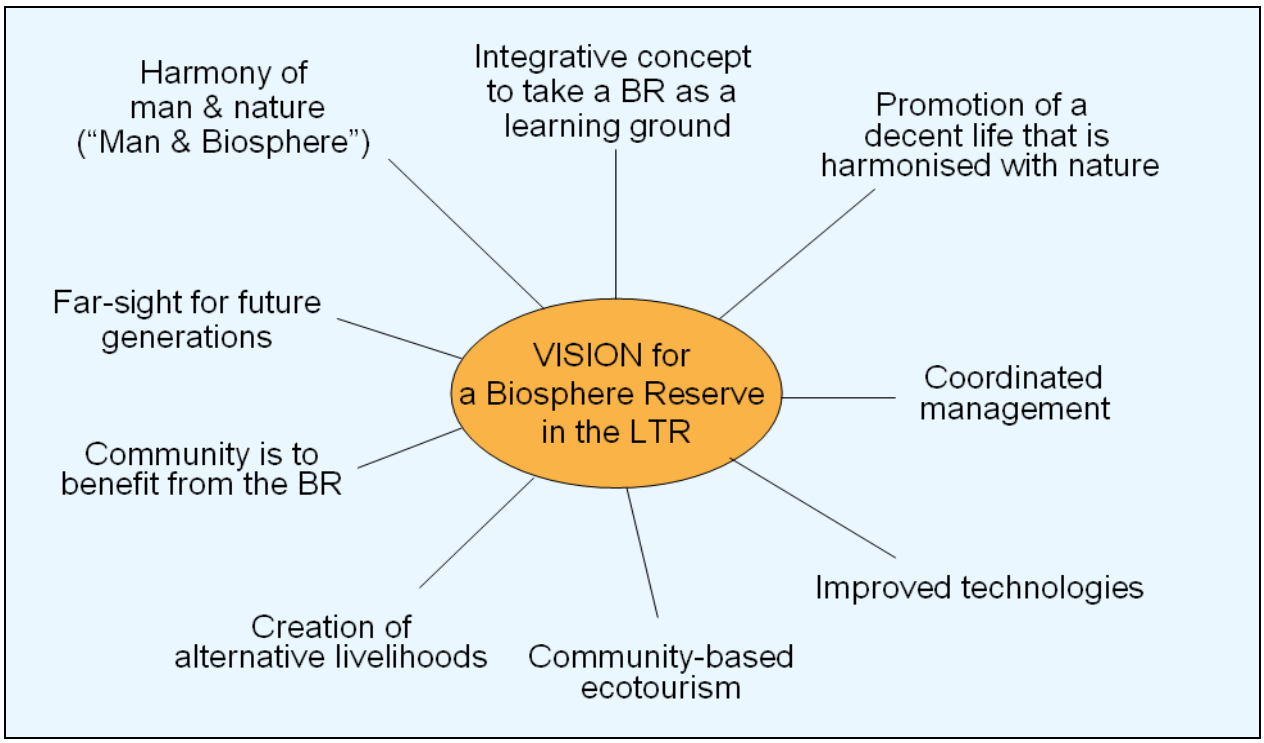


Figure 9: Visions for a BR in the LTR, regional Stakeholder Workshop on a Potential BR

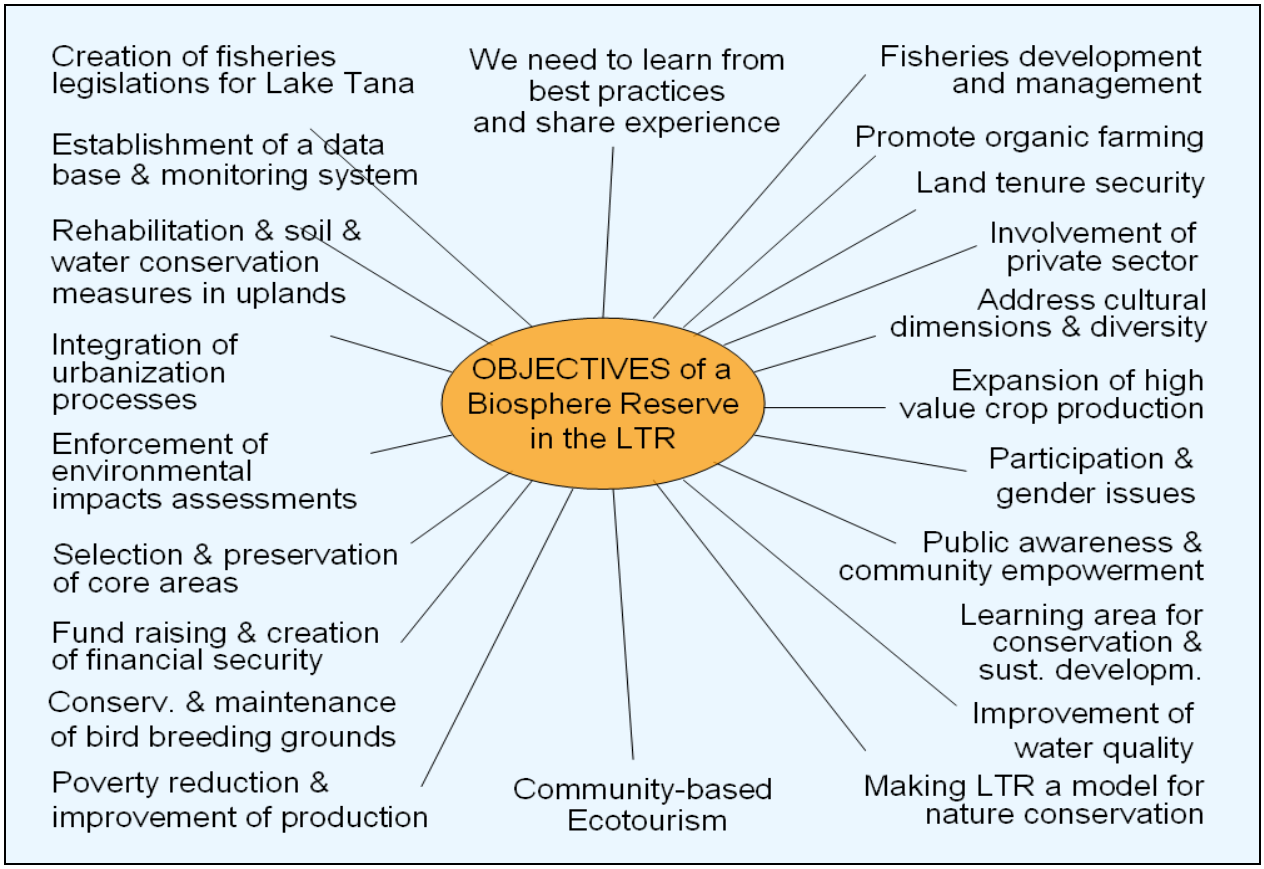


Figure 10: Objectives for a BR in the LTR, regional Stakeholder Workshop on a Potential BR

Based on these encouraging results, a ***Stakeholder Coordination Workshop on the Feasibility of a Lake Tana Biosphere Reserve*** was held in Bahir Dar on 14 November focusing on the following objectives:

- to present and discuss the preliminary results of the feasibility study;
- to get an overview of current and future projects and activities in the Lake Tana Region that are relevant for the envisaged BR;
- to address the need for coordination among the stakeholders and define each of their roles and responsibilities within the envisaged BR;
- to present and discuss a first draft of a zonation concept with potential core and buffer zones;
- to identify the next steps to take towards the realization of a BR.

For this workshop not only regional stakeholders were invited but also representatives from all respective Zonal and Woreda administrations and religious leaders of the Christian and Muslim communities to expand stakeholder involvement. For the participants to better follow the workshop, it was conducted in Amharic language and translated into English.



Picture 26: Participants of the stakeholder coordination workshop, 14 November 2011

The vibrant discussions demonstrated the participants' high interest in the BR concept. Particularly, Christian and Muslim religious leaders articulated the importance of conserving nature as a high value of life and committed themselves to support the idea of a BR. There was broad consensus for immediate action to safeguard Lake Tana. However, it remains to be concretized how to harmonize this with the planned water development interventions and investments by a continuation of the discourse through working groups to design a land-use plan in combination with the BR zonation (see below).

8.2. Key pillars of a BR in the LTR

Given the potentials and complexity of the ecological and socioeconomic context of Lake Tana Region, a BR should be founded in a set of pillars to which BR planning and management is aligned (see Figure 11).



Figure 11: Proposed pillars of a Lake Tana Biosphere Reserve

Water is a central aspect because of its paramount importance for the lake ecosystem and transboundary linkages of the Blues Nile system as well as the ecosystem services it provides (e.g. irrigation, drinking water). **Wetlands** as well as **church forests** are among the key ecosystems with a very high conservation value and uniqueness. As a densely populated area, where livelihoods are largely based on agriculture, **food security** and the provision of alternative livelihoods to sustain it should receive due attention in the BR planning and management. Therefore, **rural-urban linkages** of an increasingly urbanized region need to be considered and strengthened in a sustainable manner. **Ecotourism** has the potential to locally create social, economic and environmental benefits as a central concept of a Lake Tana BR. Due to the important role that culture, religion and indigenous knowledge play in conservation endeavours, the **ethno-ecological linkages** need to be explored and better utilized for conservation.

To improve resources management in the LTR as the central element of a BR Dejen (2003) proposed following overarching objectives to be met:

- Securing food supply;
- Meeting basic needs in high-quality water supply and sanitation;
- Equitable allocation of water;
- Protecting the ecosystems and their biodiversity;
- Managing risks such as floods, drought, pollution and water related hazards;
- Valuing water: manage water in such a way that it reflects its economic, social, environmental and cultural values of regional and local people and that the benefits of hydropower are shared among local people;
- A sustainable river basin management (boundary and transboundary water resources): sharing water resources and promoting peaceful cooperation of stakeholders as Lake Tana is a national heritage and international water body;

- A balanced development of tourism (protecting monasteries, birdlife, Nile falls).

In a workshop conducted in 2006[18] the options for a BR have been thoroughly discussed. Accordingly, the roles and objectives of a BR for Lake Tana and its environs were already stated (EPLAUA 2007: 59):

- Protect natural and near-natural ecosystems in the core areas of the intended biosphere reserve committing these entirely to natural dynamics and evolutionary processes, as strictly protected zones;
- Maintain and develop cultural landscapes with its land-use systems dependent biological and landscape diversity to function as model landscapes for sustainable development;
- Develop ecologically, economically and socio-culturally acceptable models of land use, which ensure sustained livelihoods for local people and conserve the functional capacity of natural systems and processes;
- Establish sustainable ways of life and patterns of production and consumption of natural resources;
- Provide opportunities for long-term ecological research and ecologically oriented environmental monitoring;
- Promote environmental education, training and public awareness raising;
- Enhance development of eco- tourism to help conserving the natural environment and culture and open up income generating opportunities for the local population;
- Promote and develop cooperation and coordination mechanisms of concerned stakeholders towards sustainable conservation, development and management;
- Implement the commitments of the government in compliance with the objectives of the various environmental conventions and agreements, such as CBD, CITES, UNFCCC, UNCCD, World Heritage Convention, Agenda 21, International Water Agreement;

These objectives should be realized based on the following **principles**:

- Sustainable development including integrity of human well-being, economy; efficiency, environmental integrity and technical sustainability (UNESCO 2011)
- Biodiversity conservation is a prerequisite for sustainable development;
- Material and spiritual human well-being (MA 2005);
- Environmental integrity as defined by ecological, economic and social criteria refers to the wholeness of the environment and must be one of the primary determinants of any land-use and natural resources management in order to increase economic growth and promote social inclusion (UNESCO 2011: 99);

[18] National Consultative and Promotional Workshop on „Lake Tana and its Environs: Conservation, Utilization, Development and Threats“, held in Bahir Dar on 6 and 7 November 2006 (EPLAUA 2007)

- Resilience of socio-ecological systems, which strengthens human-environment links such as environmental knowledge, adaptability of land-use systems to changing environments (bio-physical, resource-based, epistemological dimensions of **adaptive capacity** for climate change and other stressors)
- Precaution, prevention, integration and public participation

8.3. BR zonation proposal

A zonation is a prerequisite of a BR by the UNESCO. After the BR objectives and visions have been defined, areas in the LTR need to be identified as potential core zones, buffer areas and transition zones[19]. This chapter will propose a first draft on a zonation based on the Stakeholder Workshop in November 2011, expert interviews and proposals made in the National Consultative Workshop in 2006 (EPLAUA 2007). Since the zonation is a long-term consultative process that involves all local stakeholders, this proposal is a first draft which requires thorough negotiation and revision.

