



# Lake Tana Biosphere Reserve Day

## Reference Manual for Teachers



## **Reference Manual Lake Tana Biosphere Reserve Day**

### **Imprint**

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### **NABU project**

“Community-based Climate Adaptation and Biodiversity Conservation in the model area of Lake Tana Biosphere Reserve, Ethiopia” (2016-2018)

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## **Foreword by Svane Bender, NABU Vice Head of International Affairs and Head of NABU's Africa Programme**

Dear teachers, dear students,

**What does the Lake Tana Biosphere Reserve have to do with your school?** Isn't it more important to learn about maths, and how to read and write?

Well, we are all part of the global biodiversity and depend on a functioning environment providing us with air to breathe, water to drink, and food to survive. Each and every tiny plant, animal or other organism takes a place in this system. When it disappears, the whole system will deteriorate until it might collapse, leaving us without water and without food...

Doesn't it therefore sound logical that we need the essential knowledge in order to care about our environment and its fascination diversity? Shouldn't we make sure not to destroy what has been given to us as the basis of our life? The Lake Tana Biosphere Reserve is a first step into the right direction – together with you, we want to protect the Lake and the whole environment.

For over a hundred years, **NABU** (The Nature and Biodiversity Conservation Union) has been promoting the interests of people and nature, drawing on its unwavering commitment, specialised know-how, and the backing of about 600,000 members and supporters. One of **NABU's** major aims is conducting environmental education, which is why it runs more than 70 environmental education centres in Germany. It also hosts its own youth organization, NAJU, bringing together 80,000 children and youngsters. **NABU** is the German partner of BirdLife International and closely cooperates with its BirdLife partners around the world.

This manual is designed to provide you with an overview of the complexity of the Lake Tana Biosphere reserve, biodiversity, nature conservation, and climate change. It will assist you in understanding each subject and in passing your knowledge. It offers you a large selection of activities that let students experience and learn how ecosystems function, why certain behaviour (e.g. deforestation) is dangerous and how to play an active role in protecting it. In teaching biodiversity and related matters, you will become an ambassador for the environment and the Lake Tana Biosphere Reserve!

I would like to thank all teachers and students, our partners at Amhara's Bureau of Education and the Amhara Environment, Forest, Wildlife Protection and Development Authority, our **NABU** team in Bahir Dar, the participating teachers and the NAJU for contributing to the development of this wonderful Manual.

Enjoy and make use of it!

*Svane Bender*

*NABU Vice Head of International Affairs and Head of NABU's Africa Programme*

## **Key Note by Dr. Yilkal Kefale, Head of ANRS Bureau of Education**

Dear teachers, dear students,

Lake Tana is one of the most essential lakes in Ethiopia because of its biodiversity, socio-cultural features and economic importance. It is well known for its diverse fish and bird fauna. Moreover, it is home of several woody plants and wetland species like papyrus. Another element contributing to the natural wealth of the lake are its several islands covered with forests which are linked with many traditional beliefs. Apart from the natural resources, Lake Tana and its surroundings are well known for its historical and religious monasteries with fascinating paintings and historical artifacts.

However, these natural and cultural resources of Lake Tana have been degraded because of unsustainable human use that are resulting such as invasion weed called water hyacinth. Hence, we all have the responsibility to protect our natural heritage, utilize resources efficiently and transfer these values to the next generation.

Especially, the school community has responsibility to save Lake Tana and its surrounding resources. As part of the local community, the school community is utilizing Lake Tana and its surrounding resources. In utilizing these resources, it is expected to be responsible and an inspiring example to others. On the other hand, the schools are closer to the local community and are expected to raise awareness and teach the community members in using the natural resources of Lake Tana in a sustainable way and to protect and preserve the resources.

Therefore, I would like to appreciate your efforts so far in protecting natural resources of Lake Tana and promoting their sustainable use. Your commitment is a key to transfer a healthy lake to the next generation.

*Dr. Yilkal Kefale*

*Head of Amhara Region Bureau of Education*

## **Key Note by Dr. Belayneh Ayele, Director General ANRS Environment, Forest, Wildlife Protection and Development Authority**

Dear teachers, dear students,

Lake Tana is rich in biodiversity, culture and other natural resources. Because of this, it has got recognition from UNESCO as biosphere reserve site in June 2015. However, because of population increase, rapid urbanization and unsustainable utilization of resources, the natural environment and its biodiversity are degrading.

Saving the lake's resources and transfer them to the next generation, requires the contribution and efforts of all of us. Particularly, the school communities are close to the lake resources and recognize easily threats and challenges the lake is confronted with. Recently, because of its damage, invasive weeds are infesting rapidly different parts of the lake. Especially the water-hyacinth is becoming a serious threat and affects negatively the day to day life of the community.

Without the contribution of the local community and other partners, it is impossible to address the current problems of the lake and secure sustainable development that help to improve the living standards of the community living bordering to the lake.

Therefore, I am very happy to work with you and NABU to save the resources of the lake and transfer them to the next generation. Let's save Lake Tana together it!

*Dr. Belayneh Ayele*

*ANRS Environment, Forest, Wildlife Protection and Development Authority, Director General*

## Acknowledgements

Five volunteers from NABU's youth organization NAJU supported the development of the activities in this manual during a 10-day delegation trip in May/June 2018.

During a three-day teacher workshop, visits to five schools in different Woreda around Lake Tana and a focal point workshop the current challenges to be addressed by activities during the Lake Tana Biosphere Reserve were identified, discussions on best approaches and feasibility of activities were held and made strangers became friends.

Thank you to all participants and your active commitment to saving Lake Tana.



Representatives of all 11 Woreda Offices of Education and Environment, as well as the 10 Lake Tana Nature Rangers participated in a Focal Point workshop, varifying the findings and activities developed jointly with the teachers and identifying options and possibilities on how to ensure the knowledge is shared to all 387 schools in the Lake Tana Biosphere Reserve.

Thank you to all participants for your support in sharing this manual and to protecting Lake Tana with their engagement every day.



## 1. For people and nature: the significance of the natural and cultural resources of Lake Tana

Lake Tana and its surroundings are rich in rivers, wetlands, religious and historical monasteries and churches. In addition to this, the region is characterised by a high degree of biodiversity because of its unique landscapes and natural resources.

### 1.1. Natural resources of Lake Tana

Lake Tana is located in the north-east of Ethiopia and is the largest lake in the country. The lake is situated 1,830 m above mean sea level (a.m.s.l) with its highest point at the Ararat Plateau, which is 1,994 m a.m.s.l. The lowest point of the lake is located near Bahir Dar, at the outlet of Blue Nile River from Lake Tana, which is 786 m a.m.s.l. According to various sources, many years back, the total area of the lake once was 6,602 km<sup>2</sup> while now it has shrunk to 3,156 km<sup>2</sup>. The total area of the catchment measures over 15,000 km<sup>2</sup>. The width of the lake (from east to west) is 68 km while its length (north to south) is 73 km. It measures 14 m at its deepest point while the average depth is estimated to be 8 m. The Blue Nile River, the major tributary of the Nile, the longest river in the world, starts its journey at Lake Tana.