8.3.1. Functions of the zones

The Core Zone(s): These zones comprise at least 5 % of the total BR area and include sites that represent characteristic ecosystems or habitats which are near-natural or relatively undisturbed by humans. Their conservation is of paramount significance in maintaining unique biodiversity, genetic resources and ecological integrity. As strictly protected no-use zones, they will be legally protected by a special legislation, which could be enabled under the regional proclamation no. 96/2003 for regional parks development and protection and the fishery proclamation no 92/2003. The specific objectives of a Core Zone are to (EPLAUA 2007: 60):

- Protect representative sections of natural and near-natural ecosystems entirely committed to the natural dynamics of strictly protected zones
- Promote maximum protection and conservation of those habitats and ecosystems important for maintaining genetic pool variation, species and populations, and ecological integrity
- Provide opportunities for basic and applied scientific researches and long term ecological monitoring
- Provide ecologically acceptable/comparable models of land use changes occurring outside the zone
- Provide a minimum critical area for dynamic fluctuations of wetland habitats with dispersal corridors to conserve viable populations of the endangered Papyrus species

[19] The BR zonation concept is explained in the Seville Strategy and Statutory Framework (UNESCO 1996) and UNESCO 2011

Buffer Zone(s): Peripheral to the Core Zone, are the Buffer Zones (comprising at least 10 % of the total BR area) where restrictions are placed upon resource use or special socio-economic development activities, which are undertaken to enhance their conservation value. Within these zones traditional land-use practices and commercial activities, which are compatible with the objectives of the Core Zones will be allowed to generate tangible benefits for the communities. These activities require a management plan to guarantee the long-term production of resources without significant impacts on them or their adjacent ecosystems. These Buffer Zones may include seasonally closed sites and habitats, e.g. important breeding grounds of animals and corridors for riverine spawning fish stocks. The specific objectives of the Buffer Zones are to (EPLAUA 2007: 60):

- Allow only activities compatible with the Core Zones
- Safeguard the integrity of the Core Zones by reducing the pressure on the their resources
- Maintain and develop cultural landscapes with use-contingent biological and landscape diversity
- Develop ecologically, economically and socio-culturally acceptable models of land use, which ensure sustained livelihoods for local people and conserve the functional capacity of natural systems and processes
- Provide subsistence and commercial fisheries for those local people who are resource use dependents with contemporary cultures (fishermen and marginal groups whose life is relied on the resources) in a sustainable way
- Promote ecologically sound activities including environmental education, training and public awareness raising, recreation and ecotourism
- Permit controlled utilization of natural resources based on the ecological situations of the area
- Strengthen traditional knowledge and practices in cultural and natural resources conservation and management

Rehabilitation Zone: This zone is located in different parts of the envisaged BR where (a) strong natural or human-induced ecosystem alterations have exceeded ecological thresholds (b) or where biological processes have been interrupted, (c) or where species have become locally extinct. The specific objectives of the Rehabilitation Zone are to (EPLAUA 2007: 60-61):

- Rehabilitate degraded ecosystems to enhance ecosystem functions
- Translocate or transplant disappeared vegetation communities
- Improve the structure of damaged ecosystems to maintain natural processes
- Provide habitats for the various aquatic species

Sustainable resource management practices are promoted in the **Development Zone**. As the largest zone of a BR it encompasses settlements, cultural landscapes and arable lands and other surrounding areas of influence. The human activities are based on appropriate use of resources through a harmonized interaction between

Man and the Biosphere (MAB). The specific objectives of this area are to (EPLAUA 2007: 61):

- Maintain and develop cultural landscapes with use-contingent biological and landscape diversity in order to sustain long-term agricultural production
- Develop, ecologically, economically and socio-culturally acceptable land-use models and practices, which ensure sustained livelihoods for local people and conserve the functional capacity of natural systems and processes
- Conserve, develop and manage agro-ecological systems important for agro-biodiversity
- Provide significant contribution to integrated ecosystem management approaches with appropriate ecological development through demonstrating the harmonized relationship between Man and the Biosphere
- Provide opportunities for integrated ecosystem management research and long-term ecologically oriented environmental monitoring
- Contribute to water quality management of the water bodies of the lake and the various tributaries

8.3.2. Proposed areas and zones

For the workshop, experts from various respective fields (forestry, wetlands, fisheries, rehabilitation and wildlife) have been consulted to elaborate a zonation proposition, which was then presented at the workshop in November 2011.



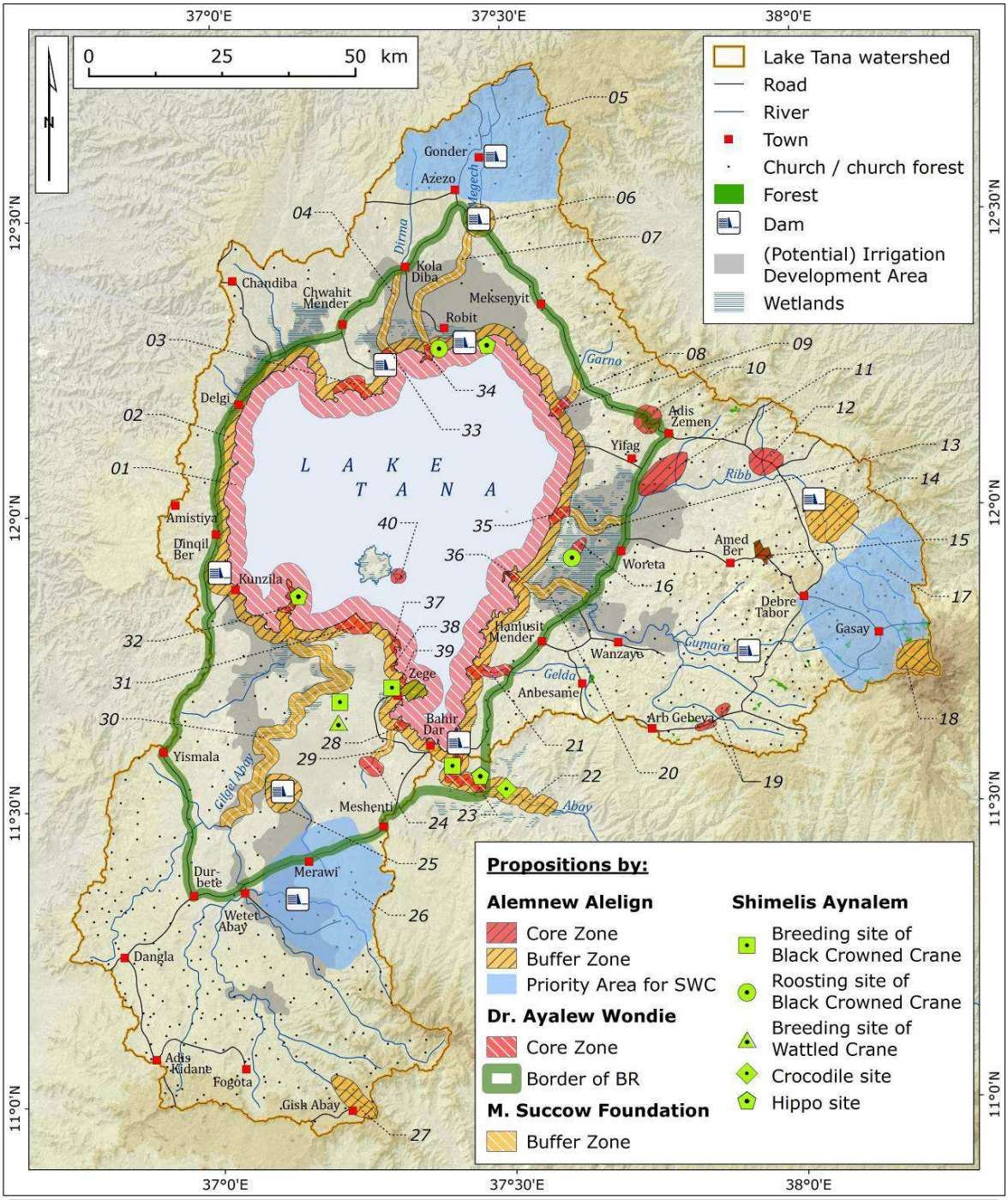
Picture 27: Alemnew Alelign proposing a BR zonation

The outer boundary and thus the size of the BR is a crucial question for the zonation because it influences the minimum required areal proportions of the Core and Buffer Zones. As a starting point for the negotiation process, the total watershed boundary of the Lake Tana Basin was used. From the ecosystem point of view this can be seen as one landscape unit, in which hydrological and geomorphological processes like siltation occur (upstream-downstream connectivity).

However, the size of the BR must be still manageable by the respective institutions. Given the huge area of the LTW, criteria have to be selected to delineate the outer boundary (including ecological, socioeconomic, logistical and cultural). It was proposed by Ayalew Wondie to include the wetland areas and downstream areas of the major tributaries of Lake Tana (Map 12).

A base map has been created to illustrate ongoing and planned water development interventions (irrigation and dams) in order to highlight where Core and Buffer Zones are feasible. As a consolidation of the perspectives of various experts[20], land-cover types and specific areas in the LTW were proposed as Core, Buffer and Development Zones (see Table 14).

[20] Zonation proposals have been developed by: Dr. Ayalew Wondie (wetlands, BDU), Shimelis Aynalem (wildlife and birds, BDU), Alemnew Alelign (forestry and rehabilitation, ORDA), Dr. Alemayehu Eshete Wassie (forests), Dereje Tewabe (fisheries, Amhara Fisheries Research Center)



Names of proposed areas

01 Shore area & open water
02 Periphery Lake Tana
03 Dembia Mendeba
04 Dirma river bank
05 The upper catchment & Megech dam
06 Megech dam
07 Megech river bank
08 Arno Garno river bank
09 Arno Garno river mouth
10 Tara Gedam forest
11 Abebayehu forest
12 Fachi forest
13 Ribb river bank
14 Ribb dam
15 Alem Saga
16 Shesher pond (Fogera Floodplain)
17 The upper catchment & Ribb dam
18 Guna mountain
19 Gelaw Dios church forest
20 Gumara river bank
21 Gelda wetland (Korata)
22 Mellenum park (to Tiss Abay)
23 Blue Nile outlet
24 Enfranz wetland
25 Koga dam
26 The upper catchment and Koga & Jema dam
27 Gish Abay
28 Enfranz river mouth
29 Enfranz river bank
30 Gilgel Abay river bank
31 Amluk
32 Gilgel Abay river mouth
33 Dirma river mouth
34 Megech river mouth
35 Ribb river mouth
36 Gumara river mouth
37 Wetland
38 Wetland
39 Yiganda wetland
40 Kibran Gebriel and other islands

Map 12: Consolidated zonation map with proposed Core Zones, Buffer Zone Development based on various experts' opinions (for further maps see annex IV)

Others instead preferred to include some upstream parts of the basin because of several forest areas and areas that are important for rehabilitation through afforestation and soil and water conservation measures to combat erosion and siltation.

It remains a subject for discussion, whether to include rehabilitation areas in the BR or not. On the one side, the status of these uplands has strong downstream implications; on the other side interventions for rehabilitation can also take place outside the BR boundary – bearing in mind that the large agricultural lands do not qualify for Buffer or Core Zones.

For the conservation of the fishing habitats and fish stock, Dereje Tewabe (Amhara Fisheries Research Center) proposes that rivers and river mouths must be closed for fishing during the spawning period (July to October). For these areas a management plan will be necessary that prohibits destructive fishing gear.



Picture 28: Alemayehu Eshete proposing a zonation

It was argued in the workshop if church forests should become Core Zones. Although priests and monks inhabit these forest remnants, they follow a mode of living from the forests resources that is very limited, non-extractive and limited to non-timber forest products like coffee. Hence they could be part of the “solution” as they are teaching the conservation agenda to the community.

The primary wetlands as bird breeding sites and fish spawning grounds as well as the river mouths and shores areas are important wildlife habitats that need to become a Core Zone.

Those sensitive and highly threatened ecosystems (wetlands, river systems, forests) that are already transformed by humans and that provide livelihoods for many locals should become Buffer Zones for which corresponding management plans would need to be developed and enforced that offer alternative livelihoods. Buffer Zones can also be those lowly productive degraded and marginal lands and ecological corridors that have a high potential for rehabilitation (see zonation proposal by A. Alelign, Box 13).

The suggestions show that there is a diversity of ecosystems that have the potential to become Core and Buffer Zones. In the face of the population density and the intensive land use in the area, the challenge remains to achieve a total minimum 5 % area of Core Zones as protected areas. Another challenges lies in harmonizing the designation of Core and Buffer Zones with the water development and agricultural intensification projects.

Zone within a BR	Proposed areas and land-cover types
Core Zones	▪ Forest remnants including church forests ▪ Primary Wetlands ▪ Primary river systems ▪ Shore areas and open waters around the lake ▪ River mouths as seasonal closures (fish breeding) ▪ Important Bird Areas (IBAs) ▪ Breeding and roosting sites (Wattled and Black-Crowned Crane) ▪ Wildlife Sites: crocodile, hippopotamus, etc.
Buffer Zones	▪ Participatory Forest Management Areas ▪ Zegie Peninsula and Deq Island ▪ Secondary Wetlands (seasonally flooded agricultural lands and wetlands of the Fogera Plains) ▪ Secondary River Systems and river banks (Gumara, Ribb, Blue Nile, Gilgel Abay) ▪ Periphery of Lake Tana ▪ Mount Guna in the eastern uplands ▪ Priority areas for afforestation and soil and water conservation (SWC) measures ▪ Ecological corridors: between church forests ▪ Nile Falls and the Bahir Dar Blue Nile Millennium Park ▪ Degraded areas ▪ Irrigation dam areas
Development Zone	▪ Agriculturally used areas (incl. parts of Fogera) ▪ Settlements ▪ Industrial areas ▪ Surface infrastructure and buildings ▪ Peri-urban areas

Table 14: Proposed areas and land-use types as BR zones

Box 13: Proposal on Forest development and conservation priority areas in a Lake Tana Biosphere Reserve
By Alemnew Alelign, ORDA

Proposed Core Zones

As far as forest biodiversity conservation is concerned, areas covered with remnant natural forest vegetation should be identified, delineated, inventoried and properly conserved. In this regard the following areas are proposed as Core Zones:

Kibran Gebrel, Deq Estifanos and other 37 small islands in Lake Tana. As these islands are rich in flora and fauna diversity, special handling systems should be in place.

Tara Gedam forest: The forest has a significant number of natural tree/shrub species like O*lea africana*, *juniperus procera*, *prunes africana*, *Apodytus dimidiate, Alopylus spp*.

Ababa Ayehu forest (in Libokemkem Woreda): This forest has mixed stands i.e. natural grown and artificially planted species, hence, at least the natural forest shall be considered as a core area and must be conserved.

Fachi forest (in Libokemkem Woreda): The vast majority of the forest is natural, but highly disturbed due to human interference, therefore, it should be protected from further extinction of the remaining species.

Alem Saga forest (located in Farta Woreda): This forest has a considerable amount of woody and herbaceous species diversity. Strengthening its protection is indispensable.

Church forests within the Lake Tana watershed: There are a large number of churches endowed with remnant natural forest species in their compound. These forests should be identified and protected from further extinction.

Proposed Buffer Zones

The following areas are very sensitive and fragile and need to be meticulously handled:

Periphery of Lake Tana: The whole periphery of the lake should be delineated and protected. The area delineated will have a radius of at least 500 m from the shore of the Lake. This buffer formation is expected to have a contribution to protect the lake from incoming silt and other human induced disturbances. To the minimum farming practices with in this radius must be prohibited, to reduce the danger.

Irrigation Dam areas: As it is recommended for the periphery of Lake Tana, the periphery of Koga, Rib, and Megech Dams should be protected by developing buffer zones so as to guarantee their longer service and life time.