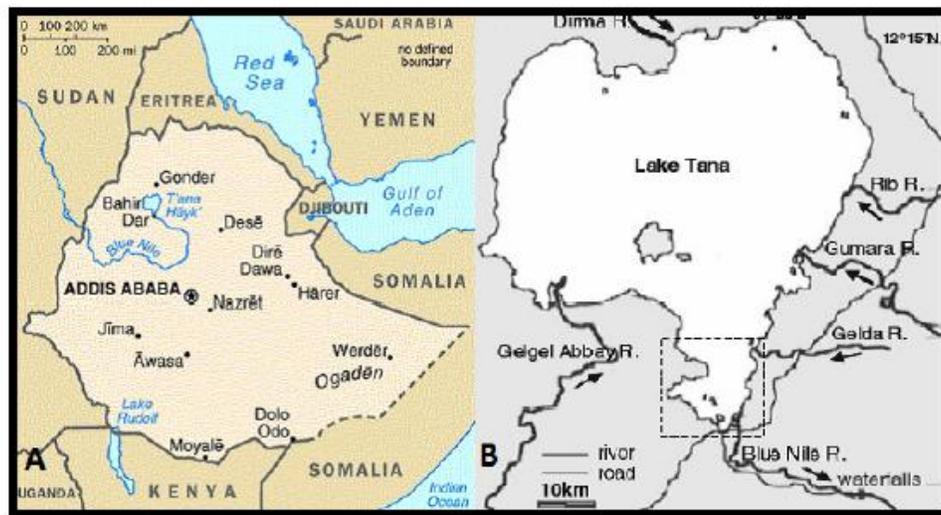


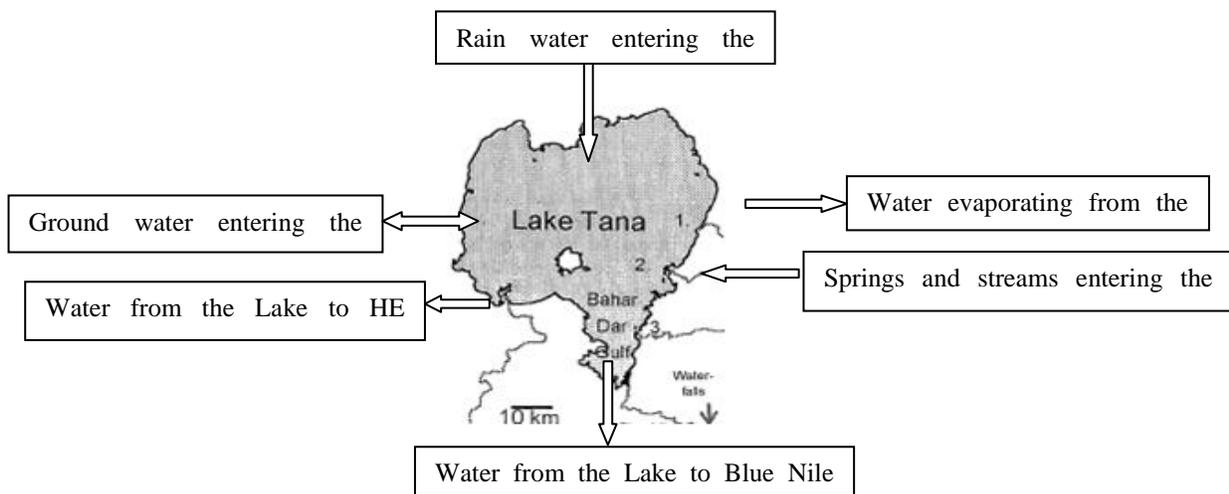
Figure 1: Topography of Lake Tana

The catchment of Lake Tana encompasses the region from Guna to Sekela and from Armachiho to Enjibara and parts of four zonal administrations, 10 woredas, a total of 117 kebeles and the Bahir Dar city administration.

**Water Resource**

The main water sources of Lake Tana are ground water, surrounding springs and rivers and rain water. More than 60 springs and five big rivers (Gilgel Abay, Rib, Gumara, Megech and Arno Garo) feed Lake Tana. Blue Nile (also named River Abay) is the only river springing from Lake Tana and running 35 km in South-East direction, before it forms a wonderful tourist attraction called Tis Issat Falls.

The water of Lake Tana is used for irrigation, fish production, transportation, tourism, hydro-electric power generation and as a source and home for many plants and animal species. It is a fundamental source of living for local communities settle around the lake. Because of these, the area is considered to be one of the growth corridors at a federal and regional level.



**Figure 2: Water Sources of Lake Tana**

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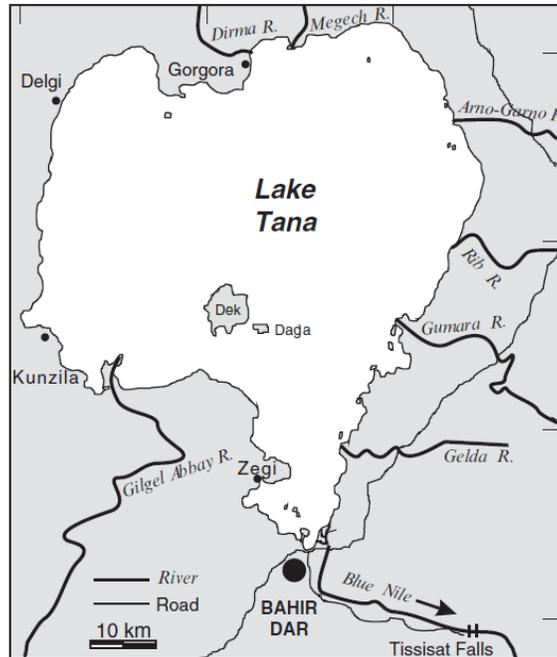


Figure 3: Tributaries of Lake Tana and outgoing rivers

### Wetlands

Wetlands are areas which can hold water temporarily or permanently. They are located at the side of lakes, next to rivers and at ditches far from other water sources. The wetlands in Lake Tana region are of importance due to the following reasons:

- **Functions** – Wetlands prevent floods, soil erosion and the entrance of waste, e.g. from towns. They also purify water, support the nutrient cycle and store carbon and therefore prevent climate change.
- **Products** – Wetlands provide fish, firewood, lumber and animal food; the reed that grows near the lake is used to build roofs. Papyrus, a grass growing in the wetlands around the lake, is used for household goods, souvenirs, reed boats (*tankwa*), to build fences and to decorate the house during celebrations.

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**Figure 4: Views of wetlands in Lake Tana**



**Figure 5: Some products made using papyrus**

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**Table 1: Some of the wetland patches in Lake Tana area**

Name of Woreda	Name of the wetland
Bahir Dar <i>Zuria</i>	Latamba, Iijome, Wenjeta, Sekelet, Ambo Bahir, Dek, Enfranz, Daki and Tomet
North Achefer	Legidiya, Estumit (inlet of Gilgel Abay), Chimba, Kunzila, Kunzila town, Wenberia eyesus area
Dembia	Megech river area, Achera, Seraba area, Gorgora, Dirma river area, Robit area
Gondar <i>Zuria</i>	Agid Kirigna, Arno Garno river area
Takusa	Asratie tokaw, Konso toka, Kechinit, Chegera toka, Bergen toka, Goja toka, Achera area, Sensay toka, Ginza toka
Alefa	Beles mesk, Kentie jonka, Esey debir area, Azo bahir, Birr wuha area, Dengel ber area, Dengel shewa area
Fogera	Wulela, Shesher, Kiristos Semmira area, Gumara river area, Woreta plain area
Libo kemkem	Rib river area, Daga tokaw
Dera	Korata area, Tana kirkos, Geldaw river area, Gumara, Kiristos Semira area, Ahunweta area, from Fiseash to Lam Maderia, Bosit, Dengecha
Bahir Dar	Gami Mesk, Debre Mariam area, Gedero, Selchen, Gudo bahir, Aba Gerima, Enfranz river, Bahir Dar University Abbay area, Chere chera Wier area, Wereb, Weramt area

### Islands

There are 37 islands in Lake Tana while the number fluctuates as a result of the increasing and decreasing water level during dry and rainy seasons. Among these islands, 19 host historical and religious monasteries and churches. Some islands are rocky, serving as nesting places for birds, while others are covered by trees.



**Figure 6: Kibran Gebriel: One of the islands of Lake Tana**

### Buffer function

The Lake Tana region serves as a buffer between potentially harmful substances and the water. It purifies the lake water by naturally filtering through wetlands and plants to clear it from harmful liquid waste, siltation and chemical fertilizers or pesticides.



**Figure 7: Birds laying eggs taking papyrus and branches of trees in Lake Tana**

### Biodiversity

Lake Tana and its surroundings are home to a vast variety of different species. Some of them are endemic, others are migratory species only staying for some months every year - but all are in desperate need of protection.

The biosphere reserve is located within the East Afromontane Biodiversity Hotspot. The biosphere reserve is home to a rich terrestrial and aquatic fauna and flora of which many species are endemic to the area.