Zegie peninsula and Deq Island: In these areas human intervention is at an increasing rate, as a result its species diversity is highly disturbed. Species diversity in Zegie is still promising, which gives a window of hope to save its remaining tree species.

Mount Guna: Mount Guna is the source of many rivers, streams and springs including the Blue Nile and Lake Tana. Moreover, the area has immense eco-tourism potential due to its unique afro-alpine ecosystem and precarious land feature. However, currently this area is in a great jeopardy as it is being encroached

up to the summit of the mountain. As a result, some streams and springs have already started to dry up and the inflow of most rivers has significantly declined. Therefore, it is proposed that the upper-most part of the mountain should be protected by developing a Buffer Zone belt around the head of Mount Guna with the minimum radius of 500m.

Bahir Dar Millennium Park: The park is already designated and gazetted, but its boundaries are not yet delineated and secured, as a result of human activity within the park negatively affecting the diversity of flora and fauna. Therefore, protecting the area (up to Tiss Issat falls) in the form of Buffer Zone is absolutely indispensable.

Priority areas for afforestation and SWC: To protect Irrigation Dams from siltation hazard and make them serve a longer period of time the upper catchment of each irrigation dam namely, Megech, Rib, Koga and Jema dam need to be protected through constructing appropriate soil and water conservation structures and planting different types of tree/shrub species in communal and individual land holdings

9. Summary and conclusions

This chapter summarizes the key aspects of the feasibility study and the analyses of the feasibility dimensions against the background of the UNESCO BR designation criteria, and draws conclusions for a future BR in the LTR. The strengths and weaknesses as well as future opportunities and threats (SWOT) of the BR related issues have already been addressed in each chapter. Because of the study's comprehensiveness the key SWOTs for a BR are highlighted in Table 15 Similarly, based on these potentials and shortcomings, recommendations for approaches and needed actions can be found in the respective chapters.

This study is addressed to all those included in the stakeholder analysis. In particular, it serves to create a baseline for the further planning and management of a biosphere reserve in the Lake Tana Region and thereby to already contribute to the process towards establishing a BR. The generated data serve to contribute to the UNESCO BR nomination.

9.1. Prerequisites of the LTR for a BR

As this feasibility study demonstrates, the LTR fulfils the prerequisites to comply with the BR selection criteria of the UNESCO in the following ways:

Lake Tana is not only a unique natural, but social and economic asset of regional and global importance, as the water tower of Africa and as a natural and cultural heritage site and economic centre of the Amhara Region. The LTR is covered by a large diversity of ecological systems, habitats and biogeographic regions with a gradation of human use. Its biodiversity and ecosystems have regional and international significance for biological diversity conservation.

There is a sufficiently large area of valuable diverse ecosystems and habitats that qualify for Core and Buffer Zones. Depending on the to be agreed upon outer boundary of the potential BR, its size could be adequate to guarantee the three functions of BRs (conservation, development and logistic) and the functionality of Core and Buffer Zones, while the large size of the area remains a challenge for stakeholder coordination.

In the Lake Tana Region there is already a wide array of experiences with the sustainable management of natural resources being beneficial for the BR implementation. With a high number of related projects and interventions, it provides opportunities to explore and demonstrate approaches to sustainable regional development (Development Zone). They need to be reconsidered against the background of the BR concept, visions and objectives, up-scaled and incorporated into the framework for implementation. Similarly, the promising approaches and existing experiences with and measures for sustainable resource management in other parts of Ethiopia, need to be adapted to the regional ecological and socioeconomic context.

A number of organizational arrangements have already been put in place such as a designated authority committed to establishing a BR and the assignment of BR Focal Persons in respective regional institutions. Moreover, the regional bureaus have

valuable experiences with sustainable development related activities that can vividly feed into the BR process. Initial public attention has already been aroused and momentum among cross-sectoral stakeholders to support the BR idea has been created.

The existing pressures, driven by alerting population and land-use trends, on the LTR are a challenge for sustainable development. The future of the Lake Tana Region depends on the degree to which the capacity of ecosystems to provide services will be internalized into the prevailing land-use and resource-extractive systems. Sustaining its resource base is a prime concern of local, regional and national stakeholders. A biosphere reserve appears to be the best approach to conserve and sustain for Man and Nature.

Strengths / potentials	**Weaknesses / constraints**
• Important wetland, forest and aquatic ecosystems and wildlife • Diversity of biogeographic regions and cultural landscapes • International significance of water • Committed stakeholders and institutions • Strong cultural heritage and ethno-ecological linkages • High awareness for environmental problems and identification with the LTR • Best practices on resource management • Natural forest protection through cultivation of coffee and the Church • Extensive forms of wetland use • Experiences with biodiversity conservation • High ecotourism potential	• Lack of coordination and integration of stakeholders and respective interventions • Challenge of zonation: dense population • Multitude of stakeholders and interest groups with diverse agendas • Dependency of agriculture on external support and inputs • Unclear land tenure/ownership enforces land degradation
Opportunities / options	**Threats / risks**
• Many options for alternative livelihoods • Community-based ecotourism • Potential for the processing and marketing of natural products • Indigenous knowledge (church forests) • Bahir Dar as a green model town • Agro-forestry • Agriculture as part of the climate change solution • Large gene banks for rehabilitation • Development Agents as community links	• Decline in agricultural production and biodiversity • Eutrophication and reduced water quality • Environmental pollution • Conversion of wetlands into farmland • Deforestation and land degradation • Climate change impacts • Population increase • Urbanization processes • Possibly unsustainable water development interventions and agriculture intensification

Table 15: SWOT analysis summary for an envisaged BR in the LTR

9.2. Approaches to focus on

For a BR to be meaningful, communities need direct economic returns to support conservation programs of a BR. Benefits need to be sufficient and tied directly to conservation, through ecotourism, watershed rehabilitation, etc.

In order to meet the BR objectives capacity building is necessary, which combines formal and informal training, including training courses, workshops, learning-by-doing activities, appropriate training-of-trainers, access to expert advice, and the use of multiple media for both local communities and regional institutions in charge of various BR management mandates.

Environmental impact assessments should be enforced as a prerequisite of any development intervention and investment and pollution of the lake from agricultural and urban activities need to be monitored. Rehabilitation measures such as afforestation, Area Closures and soil and water conservation in the watershed will have to be extended to reduce erosion and siltation and increase the soil productivity.

In line with the idea of a Green Economy, the Ecosystem Service (ESS) approach should be followed, because biodiversity and ecosystems are the basis for economic viability and provide benefits for local communities. Ecosystems like wetlands and natural forests are not sufficiently valorised, although they are the source of livelihoods that offer many ESS (for example the wetlands and forests providing fuel wood, papyrus plants, traditional coffee, straw basket, medicine, charcoal, bee-keeping and honey production etc.).

To steer the socioeconomic and environmental trends and manage their risks such as urbanization, agricultural intensification and land degradation, an integrative regional planning and coordination among the stakeholders across all sectors and levels is a must.

9.3. The way forward and outlook

Given that the prerequisites of the LTR can be evaluated as good, the stakeholders and respective authorities need to work towards fulfilling the selection criteria to qualify as a BR. The zonation will have to be realized through a land-use planning, which legally constitutes the Core Zones (gazetting and a zoning proclamation) and clearly identifies Buffer Zones, where only activities compatible with the conservation objectives can take place. It has to be guaranteed that the zonation is developed in a participatory process that involves all local communities. Along with the zonation alternative livelihoods need to be developed and supported, especially for those depending on sensitive ecosystems. In the Development Zone further sustainable resource management practices should be promoted and developed that serve as a model for the region. In addition, provisions should be made for mechanisms to manage human activities in the Buffer Zone through management policies and BR management plans by the designated authority (BoCTPD). For the BR to be accepted by a broad spectrum of public authorities, local communities and private interests, stakeholders need to be further involved and mobilized through workshops, trainings and coordination mechanisms and organizational arrangements to design and carry out the functions of a biosphere reserve. Therefore it is necessary to clearly define the roles and responsibilities of each stakeholder and formalize the

mandate of each public authority. Because of the crucial roles of the private sector in managing natural resources, they have to be actively involved for the creation of models, e.g. through public private partnerships (PPPs). The regional government and designated authority should develop and guarantee sustainable financing options to cover the costs of a long-term BR management, e.g. through Conservation Trust Funds. Once these provisions are made and related activities are initiated or bindingly planned, the respective nomination documents can be submitted to the UNESCO for evaluation.

In order to assist in the planning and management of a BR in the LTR, the BoCTPD has welcomed and enquired external support from the Michael Succow Foundation (MSF) and the Nature and Biodiversity Conservation Union (NABU). As a follow-up of the preliminary results of this feasibility study, the German Federal Ministry for Economic Cooperation and Development (BMZ) will support a MSF-NABU-run four-year project that aims at establishing a BR and piloting corresponding measures for wetlands, church forests, natural product marketing, community-based ecotourism and related capacity building.

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Annex I

Resolution of National Wetland Stakeholders Workshop on Creating National Commitment for Wetland Policy and Strategy in Ethiopia

August 7th to 8th, 2008

The participants of this wetland workshop after two days deliberation have recognised the following issues on wetlands in Ethiopia.

1. Wetlands are vital to human livelihoods and creating economic growth, social stability and cultural integrity;
2. Wetlands play a significant role for the well-being of people and environmental or ecological balance;
3. Wetlands play an important role in poverty reduction, food security, social well-being and achieving all the millennium development goals in addition to meeting the objectives of the RIO Conventions and other environmental commitments, and
4. Wetlands should be seen as encompassing cross-sectoral nature and multi-faceted benefactors.

Even though wetlands are the source of the above services, they have not received the attention they deserve. We recognise that the status of wetlands in Ethiopia is declining at an alarming rate as the result of:

- Lack of awareness at all levels;
- Absence of national wetland criteria and definition;
- Lack of knowledge and information;
- Increasing population pressure;
- Conflicting interests on the resource base;
- Lack of efficient wetland focused institutional arrangement and policy, and
- Non-ratification of international wetland Conventions.

We believe and strongly advise that the way forward will be to:

1. To designate an appropriate lead agency to coordinate wetland conservation and wise use in Ethiopia.
2. Build capacity of concerned relevant stakeholders including the establishment of a national wetland database centre.
3. Develop a stand-alone policy, strategy and legislation on the wise use of Ethiopia's wetlands.
4. Develop and implement modalities for national wetland awareness creation and capacity building.
5. Speed up the process leading towards the ratification of the Ramsar Convention.
6. Establishment of an ad hoc committee that will coordinate sustainable wetland management in Ethiopia.

August 8, 2008
Addis Ababa, Ghion Hotel

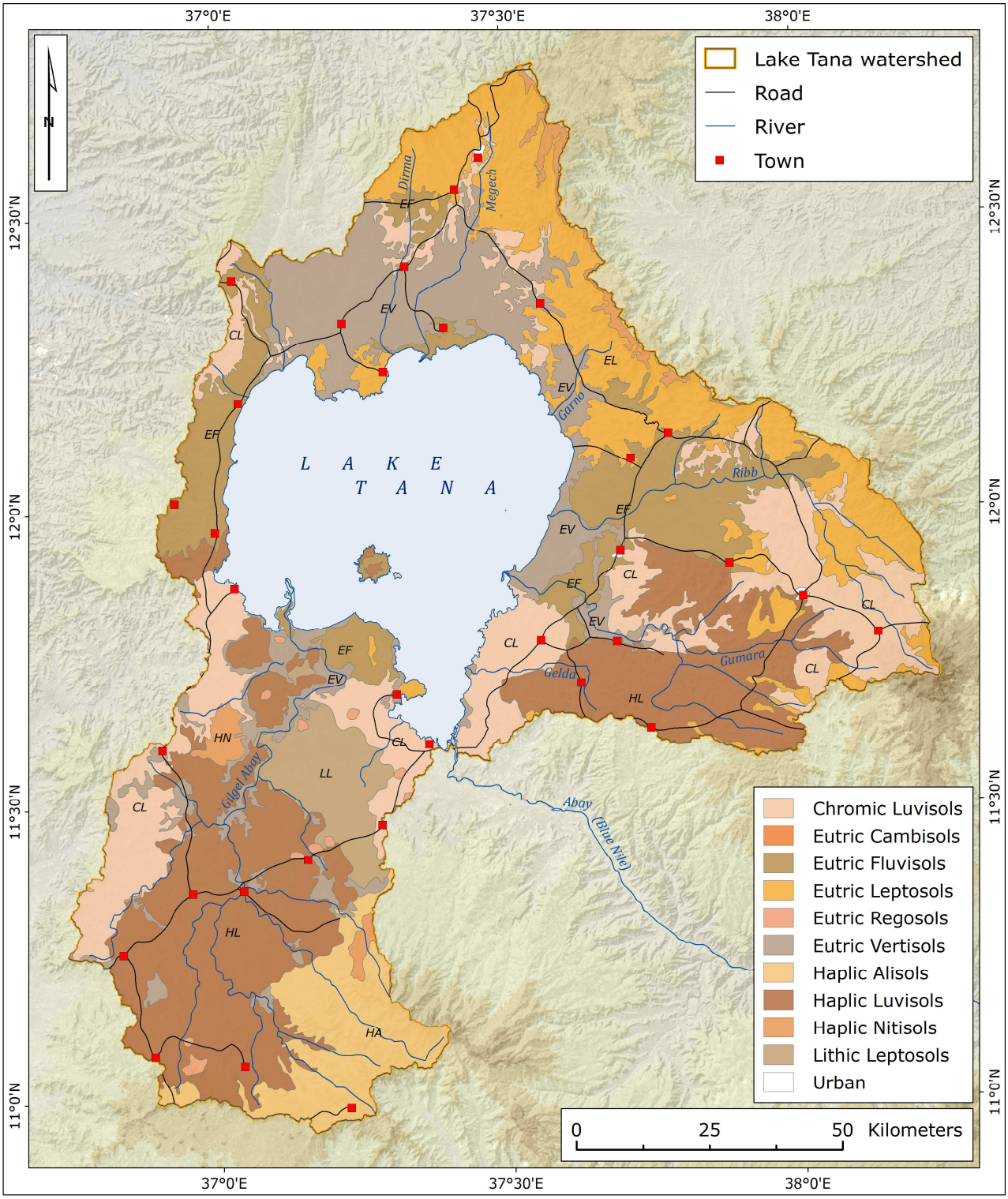
Annex II: Overview of master theses in the Lake Tana Region (LTR) potentially to be developed as a Biosphere Reserve, Ethiopia, in 2011

Tentative topics	Time period	Supervisor for German students	BDU Counterpart Dpt., supervisors	„Diplom“ students
Wetlands around Lake Tana. A landscape & avifaunistic study • Wetland delineation (GIS, remote sensing) • categorization of wetlands, keystone species • Seasonal wetland dynamics • degree of land-use (agricultural activities), degree of degrad.	Beginning Sept. – end-November	Prof. Succow & Prof. Kehrt (Greifswald Univ.)	Dr. Ayalew (Department of Biology)	*Fanny Mundt* Landscape Ecology (Greifswald Univ.)
Land Use Change and Transformation of Agricultural Livelihoods along the Eastern Shores and Plains of Lake Tana • Land use changes since the Haile Selassie regime • Land use conflicts • Local perceptions on land use change and wetland alteration • Socio-economic analysis: Impact of the alteration of wetlands and the planned large-scale irrigation and drainage scheme on the livelihoods of local people, factors of food security • Role of informal institutions („Mahiber“, „Sembeti“) and by-laws for land management • pathways f. alternative livelihoods & coping strategies	Beginning Sept. – end/mid-November	Dr. Christina de la Vega-Leinert (Greifswald Univ.)	Natural Resource Management Dpt., College of Agriculture Babiyew Subhat (BDU MSc. Student)	*Maxi Springsguth* Landscape Ecology (Greifswald Univ.) Friedrich zur Heide (Institutionen)
Sustainable (eco-)tourism in LTR: • Situation analysis (infrastructure, settings, etc.) • Opportunities and potentials for community-based eco-tourism, ethno-ecological diversity for tourism • Requirements for sustainable tourism in LTR • Study area: Bahir Dar regions, Zege, Blue Nile Millennium park, Church forests, wetlands, etc.	Beginning July – end September	Prof. Bohle (Uni Bonn) & Prof. Ellenberg (HU Berlin)	Tesfai Minalhegn (PRA Expert, BSc. Disaster Management and Sustainable Development)	*Christian Sefrin* Geographie (Bonn Univ.)
Remaining Forests of the LTR: • Biodiversity and utilization of the forests • Provision of Ecosystem Services, esp. Non-Timber Forest Products • Perceptions of the local communities to conserve the forests • Possibilities for rehabilitation & conservation (e.g. area closure)	Beginning Sept. – end/mid-November	Dr. Lutz Fähser & Dr. Cristina de la Vega-Leinert (Greifswald Univ.)	Tesfaye Minalhegn (PRA Expert, BSc. Disaster Management and Sustainable Development)	*Renée Moreaux* Landscape Ecology (Greifswald Univ.)

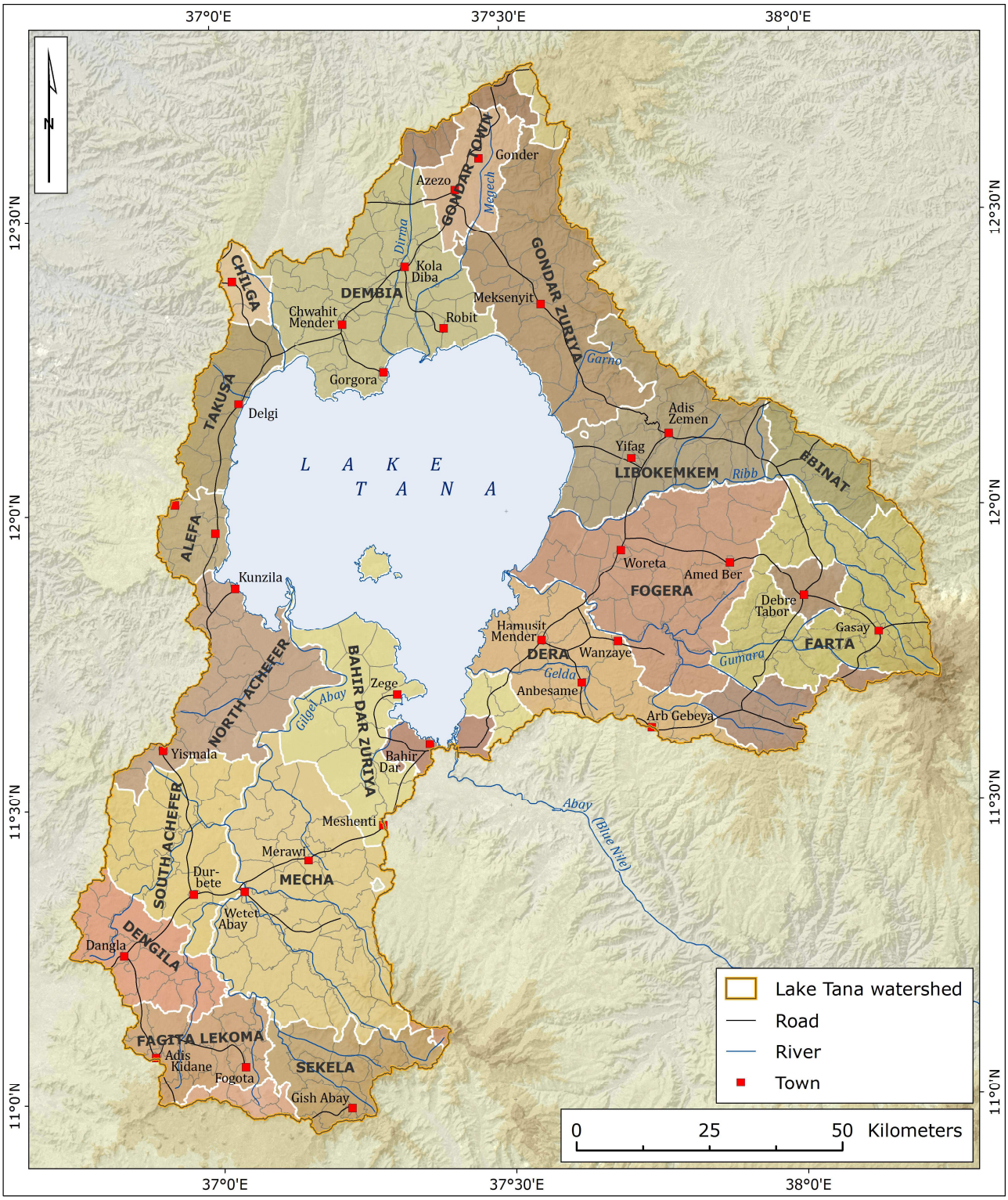
Annex III: Components of the feasibility study

I-a Assessment and analysis of location-specific characteristics and dynamics	
Biophysical settings and dynamics	Important habitats, biodiversity, its threats, climate, vegetation, endemits, hydrology
Wetlands	Types, ecology, flora, fauna, status and dynamics
Socioeconomic conditions and trends	Settlements; Demography; Cultural specifics ; infrastructure development; Commercial and industrial use; Regional development plans, visions, guidelines; Environmental problems
Land-use systems	Land-use types and strategies, livelihood sources, land tenure conditions, agricultural practices; existing & potential land-use conflicts
(Church) forests remnants	Status, use, management, afforestation and rehabilitation potential
Stakeholder analysis	Roles, responsibilities, capacities, gaps
Institutional analysis	Formal and informal institutions, regulations, by-laws, legal framework
Visions for the future	Hopes, desires, fears, concerns
I-b Conceptualization for marketing nat. products	Potential for non-timber forest products, market conditions, demand, infrastructure, requirements for processing and marketing, costs
I-c Potential analysis for ecotourism	Current infrastructure, sites and activities, potential for eco-tourism, conditions and requirements for community-based tourism

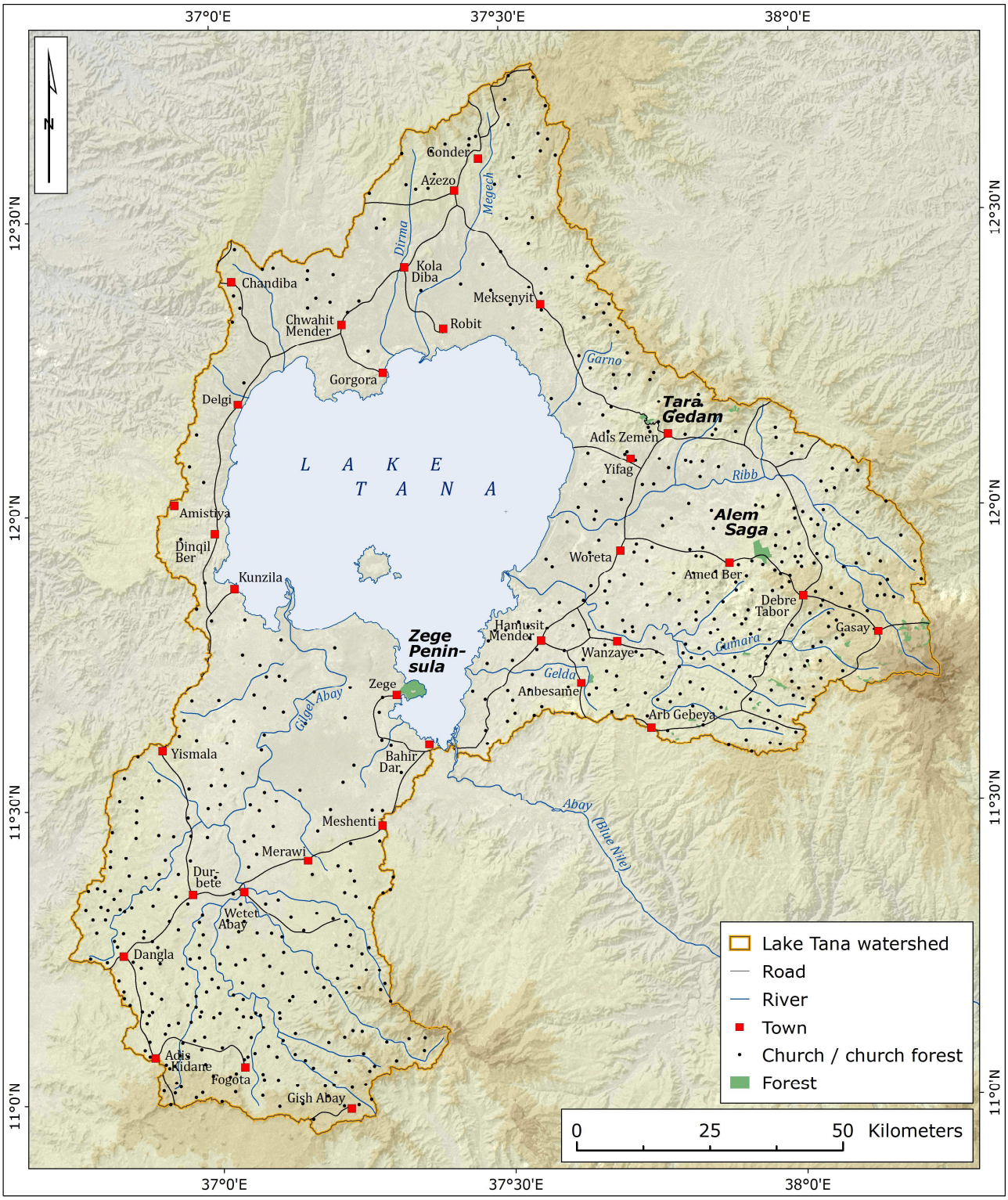
Annex IV: maps



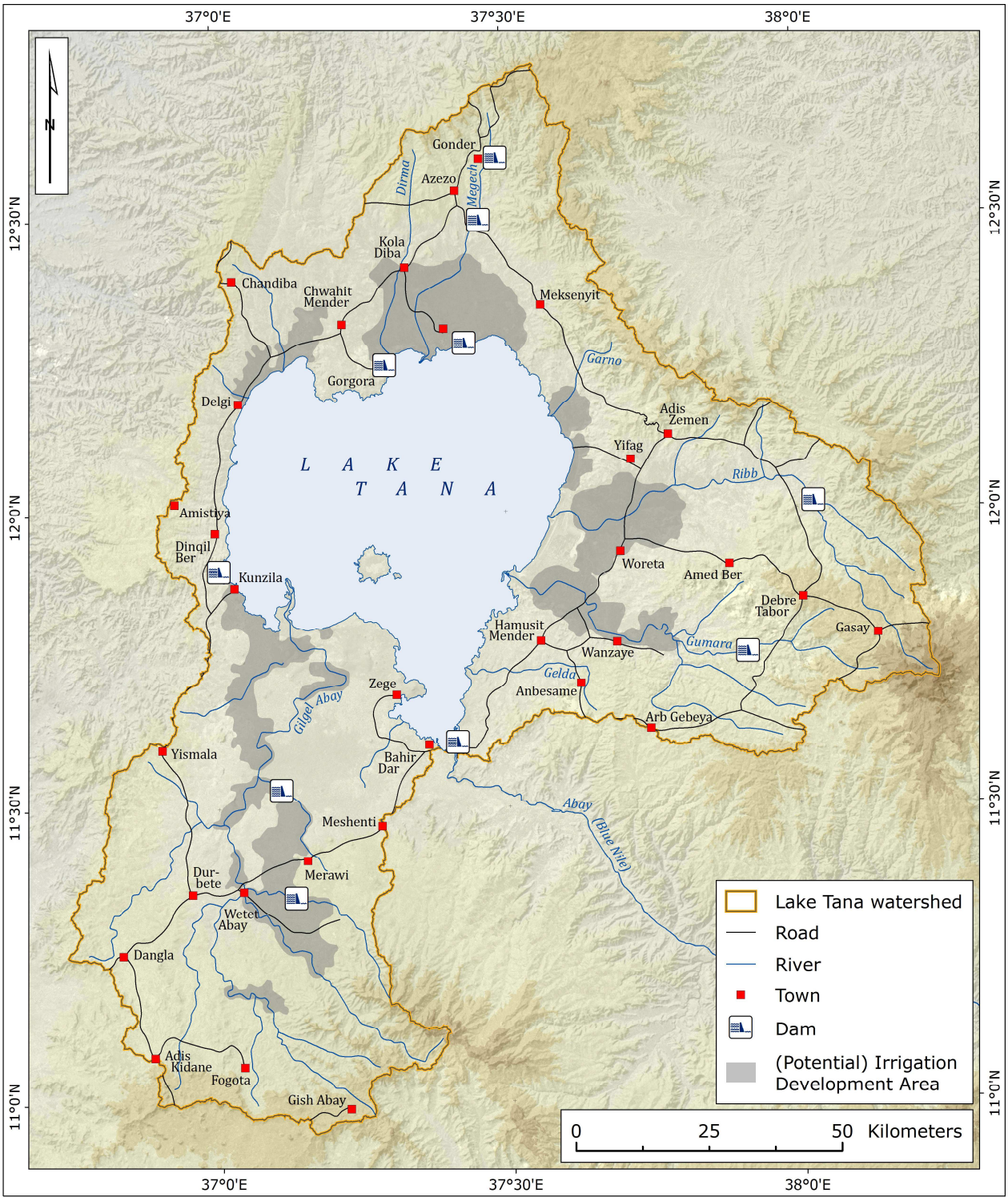
Map 13: Soil types in the LTW (design: Stefan Busse, MSF 2011, source: ANRS BoA)