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### Fish

There are more than 200 fish species in Ethiopia, 40 of which are endemic. In Lake Tana region there are 28 types of which 19 are endemic in Ethiopia, mainly of the following categories:

**Table 2: Major categories of fish in Lake Tana**

No.	Amharic	English
1	<i>Kereso</i>	Tilapia
2	<i>Ambaza</i>	Catfish
3.	<i>Nech asa</i>	Barbus
4	<i>Bezo</i>	Varicorhinus beso



**Figure 8: Fish in Lake Tana: Catfish and Barbus respectively**

Lake Tana is the highest-lying of the great lakes of Africa, the source of the Blue Nile River that contributes most of the water to the Nile River system and contains an extraordinary diversity of cyprinid fishes. The floodplains around Lake Tana provide important habitats for waterfowls and seasonally migrating fish stocks for spawning.

While 1,454 tons of fish are annually produced in the Lake Tana region using traditional methods, it is possible to produce up to 15,000 tons a year by using modern processes.

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**Figure 9: Fish produced and stored using modern methods**



**Figure 10: Fish produced using the traditional method**

Although the fish production in Lake Tana region decreases more and more, the species “Barbus” and “Varicorhinus” are currently seriously endangered.

### Mammals

284 species of mammals are found in Ethiopia, of which 29 are endemic. Many mammals can be found in and around Lake Tana, including the hippopotamus (*Hippopotamus amphibious*), black and white colobus monkey (*Colobus guereza*), and leopard (*Panthera pardus*). For more information please see annex five.



**Figure 11: Mammals in Lake Tana: Grivet monkey and hippopotamus**

## **Reptiles and Amphibians**

There are 201 species of reptiles and amphibians in Ethiopia including 10 endemic ones. Reptiles that are commonly found in Lake Tana region are crocodiles, water snakes and pythons; toads and frogs are examples for amphibians domiciled in this area.



**Figure 12: Nile monitor of Lake Tana**

## **Birds**

Ethiopia is home to 861 different bird species, of which 18 are endemic. The Biosphere Reserve supports the conservation of avifaunal biodiversity, providing habitats for a wealth of bird species. More than 300 types of birds inhabit the region around Lake Tana, of which 50 are ecologically crucial for preserving biodiversity, while they also attract international attention for their rarity. Lake Tana is internationally known as an Important Bird Area (IBA).

The lake and the surrounding wetlands host a wide variety of birds both resident and migratory. Many Palaearctic migrant water birds depend on the lake as feeding and resting grounds, including the common crane (*Grus grus*), northern shoveller (*Anas acuta*), black-tailed godwit (*Limosa limosa*) and ruff (*Philomachus pugnax*). Furthermore, it provides habitats for several endangered and endemic species, such as the wattled crane (*Grus carunculatus*), wattled ibis (*Bosstrychia carunculata*), white-collared pigeon (*Columbia albitorques*), black-winged lovebird (*Agapornis taranta*) and white-cheeked turaco (*Tauraco leucotis*), pallid harrier (*Circus macrourus*) and black-crowned crane (*Balearica pavonina*).

Migratory birds such as the Eurasian or Common Crane shelter in this area during the winter in the northern hemisphere. These birds come to Lake Tana from Western Europe to escape from the snow and the cold and return to their home countries at the beginning of March every year.



**Figure 13: Birds around Lake Tana: Crowned crane and pelicans**

## Plants

There are over 6,000 species of big plants in Ethiopia, of which 10% are endemic. As indicated in various studies, there are 181 species of trees and shrubs in and around Lake Tana.



**Figure 14: Some of the old trees in Lake Tana Area**

## 1.2. Cultural and economic resources

### Churches and monasteries

In Lake Tana, there are more than 19 ancient and historical monasteries and churches most of which are found on islands while the others are situated at the shore of the lake. The monasteries and churches on the islands of Lake Tana are of high architectural value. They are valued as tourist attractions due to their paintings, manuscripts, dresses of former empresses and annual religious celebrations. The monasteries are rich in private goods of former emperors, burial places of former kings, wall paintings, architectural features and writings on

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parchment (*Birana*). In addition, monastery life plays a pivotal role to preserve endemic trees, wildlife and other natural resource. As an example, monastic communities have protected the last remaining forests in the region as well as promoting the protection of wildlife and nature.