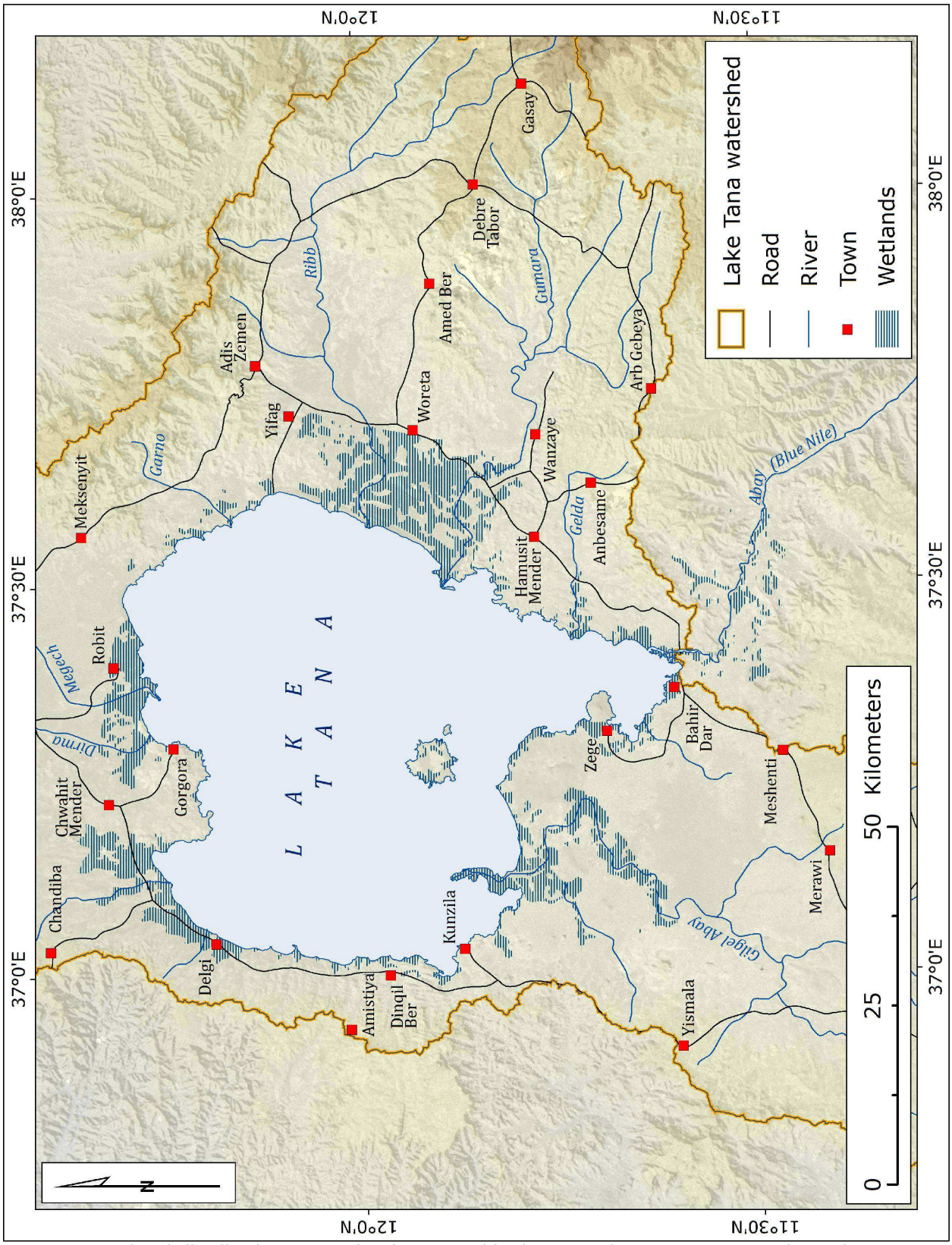
Map 14: Administrative boundaries of Woredas around Lake Tana (design: Stefan Busse, MSF 2011, source: GIS Team of ANRS BoFED).



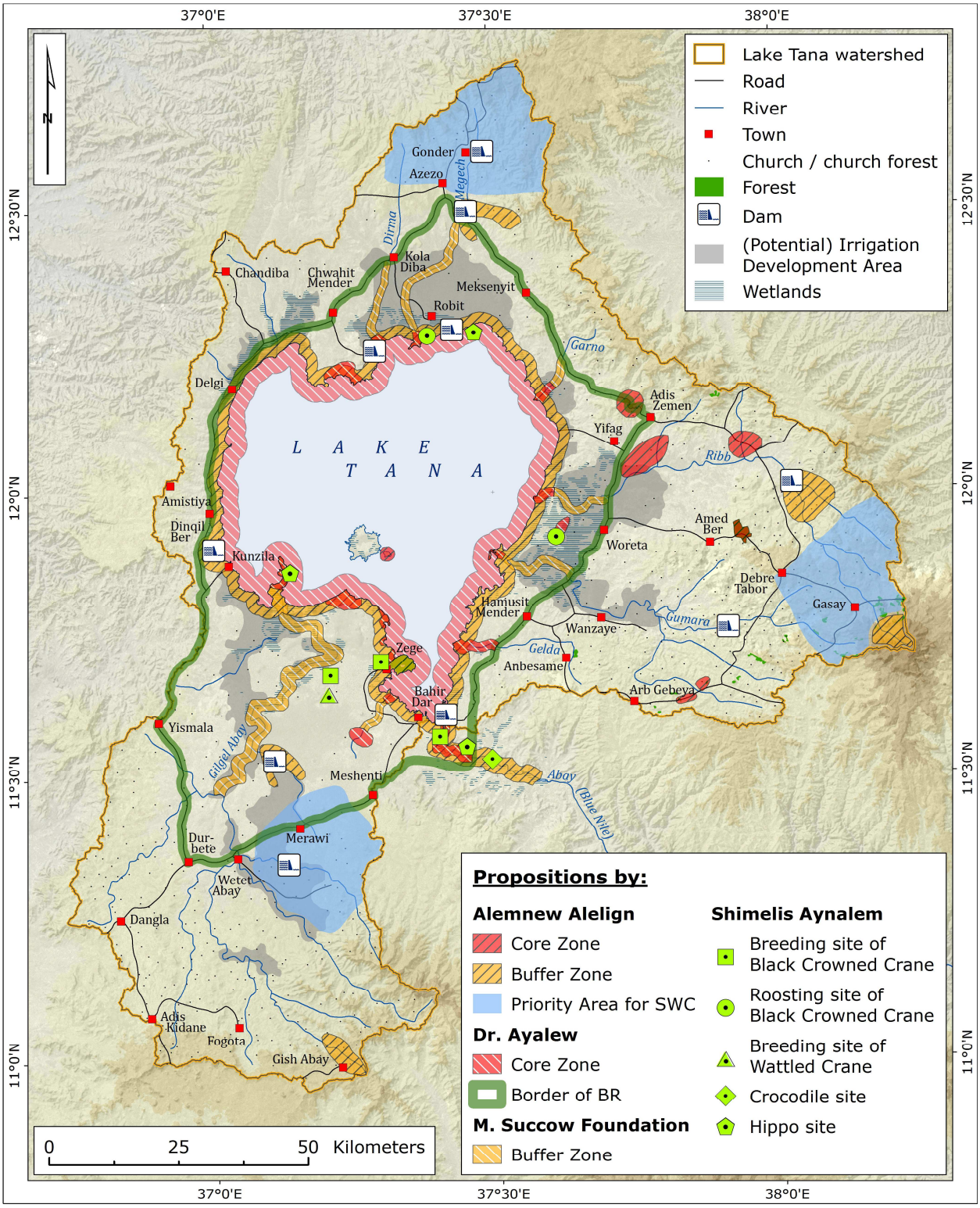
Map 15: Forests and church forests in the LTR (design: Stefan Busse, MSF 2011).



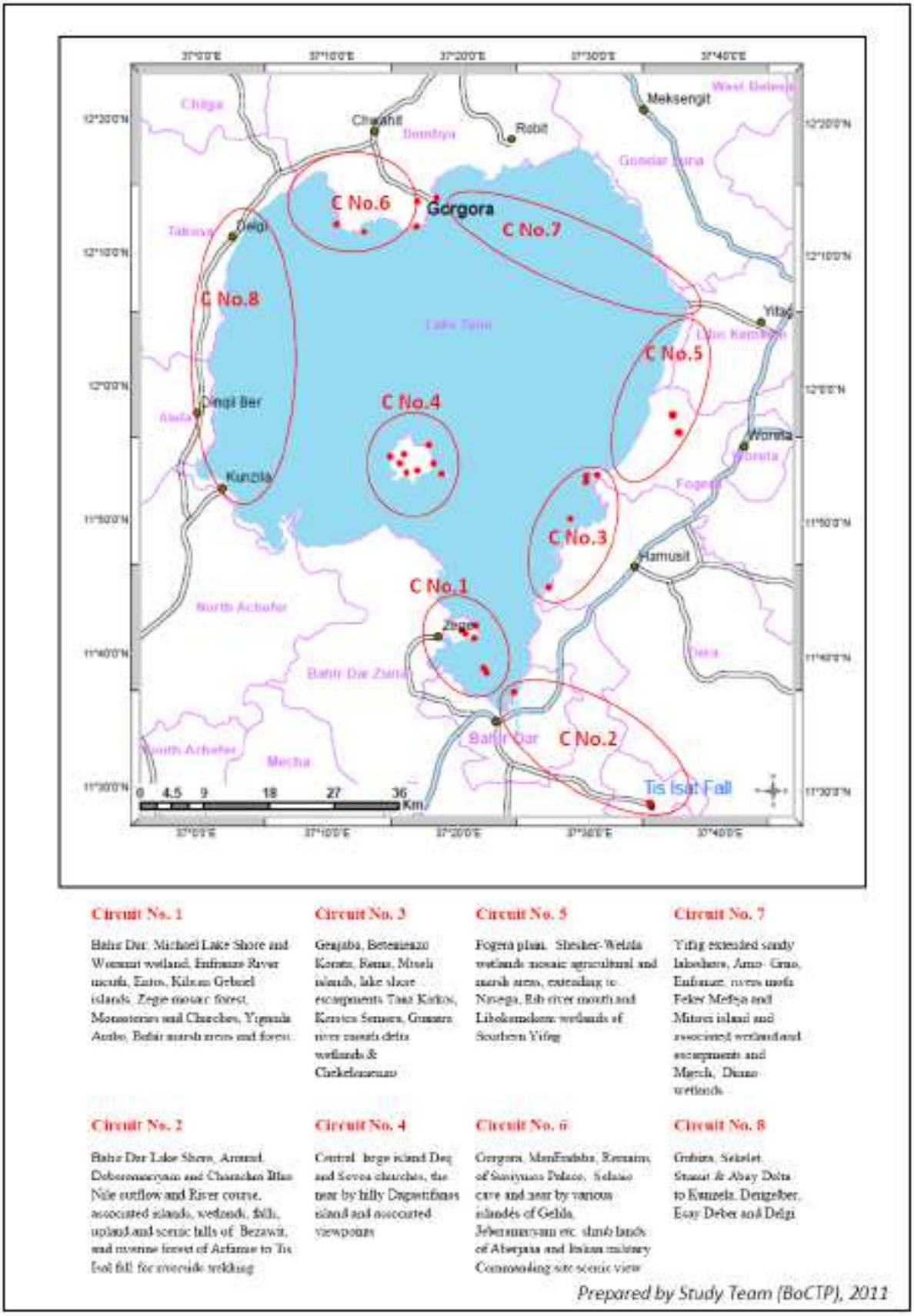
Map 16: Planned irrigation and hydropower sites (design: Stefan Busse, MSF 2011, source: Alemayehu et al. 2009: 5).



Map 17: Wetland distribution around Lake Tana (design: Stephan Busse, MSF, based on: MoWE 2010a: 4/17).



Map 18: Proposed zonation by various experts for the envisaged Lake Tana BR



Map 19: Eight tourist destination circuits around Lake Tana (Marye et al. 2011: 102).

Annex V: List of meetings and interviews

Date	Person / institution	Purpose / topics
Germany: Greifswald, Berlin, Bonn		
5/1/2011	Prof. Martin Schnittler (Director Institute of Botany and Landscape Ecology, Greifswald University)	Cooperation with the Institute for supervising master theses Excursion to Lake Tana Region 2012
7/1/2011	Prof. Hannes Knapp (Institute of Botany and Landscape Ecology, Greifswald University)	Role of BfN for supporting a competence centre, planning of a delegation trip of Ethiopian decision-makers to Germany in 2012
7/1/2011	Renée Moreaux and Maxi Springsguth (Greifswald University)	Inception meeting on master theses topics
24/1/2011	Dr. Bettina Hedden-Dunkhorst (BfN), Stefan Mörsdorf (Asko Europa-Stiftung, Managing Director)	Envisaged project components and plans / Establishment of a competence network for sustainable development, possibilities for linking with education, master programme on sustainable development by Asko, e-learning in Africa; links to AfriMAB Coordination of MAB workshop(s) with BfN
24/1/2011	Dr. Till Stellmacher (Center for Development Research, Bonn University)	Scientific cooperation with Addis Ababa University (Prof. Albert, EiABC) Experiences from Yayu Right Livelihood Campus, Lecture Series Prof. Succow
Ethiopia: Bahir Dar		
17.-19//2/11	Bahir Dar University, (& Hafen City University Hamburg)	Workshop: prospectives for future urbanization in the Lake Tana Region
18/2/2011	Henning Schwartze (World Habitat Society)	Hitherto initiative on developing a biosphere reserve around Lake Tana
21/2/2011	Mulugeta Seid (ANRS Bureau of Culture and Tourism)	TORs Friedrich zur Heide Cooperation Agreement Working settings at the Bureau Counterpart
22/2/2011	Dr. Ayalew Wondie (Bahir Dar University, Ass. Prof. Applied Science Department)	Existing studies (IFAD baseline assessment) and projects Wetlands around Lake Tana: environmental problems, studies Relevant contacts and institutions
22/2/2011	Hussien Adal (Addis Ababa University, Biology Department)	The potential of biodiversity in diversifying tourism in Ethiopia
23/2/2011	Dr. Zerfu Hailu (GIZ Amhara, Deputy Head)	Relevant documents Activities of GIZ-SLM Program Contact persons
24/2/2011	Rural Urban Planning Institut, Bahir Dar, Canadian Urban Institute	Workshop on Bahir Dar waterfront development
25/2/2011	Woldegabriel G/kidan & Teklu Damtie (ANRS Bureau of Environmental Protection, Land Administration and Use)	History of biosphere reserve initiative Contact persons Relevant documents Structure of presentations for

		stakeholder workshop on 10 March 11
27/2/2011	Abeba Mola (Bahir Dar University)	Research on wetlands Working with participatory methods Potential support
1/3/2011	Dr. Frew Tegegne (Vice President Bahir Dar University)	Formalizing the cooperation with Bahir Dar University, MSF and BoCT Counterparts for master students
1/3/2011	Dr. Ayalew Wondie	Info about practitioners´ guide for wetland management Planning boat tour Lake Tana
4/3/2011	Dr. Ayalew Wondie, Prof. Succow, Dr. Lutz Fähser	Planning round trip Lake Tana Exchange on wetlands around LT
4/3/2011	Birhanu Gebre, Abeje Zewdie (BoCT), Succow, Fähser	Invitations and structure of the workshop on 10 March ´11
5-9/3/2011	Abeje Zewdie, Succow, Fähser	Round trip Lake Tana (Tana Kirkos, Shesher, Woreta, Tara Gedam, Robit, Delgi, Shahura, Alefa, Kunzula)
10/3/2011	Kick-off stakeholder workshop	Concept BRs, vision, objectives, stakeholders, way forward
13/3/2011	Officer Blue Nile River Millennium Park	Park visit, measures, problems, land-use, landscape units
14/3/2011	Aytenaw Endeshaw (ANRS Bureau of Agriculture, Process Owner Natural Resource Management), Fähser	Area closures Forest extension services and forestry State Church forests Tree nurseries
14/3/2011	Dr. Alemayehu Dessie Eshete (ORDA)	Activities of ORDA Church forests: status, dynamics, religion, threats, rehabilitation Area closures / Management options
15/3/2011	Dr. Zerfu Hailu (GIZ), Fähser	Afforestation, eucalyptus, Amhara Forest Enterprise, forestry approaches, carbon trade
16/3/2011	Ura and Yiganda Kebele leaders, Abeje Zewdie, Fähser	Trip to Zege penninsula, interviews on: forest management, coffee production, livelihood sources, etc.
17/3/2011	Bayleyegn Azene (ANRS Bureau of Agriculture, Natural Resource Mngt. and Conservation Dpt.)	Forest management Area closures Watershed mngt. measures Tree nurseries
18/3/2011	Adugna Getahun (ANRS Bureau of Finance and Economic Development)	Maps and data Economic benefits of a biosphere reserve Synergies with and relevance of water resources development projects
18/3/2011	Getachew Tamiru (ORDA)	Conservation of forests in Amhara Tree planting, participatory forest management
21/3/2011	Tenaw Mekonnen (ANRS Bureau of Agriculture); Nico Stöhr (GIZ); Fasikaw Atanaw (ANRS Bureau of Water Resources Development); Tsegaya Sawnet (BoFED, GIS section)	Data collection (socioeconomic, plans, agriculture, project documents, maps, GIS data, etc.)
22/3/2011	Woldegabriel G/kidan & Teklu Damtie (ANRS BoEPLAU)	Way forward after the workshop: Zoning concept, technical committee for a biosphere reserve, experience

		sharing with Kafa & Yayu BRs
22/3/2011	Tenaw Mekonnen (ANRS BoA)	Potential PhD on irrigation management in the BR context
23/3/2011	Dr. Berhanu Abraha (Bahir Dar University, Ass. Prof. Biology Dpt.)	Master theses and counterpart for forest ecology and management
23/3/2011	Seid Hussen (BDU Institute of Land Administration ILA)	Mandate and activities of ILA Land administration situation in LTR Potential research cooperation
23/3/2011	Ato Melese (ANRS BoWR)	Irrigation projects and documents
25/3/2011	Sisay Megersa (Bahir Dar University, Head of History Dpt.)	Master theses and counterpart for (eco-)tourism topic
25/3/2011	Berhanu Gebre (ANRS BoCT)	Wrap-up discussion / MoU with BDU Full support of the project by BoCT
Ethiopia: Addis Ababa		
29/3/2011	Dr. Ludwig Siege (GIZ)	Requirements for research permits Mutual updates on Tana & Gambella
29/3/2011	Solomon Getachew (Ministry of Science and Technology, MAB focal person)	Requirements for registration of the MSF as a NGO / Process for BR application to UNESCO / MoU MSF with NABU
30/3/2011	Prof. Albert, Dr. Brook, Dr. Kumelachew (Addis Ababa University AAU)	Options for scientific cooperation (master and PhD research, supervision), common MoU AAU, BDU, BoCT, MSF, Greifswald Univ.
30/3/2011	Dr. Mitslal Kifleyesus-Matschie (ECOPIA)	Potential for improving non-timber forest product processing and marketing in LTR, sketch for tentative PPP between ECOPIA and MSF Visit of the production site
31/3/2011	Sisay Nune & Daniela Tunger (NABU)	MoU between NABU and MSF Requirements for and experiences with NGO registration in Ethiopia Nomination process for Kafa BR
31/3/2011	Dr. Eshete Dejen (FAO Ethiopia, Fisheries Officer)	Strategy for promoting BR in LTR History of the first BR initiative
1/4/2011	Kidanemariam Jemberre (Norwegian Embassy)	Technical, social and logistical settings and challenges for piloting conservation agriculture in Ethiopia (NORAD and SLM)
4/4/2011	Dr. Tadesse Woldemariam (ECFF, Managing Director), phone conversation	Background and experiences from BR Yayu: zoning, legal settings, nomination, stakeholder involvement Need for a BR competence network
5/4/2011	Dr. Hirut Woldemariam (AAU, Vice President for External Relations, Strategic Planning & Partnership)	Planning of Lecture by Prof. Succow for the Right Livelihood Campus on BRs for November 2011 Role of AAU in competence network
7/4/2011	Dr. Johannes Schöneberger (GIZ, Director of SLM Program)	Synergies between SLM and BR LTR Component of Conservation Agriculture in SLM; PPP with ECOPIA
5/4/2011	Dr. Alexandros Makarigakis (UNESCO)	National MAB strategy Consultation on previous experiences Options and next steps for strengthening MAB Outline of MAB Workshop November

9/4/2011	Solomon Getachew (MoST)	Options for activating national MAB committee; inauguration BR Kafa; new BR initiative in Sheka forest
Germany: Berlin, Bonn		
10/5/2011	Dr. Tewolde Egziabher (Ethiopian Environment Protection Agency, Director)	"Forum für Globale Fragen" Auswärtiges Amt, Berlin Consultation on idea BR in LTR Need for Ethiopia to sign Ramsar
16/5/2011	Dr. Bettina Hedden-Dunkhorst (BfN, Head International Section)	Project progress reporting Planning of MAB workshops in Dresden (June/July) and Addis Ababa (Nov. 2011)
24/5/2011	Thomas Tennhardt & Svane Bender-Kaphengst (NABU, Internation Section)	MoU and cooperation MSF-NABU Planning of November: workshop, visits from members of German parliament
25/5/2011	Günter Nooke (BMZ, German Chancellor´s G8 Personal Representative for Africa)	Estimation and willingness of German government to support a BR in the LTR
26/5/2011	Dr. Friedrich Kitschelt (BMZ, Director General, Africa; Global and Sectoral Affairs)	Options for supporting a follow-up project on BR development in the LTR

Annex VI: Workshop agendas and participant lists

Stakeholder Workshop on a Potential Biosphere Reserve in the Lake Tana Region, Ethiopia

10 March 2011 (Homland Hotel, Bahir Dar) | Organized by the Michael Succow Foundation | Supported by the ANRS Bureau of Culture and Tourism

Time	Topics	Resource Persons
8:45-8:55	**Keynote address:** Biosphere Reserves in Ethiopia	Solomon Getachew (Ministry of Science and Technology)
8:45-9:00	**Opening speech:** Call for a Biosphere Reserve in the Lake Tana Region (LTR)	Birhanu Gebre (Deputy Head of ANRS Bureau of Culture & Tourism)
9:15-9:45	**The concept of Biosphere Reserves**: a tool for sustainable development, nature conservation and climate protection	Prof. Michael Succow (Michael Succow Foundation. Germany)
9:00-9:15	**Introduction of the project**: feasibility study on a potential Biosphere Reserve in the LTR	Friedrich zur Heide (Michael Succow Foundation)
9:45-10:15	**Wetlands, freshwater habitats and biodiversity in the LTR**	Dr. Ayalew (Bahir Dar Universtity) & Teklu Damtie (ANRS BoEPLAU)
	Resource and Land use in the LTR	
10:15-10:45	**a) Water Resources**	Fasikaw Atanaw (ANRS Bureau of Water Resources)
10:45-11:15	Coffee break	
11:15-11:45	**b) Agriculture**	Tenaw Mekonnen (ANRS Bureau of Agriculture)
11:45-12:10	**c) Forestry** (and church forests)	Dr. Alemayu Eshete (ORDA)
12:10-12:30	**b) Fisheries** (socioeconomic perspective)	Chalachew Aragaw (ANRS Bureau of Agriculture)
12:30-13:30	Lunch break (fasting lunch)	
13:30-14:00	**Socioeconomic dimensions and trends in LTR**	Adunya Getahun (ANRS Bureau of Finance and Economic Development)
14:00-14:25	**Tourism potentials in the LTR**	Getinet Fetene (SNV)
14:25-14:40	**Towards a potential Biosphere Reserve in the LTR**	Woldegabriel G/kidan (ANRS BoEPLAU)
14:40-15:00	Coffee break	
15:00- 17:30 (tentatively)	**Discussion and working session**	Moderation: Birhanu Gebre & Dr. Lutz Fähser (Germany)

Workshop on Linking Knowledge and Sharing Experiences within the Ethiopian MAB Programme

4 November (full day) + **5 November 2011** (first half day), Pacific Hotel, Addis Ababa

Expected outcomes

- Networking (and creation of allies) among biosphere reserve (BR) and MAB related stakeholders within Ethiopia and across Africa
- Experience sharing on BR planning and management and on managing national MAB committees (among Ethiopian and African Stakeholders from MAB committees and BR initiatives)
- Induction of the new members of the Ethiopian MAB Committee

Workshop syllabus

Time	Inputs/topics	Resource persons
	Friday, 04. November: **Part I – Introduction**	
08:45 - 09:00	Arrival of participants and registration	
09:00 - 09:15	Welcoming words	Mr. Tewodroes Wakuma, Head of the Minister´s Office, Ethiopian Ministry of Science and Technology
09:15 - 09:40	Introduction to the UNESCO MAB programme	Dr. Alexandros Makarigakis (UNESCO Office Addis Ababa, Science Programme Specialist)
09:40 - 10:00	Remarks on the draft National MAB Strategy and draft guidelines for Ethiopian biosphere reserves	Mr. Solomon Getachew (Ministry of Science and Technology, Focal Person Ethiopian MAB Committee)
10:00 - 10:30	The need for networking among African BRs and MAB committees	Dr. Paul Makenzi (Chair AfriMAB network)
10:30 - 11:00	Tea break	
11:00 - 11:30	Man and the Biosphere: From regional cooperation to national implementation and local management	Prof. Beate Jessel (President of the German Federal Agency for Nature Conservation)
11:30 - 12:00	Biosphere Reserves as an integrated tool for regional development endeavour	Mr. Heiko Warnken (Head of Division Environment and Sustainable Use of Resources, German Federal Ministry for Economic Cooperation & Development)
12:00 - 12:30	Experiences from Biosphere Reserves in developing countries	Prof. Dr. Michael Succow (Michael Succow Foundation, Chairman of the Board)
12:30 - 13:30	Lunch break	

Part II – Experiences from biosphere reserves in Ethiopia		
13:30 - 14:00	Experiences from Kafa Biosphere Reserve	Mr. Mesfin Tekle (Nature and Biodiversity Conservation Union, NABU)
14:00 - 14:30	Experiences from Yayu Biosphere Reserve	Dr. Tadesse Woldemariam Gole (Environmental Coffee Forest Forum)
14:30 - 15:00	The Lake Tana Biosphere Reserve Initiative – current status and potentials	Mr. Berhanu Gebre (ANRS Bureau of Culture, Tourism and Parks Development, Deputy Head)
15:00 - 15:30	Current situation of the Shaka Forest BR initiative	Mr. Befekadu Refera (MELCA-Ethiopia)
15:30 - 16:00	Tea break	
16:00 - 17:30/18:00	Discussion on key aspects in BR planning and management	Moderation: Mr. Solomon Getachew (Ministry of Science and Technology) and Mr. Friedrich zur Heide (Michael Succow Foundation)
05. November: Part II – Experiences from biosphere reserves in Africa		
09:00 - 09:15	Introductory remarks and wrap-up of previous day	n.n.
09:15 - 09:40	Experiences from the Saloum Delta BR, Senegal (best practices)	Dr. Nouhou Diaby (Sub-regional AfriMAB coordinator for Western Africa)
09:40 - 10:05	MAB in Tanzania: Experiences from the Lake Manyara BR (best practices)	Mr. Arnold Mapinduzi (Member of the Tanzanian MAB Committee)
10:05 - 10:25	Kenya National MAB committee: A best case for the constitution and functioning of a national MAB committee	Dr. Paul Makenzi (Chairman AfriMAB network) & Boniface Wekesa (AfriMAB secretary)
10:25 - 10:45	Towards creating a platform for Biosphere Reserve related issues	Mrs. Noeline Raondry Rakotoarisoa (Chief, Biosphere Networks & Capacity Building Section, UNESCO Secretariat)
10:45 - 11:15	Tea break	
11:15 - 12:45	Discussion on how to link knowledge within and beyond the Ethiopian MAB Programme	Moderation: Mrs. Noeline Raondry Rakotoarsoa and Mr. Solomon Getachew
12:45 - 13:45	Lunch break and departure of participants	

Tentative participant list

Name	Institution/function
Mr. Solomon Getachew	Ethiopian Federal Democratic Ministry of Science and Technology (MAB Focal Point)
Dr. Alexandros Makarigakis	UNESCO, Science Programme Specialist
Mr. Membratu Berhanu	Secretary General of the UNESCO Commission, Ministry of Education
Mr. Berhanu Gebre & Mr. Abraham Marye BR Focal Person	Amhara National Regional State Bureau of Culture, Tourism and Parks Development (ANRS BoCTPD), Deputy Head
Respective BR Focal Person	Amhara National Regional State Administration
Dr. Ayalew Wondie	Bahir Dar University, Wetlands expert, BR Focal Person
Dr. Alemayehu Eshete	Organization for Rehabilitation and Development in Amhara (ORDA), forest expert
Mr. Teklu Damtie	Amhara National Regional State Bureau of Environmental Protection Land Administration and Use (ANRS BoEPLAU), BR Focal Person
Mr. Sisay Asres	Amhara National Regional State Bureau of Water Ressources Development, BR Focal Person
Prof. Dr. Michael Succow	Michael Succow Foundation (MSF)
Mr. Friedrich zur Heide	Michael Succow Foundation (MSF)
Dr. Lutz Fähser	Michael Succow Foundation (MSF)
Mrs. Svane-Bender-Kaphengst	Head of the Africa Programme, Nature and Biodiversity Conservation Union (NABU)
Mrs. Daniela Tunger	Nature and Biodiversity Conservation Union (NABU)
Mr. Sisay Nune	Country Representative Ethiopia, Nature and Biodiversity Conservation Union (NABU)
Mr. Mesfin Tekle	Nature and Biodiversity Conservation Union (NABU)
Dr. Tadesse Woldemariam Gole	Director, Ethiopian Environment & Coffee Forest Forum (ECFF)
Dr. Aseffa Seyoum	Environmental Coffee Forest Forum (ECFF) & Addis Ababa University, Center for Environment, Water and Development , College of Development Studies
Mr. Befekadu Refera	Representative from Shaka Forest BR initiative; MELCA-Ethiopia
Mr. Abera Mulat	SNNPRS Bureau of Agriculture, Hawassa; member of Ethiopian MAB Committee
Dr. Woldeyohanis Fantu	Ethiopian Institute of Agricultural Research, Addis Ababa; member of Ethiopian MAB Committee
Mr. Nadew Tadele	Ministry of Water and Energy; member of Ethiopian MAB Committee
Mr. Tafese Sisay	Higher Education Strategy Center, Addis Ababa; member of Ethiopian MAB Committee
Dr. Gemedo Dale	Institute of Biodiversity Conservation, Addis Ababa; member of Ethiopian MAB Committee
Mr. Habtamu Bezabih	Ministry of Agriculture; member of Ethiopian MAB Committee
Mr. Yonas T/Michael	Environmental Protection Authority; member of Ethiopian MAB Committee
Mr. Bekele Kefyalew	Regional Government of Oromia, Bureau of Agriculture, Addis Ababa; member of Ethiopian MAB Committee
n.n.	SNNPRS, Kaffa Zone Agriculture Department Head,

	Bonga
n.n.	SNNPRS, Sheka Zone Agriculture Department Head, Masha
n.n.	Representative from the Zonal Administration of West Gojam, Amhara Region
n.n.	Representative from the Zonal Administration of South Gondar, Amhara Region
n.n.	Representative from the Zonal Administration of North Gondar, Amhara Region
Dr. Endalkachew	University of Gondar, Department of Tourism Management
Mr. Fetene Hailu	Ethiopian Wilidlife and Conservation Authority (EWCA)
Dr. Johannes Schöneberger	Director of the Sustainable Land Management Programme (SLM), Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Dr. Paul Makenzi	Chair of the AfriMAB Network (Nairobi)
Laurent Nsenga (Congo)	Sub-regional AfriMAB coordinator for Central Africa
Prof. Chris Magadza (Zimbabwe)	Sub-regional AfriMAB coordinator for Southern Africa
Dr. Nouhou Diaby (Senegal)	Sub-regional AfriMAB coordinator for Western Africa
Mrs. Noeline Raondry Rakotoarisoa	Chief, Biosphere Networks and Capacity Building Section / Division of Ecological and Earth Sciences Man and the Biosphere (MAB) Programme UNESCO
Mr. Boniface Wanyama Wekesa	Member of the AfriMAB secretariat committee
Mr. Arnold Mapinduzi	Member of the Tanzanian MAB Committee
Dr. Till Stellmacher	Center for Development Research (ZEF) at Bonn University
Mr. Sanne van Aarst	Horn of Africa Regional Environment Center
Mr. Tewodroes Kassahun	Horn of Africa Regional Environment Center
Dr. Eshete Dejen	UN Food and Agriculture Organization (FAO), fisheries expert
Prof. Dr. Gerhart Albert	Addis Ababa University, Ethiopian Institute for Architecture, Building EIABC
Prof. Dr. Ensermu Kalbessa	Addis Ababa University, Biology Department
Prof. Dr. Beate Jessel	President of the German Federal Agency for Nature Conservation (BfN)
Mr. Heiko Warnken	German Federal Ministry of Economic Cooperation and Development
Mr. Florian Carius	German Federal Agency for Nature Conservation (BfN)
Mr. Mutesa Albert	Director, Science & Technology Unit within Rwanda National Commission for UNESCO, Focal Point MAB-Rwanda
Mr. Ngoga Telesphore	Rwandan MAB National Committee Ag. Conservation Division Manager, RDB/Tourism and Conservation Department, Rwanda
Prof. Dr. Brook Lemma	Addis Ababa University, Freshwater Ecologist
Dr. Mitslal Kifleyesus-Matschie	ECOPIA plc., CEO
n.n.	Bahir Dar City Administration
Dr. Till Blume	German Embassy, Head of the Division for Economy and Culture
Mr. Kibreab Habtemichael	Addis Ababa University, Right Livelihood College
Mr. Shewaye Deribe	Ethio-Wetlands Natural Resources Association (EWNRA), Program Officer

Stakeholder Coordination Workshop on the Feasibility of a Lake Tana Biosphere Reserve

14 November, Homeland Hotel, Bahir Dar

Workshop objectives

- to present and discuss the preliminary results of the feasibility study,
- to get an overview of current and future projects and activities in the Lake Tana Region that are relevant for the envisaged BR
- to address the need for coordination among the stakeholders and define each of their roles and responsibilities within the envisaged BR
- to present and discuss a first draft of a zonation concept with potential core and buffer zones
- to identify the next steps to take towards the realization of a BR

Note: the workshop will be conducted in Amharic language.

Draft workshop syllabus

	Inputs/topics	Resource persons
	Part 1: Introduction and Lake Tana BR feasibility	
08:30 - 08:45	Arrival of participants and registration	
08:45 - 08:55	Welcoming words	Mr. Mulugeta Seid (ANRS BoCTPD, Head)
08:55 - 09:00	Keynote address	Prof. Dr. Michael Succow (Michael Succow Foundation)
09:00 - 09:10	Biosphere Reserves in Africa and the Ethiopian Way	Mr. Berhanu Gebre (ANRS Bureau of Culture, Tourism and Parks Development, Deputy Head)
09:10 - 09:25	The biosphere reserve concept: model regions for sustainable development and a green economy	Mr. Abraham Marye (ANRS BoCTPD, BR focal person)
09:25 - 10:00	Preliminary results of the Feasibility study for Lake Tana Biosphere Reserve	Mr. Friedrich zur Heide (Michael Succow Foundation)
10:00 - 10:30	Short inputs from supplementary assessments in the Lake Tana Region: • The use and role of forests • The status of wetlands • The socio-economic role of wetlands • Ecotourism potentials	Fanny Mundt, Reneé Moreaux and Maxi Springsguth (Greifswald University) Babiyew Sibhat (BDU) Christian Sefrin (Bonn Univ.)
10:30 - 11:00	Tea break	
	Part 2: Brief outline of key project in the Lake Tana Region	
11:00 - 11:10	Implementation of Growth and Transformation Plan – Lake Tana Growth Corridor and energy visions in the LTR	n.n. (ANRS BoFED)
11:10 - 11:20	Agricultural Growth Project (AGP)	Teferi Wondale (ANRS Bureau of Agriculture)
11:20 - 11:30	Nile Irrigation and Drainage Project	Tenaw Ejubu (ANRS Bureau of Agriculture)

11:40 - 11:50	Community-based Integrated Natural Resources Management Project: Wetland component	Dr. Ayalew Wondie (Bahir Dar University)
11:50 - 12:00	Sustainable Land Management Program	n.n. (GIZ Amhara)
12:00 - 12:10	Tourism activities of the ANRS Bureau of Culture, Tourism and Parks Development in LTR	Mr. Negash Atenafu (ANRS BoCTPD)
12:10 - 12:45	Discussion: the need for coordination of stakeholders	Moderation: Mr. Mulugeta Seid (ANRS BoCTPD, Head)
12:45 - 14:00	Lunch break	
	Part 3: Towards fulfilling the BR criteria	
	3.1 Zonation	
14:00 - 14:15	Overview of Biosphere Reserve criteria and BR zonation	Mr. Friedrich zur Heide (Michael Succow Foundation)
14:15 - 15:05	Draft zonation proposals for LTR BR: • Wetlands • Wildlife and birds • Aquatic ecosystems • Existing forests • Forest rehabilitation areas	Dr. Ayalew Wondie (BDU) Shimelis Aynalem (BDU) Dereje Tewabe (ARARI) Dr. Alemayehu (ORDA) Alemnew Alelign (ORDA)
15:05 - 16:00	Discussion: how to harmonize the zonation with other land-use interests	Moderation: Mr. Mulugeta Seid (ANRS BoCTPD, Head)
16:00 - 16:30	Tea break	
16:30 - 18:00	**3.2 Way forward**	
	Project application to the German Government (BMZ)	Mr. Friedrich zur Heide (Michael Succow Foundation)
	Discussion: • What needs to be done next • Roles and responsibilities of various stakeholders	Moderation: Mr. Mulugeta Seid (ANRS BoCTPD, Head) or Mr. Berhanu Gebre (ANRS BoCTPD, Deputy Head)

Tentative participant list

Name	Institution/function
Mulugeta Seid	ANRS Bureau of Culture, Tourism and Parks Development (BoCTPD), Head
Berhanu Gebre	BoCTPD, Vize Head
Mr. Abraham Marye	BoCTPD, BR focal person
Abeje Zewdie	BoCTPD
Yosef Haileselassie	BoCTPD
Gezachew Alamerew	BoCTPD
Bayeh Tiruneh	ANRS Bureau of Environmental Protection, Land Administration and Use (BoEPLAU), Vize Head
Teklu Damtie	BoEPLAU, BR focal person
Woldegabriel Kidan	BoEPLAU
Sentayehu Deresse	BoEPLAU, Head of Land Administration and Use Core Process
Melesachew Fentie	BoEPLAU, Head of Environmental Protection Core Process
Sisay Asres	ANRS Bureau of Water Resources Development (BoWRD), BR focal person
Tenaw Mekonnen	ANRS Bureau of Agriculture (BoA), BR focal person
Dr. Ayalew Wondie	Bahir Dar University, BR focal person
Bazezew Gellaw	Bahir Dar City Administration, Vize Head
n.n.	Amhara National Regional State Government, BR focal person
Dr. Teshome Walle	Bureau of Agriculture, Vize Head
Friedrich zur Heide	Michael Succow Foundation
Michael Succow	Michael Succow Foundation
Lutz Fähser	Michael Succow Foundation
Fanny Mundt	University of Greifswald
Renée Moreaux	University of Greifswald
Christian Sefrin	Bonn University
Maxi Springsguth	University of Greifswald
Dr. Till Stellmacher	Bonn University
Prof. Prasse	University of Hannover, Environmental Planning
Dr. von Ruschkowski	University of Hannover, Environmental Planning
n.n.	Religious leader from Ethiopian Orthodox Church, West Gojam
n.n.	Religious leader from Ethiopian Orthodox Church, North Gondar
n.n.	Religious leader from Ethiopian Orthodox Church, South Gondar
n.n.	Religious leader from the Muslim community, West Gojam
n.n.	Religious leader from the Muslim community, North Gondar
n.n.	Religious leader from the Muslim community, South Gondar
n.n.	Representative from West Gojam Zone: Zonal Administration, Agricultural Department, Environmental Protection Department, Culture and Tourism Department
n.n.	Representative from South Gondar Zone: Zonal Administration, Agricultural Department, Environmental Protection Department, Culture and

	Tourism Department
n.n.	Representative from North Gondar Zone: Zonal Administration, Agricultural Department, Environmental Protection Department, Culture and Tourism Department
n.n.	Representative of the Woreda administration of: Bahir Dar City, Bahir Dar Zuria, Dera, Fogera, Libokemkem, Gondar Zuria, Dembia, Tagussa, Alefa, Northern Achefer Woredas
Dr. Ayalew Wondie	Bahir Dar Unversity, Biology Department
Dr. Minwyelet Mingist	Bahir Dar University, College of Agriculture and Environmental Sciences, Department of Fisheries, Wetlands and Wildlife Management
Dr. Berhanu Abraha	Bahir Dar University, Department of Biology
Dr. Endalkachew Teshome	Gondar University, Department of Tourism
Head	ANRS Bureau of Mining and Energy
n.n. (e.g. Fanta Beyene)	Lake Tana Transport Agency
n.n.	Forum for Environment (NGO)
Dr. Tadesse Amsalu	Bahir Dar University, Institute of Land Adminstration (ILA)
n.n.	Amhara Mass Media Agency
Dr. Ernst Mill	GIZ Amhara, Head
n.n.	GIZ Amhara
Bekele Zerihun	Sustainable Natural Resource Conservation Program in Northern Gondar (NGO)
n.n.	ANRS Bureau of Industry and Urban Development, Department of Investment & Department of Urban Development
	ANRS Bureau Small Enterprise (?)
n.n.	Regional Urban Planning Institute (RUPI)
Getinet Fetene	SNV Netherlands Development Organization
Fantahun Mengistu	Amhara Regional Agricultural Research Institute (ARARI)
Dereje Tewabe	Amhara Fisheries Research Center
Getachew Tamiru	Organization for the Rehabilitation Development in Amhara (ORDA)
Alemnew Aleligne	Organization for the Rehabilitation Development in Amhara (ORDA)
Dr. Alemayu Eshete	Organization for the Rehabilitation Development in Amhara (ORDA)
Metuku Kebede	Tana and Beles Integrated Water Resources Development Project, project leader (BoA)
Teferi Wondale	Agricultural Growth Program, coordinator (BoA)
Alehegn Dagnew	Community-based Integrated Natural Resources Management Project (CBINRM), ANRS BoA
n.n.	ANRS Bureau of Food Security and Desaster Preparedness
Head or Vize Head	ANRS Bureau of Finance and Economic Development (BoFED)
n.n.	Dreamlight Waste Collection private company
Head or Vize Head	Bahir Dar City, Waters and Sewerage Office
Getinet Bezabih	Blue Nile Millennium Park Office
Shimelis Aynalem	Bahir Dar University, College of Agriculture and Environmental Sciences, Department of Fisheries, Wetlands and Wildlife Management

n.n.	Amhara Development Association (ADA)
n.n.	“Hotel Association”
n.n.	ANRS Cooperative Agency
n.n.	Nile Basin Initiative (NBI)
Tenaw Ejubu	Nile Basin Irrigation Drainage Project
2 representatives	Lake Tana Wetland and Horticulture Association
n.n.	Lake Tana Fisheries Association
Babiyew Sibhat	Bahir Dar University
Tesfaye Minalhgen	PRA expert

Annex VII: List of projects related to land management

Title	Duration/ area	Field of activity/ major thrust	Stakeholders/ Implementation/funding	Relevance to BR LTR
Community-Based Integrated Natural Resources Management Project in Lake Tana Watershed-Ethiopia	2010-2017 21 woredas covering 15,000km²	• Objective: removing barriers to sustainable land management (SLM) through demonstrating best practices and stimulating upscaling; contributing to poverty eradication in the LTW through improving ecosystem integrity. Purpose: increasing household income through sustainable land management. Community-based integrated watershed management through: • supporting land administration and certification in the entire Lake Tana watershed • helping communities prepare and implement 650 watershed management plans • establishing a database of existing land-use patterns and natural resources • improving fodder management • rehabilitating severely degraded lands • promoting participatory forest management • supporting off-farm soil and water conservation measures • improving biodiversity conservation Institutional, legal and policy analysis and reform through: • fostering an enabling environment for • integrating sustainable land management best practices into regional policies, strategies and development programmes	Various institutions of the Government of Ethiopia **National level**: Environmental Protection Authority Ministry of Agriculture and Rural Development (MoARD) **Regional level**: Regional Steering Committee Project Coordination Unit Woreda Steering Committee Bureau of Agriculture and Rural Development (BoARD) ANRS Environment Protection, Land Administration and Use Agency (EPLAUA) GEF and IFAD (funding)	**Contribution to the BR idea** It contributes to biodiversity by: • Addressing habitat degradation of forests, lakes, and watercourses, including wetlands, and agricultural lands as a result of inappropriate management. • Climate protection mainly through afforestation and agroforestry activities as well as improving vegetation cover and carbon sequestration within the soil and within vegetation • Reducing soil erosion contributes to CBD through the restoration of ecological balance in fragile ecosystems (forest, agricultural land and wetlands) and conservation of endemic and indigeneous flora and fauna. • Community-based farming
Action for Sustainable Natural Resources Management to Combat Land Degradation for Improved Livelihood and	2008-2009	• Objective: to undertake community-based intervention in three micro-watersheds in order to achieve sustainable use and conservation of natural resources and	Ethio Wetlands and Natural Resources Association (EWNRA)	

Poverty Reduction in Fogera Woreda, Amhara Regional State		contributing towards improved household level livelihoods, increased food production and poverty alleviation • Target group: community members, kebele and local institution leaders and Fogera Woreda and Rural Development Office		
Tana & Beles Integrated Water Resources Development Project (TBIWRDP)	09/2008-09/2013	• Objective: to develop enabling institutions and investments for integrated planning, management, and development in the Tana and Beles Sub-Basins to accelerate sustainable growth (World Bank 2008: vii)		
Sida Amhara Rural Development Programme	1997-2008	• Objective: to improve food security and reduce poverty of rural people to develop two of the ten Zones in the Amhara Region: East Gojjam and South Wollo Activities: • Support for land tenure security – introducing a land administration system, and providing landholders with certificates to their land to encourage them to invest in it. • Improving agricultural productivity and natural resources management – introducing new crops, livestock breeds, farming techniques and small scale irrigation together with innovative approaches. • Economic diversification – supporting the development of non-farm enterprises and creating new sources of income for local people. • Developing infrastructure and social services, such as roads, bridges, drinking water supply schemes, irrigation systems, schools, health posts and centres. • Promoting gender equality and mainstreaming HIV/AIDS into programme activities • Decentralization and capacity building – enabling local governments and communities	SIDA Orgut-Scanagri Consortium ANRS regional, Woreda and Kebele institutions	

		to make decisions that concern them, and ensuring that government staff and local people have the skills and resources they need to promote development. (SARDP 2010)		
Sustainable Land Management Program (GIZ)	35 watersheds in six Regional State (Amhara, Oromiya, Tigray, SNNPR, Beneshangul Gumuz, and Gambela)	• Objective: to reduce land degradation in agricultural landscapes and improve the agricultural productivity of smallholder farmers. • Global environment objective is also to reduce land degradation, leading to the protection and/or restoration of ecosystem functions and diversity in agricultural landscapes • Components: • Watershed Management / Rural Land Certification and Administration / Project management / Knowledge management	Government of Ethiopia: Ministry of Agriculture and subordinate institutions German International Cooperation (GIZ) World Bank	Beneficial because: • Project sites are located in the LTW • Model sites for watershed management measures • Contributing to addressing upstream-downstream linkages, reducing siltation of the lake, implicit benefits for biodiversity (e.g. through area closures) • Ideal for development zones within the BR
Ethiopian Nile Irrigation and Drainage Project (including Megech Pump Irrigation and Drainage Project and Ribb Irrigation and Drainage Project)	Floodplain of Lake Tana Total approx. 100,000 ha Budget: $ 178.7 Mio.	• Objective: Assist the Government of Ethiopia in identifying investments in irrigation that are cost effective, environmentally and socially sound, and beneficial to the rural poor, and to finance such investments adding approx. 20,000 hectares to irrigated area • Development objective of the project is to sustainably increase agricultural output and productivity in project areas. • To sustainably develop about 20,000 hectares (Megech-Seraba and Ribb) of infrastructures • To prepare feasibility studies for up to 80,000 hectares of new irrigation development in selected sites, including Upper Beles, Negesso & Megech-Robit	Ministry of Water and Energy World Bank (funding)	• Alteration of wetland ecosystems and their benefits • Risks from chemicalization of agriculture and eutrophication, loss of crop variety diversity • Zonation: no buffer zones; need to be harmonized with potential core and buffer zones (downstream implications) • Agricultural production should be needs-oriented
Bahir Dar Abay (Blue Nile) River Millennium Park (BDBNRMP)	2010-2014 (strategic plan)	Objectives: • to conserve, preserve manage and enhance the natural, physical, ecological, and cultural	BDBNRMP Office	• Contribution to BR as the only protected area • Potential model for

		resources • develop sustainable tourism for the benefit of present and future, generations of the local and international communities • to become a model for sustainable environmental conservation, tourism, and scientific research (biodiversity conservation and sustainable utilization is a prime goal) • Vision for 2015: a successful and sustainable biodiversity, scenic beauty and tourism industry that will benefit all stakeholders		recreation and environmental education sites for urban population • Zoning for different uses; • Alignment with the Bahir Dar city Development Plan necessary (integration to address urban dwellers)
Bahir Dar Integrated Development Plan	Five-year plan 2004-2009	• Objective: prepare a strategic development plan, which guides and informs all the planning, budgeting, managing and decision - making in a municipality for a five year period • Components: urban-urban and rural-urban linkage study, the metropolitan study and city-wide level study plan	Bahir Dar City Administration Federal Urban Planning Institute (FUPI)	• Integrated approaches helps address urban-rural linkages (regional planning perspective)
Ethiopian Energy II Project: Woody Biomass Inventory and Strategic Planning	1999	• National inventory of woody biomass yield and fuelwood consumption • Objective: to strengthen strategic planning and woody biomass inventory capabilities to identify and manage the country's woody biomass resources and to define a strategy for meeting the biofuel needs of the future and counter the negative impacts of deforestation.	Ministry of Agriculture and Rural Development	• GIS database for planning forest rehabilitation interventions and fuelwood plantations
Sustainable Resource Management Program in North Gondar (SRMP-NG)	01/2008-12/2012 Total budget: € 8.2 million	• Overall objective: to contribute to sustainable rural development and improvement of food security in North Gondar through rational use and conservation of natural resources and increase household income in 19 selected Woredas • Beneficiaries: farmers, 50,000 households Component: • Market-oriented livestock development • Integrated watershed management • Alternative livelihood options: poultry, bee-	ANRS Bureau of Finance and Economic Development and PCU, Woredas, BoCT, PaDPA, DoA, DoEPLAU, Gondar Agricultural Research Centre	• Some target Woredas are in LTR Best practices from: • Area closures • Natural forest protection • Forestry and agro-forestry development • Land registration • Preparation of by-laws for communal lands • Agricultural intensification:

		keeping, **sesame production** and marketing, cooperatives for fattening • Community based (eco)tourism development (Semien) • Park infrastructure and its management • Rural land administration • Capacity building and action-research • Program management and gender		introduction of high-value crops • Promote production and utilization of indigenous forage resources and zero grazing
Productive safety net APL	2004-2012 Grant amount: US $55.7 million	• Objective: support for the creation of productive and sustainable community assets; and contribute to large-scale rehabilitation of severely degraded areas • The project provides grants to households whose adults participate in labour-intensive public works (mostly watershed and communal land management related work) and to households that are labour-poor and cannot undertake public works	Ministry of Agriculture World Bank (funding)	
Food Security Project	2002-2010	Activities: Provide grants to communities to create and increase household and community assets and incomes by: • better management of rain fed agriculture (crops and livestock) • investment in small-scale irrigation • better natural resource management through "zero tillage" techniques on farms, and catchment level activities to conserve soil, reverse soil degradation, improve water harvesting and use	Regional governments of Amhara, Oromia, Southern Nations and Tigray World Bank (funding)	• Transferring experiences with zero tillage to the LTR context to address siltation and increase agro-biodiversity • Promote regionalization of agriculture
Tana-Beles Hydropower Project	2010 completed	• Divert water from the western shores of Lake Tana to the Beles basin through a tunnel with the objective of providing hydropower (460MW installed capacity)	Ministry of Water and Energy	• Lowering of the lake water level and reduction of wetlands • Decreasing pressure on fuelwood resources
Koga Irrigation and Watershed Management project	Since 2002 (ongoing)	• Located in Amhara region, with an irrigation command area of 6,000 ha, covering a catchment area of 22,000 ha	Ministry of Water and Energy African Development Bank	

Eastern Nile Planning Model	Since 2009 Nile Basin	• Objective: that countries in the Eastern Nile adopt an improved decision support modeling framework to identify water-related investments and evaluate them in a regional context • Components: knowledge base development, modeling system, institutional and human capacity building	Eastern Nile Technical Regional Office (ENTRO)	
Flood Preparedness and Early Warning - Phase I and II	2007-2016	• Objective: To reduce human suffering caused by frequent flooding while preserving the environmental benefits of floods • Focus: flood risk management and non-structural approaches to managing the impact of flood. The FPEW project enhances regional collaboration and improves national capacity in the mitigation, forecasting, warning, emergency preparedness, and response to floods in the Eastern Nile basin	Eastern Nile Technical Regional Office (ENTRO)	
Agribusiness and trade expansion	2006-2009 Ethiopia	Objective: provide clients with an integrated program of technical assistance and training focusing on four agricultural subsectors of major importance to Ethiopia: • Horticulture • Oilseeds • Coffee • Hides, Skins and Leather products	USAID Ministry of Agriculture Ministry of Trade and Industry Ethiopian Grain Trade Enterprise (EGTE) Ethiopian Horticultural Producers and Exporters Association Oilseeds Association Coffee Exporters Association	There is a potential for marketing natural products such as coffee without transforming ecosystems

Annex VIII: Further Reading on Lake Tana and Biosphere Reserves

Content:

a) Biodiversity conservation and biosphere reserves
b) Studies on Lake Tana
c) Wetlands
d) Socioeconomic documents
e) Agriculture
f) Water development and management
g) Forests and forestry
h) Fishery
i) Tourism
j) Project documents

a) Biodiversity conservation and biosphere reserves

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b) Studies on Lake Tana

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c) Wetlands

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