Figure 15: Some monasteries around Lake Tana

### Local culture and annual celebrations

Among the various annual celebrations in Lake Tana and its surroundings are *Meskel* (commemoration of the Finding of the True Cross), *Epiphany* and *Eid-Al Fetir*.



Figure 16: Annual religious celebration at Saint George Church, Bahir Dar

### Source for traditional medicine

Lake Tana (especially Zegie Peninsula) is home to numerous important medicinal plants which are used for both human and veterinary ailments. Some of these medicinal plants are locally rare. Examples are *Dorstenia barnimiana*, *Plumbago zeylanicum*, *Gnidia glauca*, *Clutia abyssinica*, *Stephania abyssinica* and *Cucumis ficifolius*.

### Source for water for irrigation and human consumption

Lake Tana is considered as the water tower of Ethiopia because it accounts for 50% of the total inland waters of the country with 60 seasonal and perennial rivers that flow into it. As the

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source of the Blue Nile it contributes a significant amount of water to Sudan and Egypt through the Nile system. A number of traditional Water User Associations (WUA) are found across the Biosphere Reserve, which are usually organized around traditional irrigation schemes.

Besides drinking water and irrigation the lake provides various other services: Groundwater recharge including maintenance of springs and moderation of stream flow and floods, water storage throughout the year, water purification through the functioning of reed beds and the filtration of water flow and sediment trapping.

### **Providing local and modern transportation service for people and goods**

There are eight ports at the lake offering transportation service (Bahir Dar, Afafa, Ura, Gurer, Kunzila, Esey Debir, Delgi and Gorgora). The lake is an important means of transportation of goods, e.g. by ferry operating between the 6 main landing points.



**Figure 17: Traditional and modern ways of transportation in Lake Tana**

### **Water and water-related attractions**

The different activities you can do because of the water access are motivating tourists to visit the region, which makes tourism an important income source for boat owners, hotels, tour operators and monasteries.

### **Providing food**

The area is also the distribution area of the endemic *Fogera* cattle breed and produces traditionally meat, honey, crop and fish.

### **Providing income**

Different income possibilities are available in the region, including low-consumption land-use (e.g. natural coffee harvesting), subsistence-based and commercial agriculture (sales of fish,

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papyrus, etc.), livestock production and fishing. On Zegie Peninsula, coffee (*Coffea arabica*) is the main source of income. Lake Tana's churches and monasteries are important cultural and religious heritage sites for the Ethiopian Orthodox Christians as well as interesting tourist destinations. In this regard it is noted that the culture-historic landscapes are characterised by a fusion of different cultures and their history. The tourism sector plays a key role in Ethiopia and the Biosphere Reserve, 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. 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.

### **Source of wood, coffee, fruit and fodder**

The wetlands provide a source of animal feed, building materials, fuel, food (honey, fruits, coffee) etc. to the local communities. One of the most important wetland species found in these wetlands is the papyrus, *Cyperus papyrus*, which is used as building material, fuel, and the making of the unique Tankwa reed boats. Certain types of Lake Tana's wetlands are used as grazing sites, for crop production (rice, pulses, vegetables) and as fish and seedling nursery sites.

### **Agriculture at Lake Tana**

Lake Tana region is blessed with high yields and good agricultural outputs. The major agricultural products are teff, maize, rice, finger millet, sorghum, chickpea, sunflower, lentils, vetch wildfire, garlic, onion, black cumin, white cumin, tomato, fenugreek, faba bean, pepper, mango, avocado, papaya, potato, hopp tree, coffee, lemon, cabbage and sugar cane. The region has a very high genetic diversity in four of the world's widely grown food crops (wheat, barley, sorghum and peas), in three of the world's most important industrial crops (linseed, castor and cotton), in a number of food crops of regional or local importance (teff, lentil, enset, etc.) and in a number of groups of forage plants of world importance (clovers, lucerne, oats, etc.).

### **Electric power**

The water from the Lake Tana dams, such as Tis Abay 1 (11 MW), Tis Abay 2 (75 MW) and Tana Beles (460 MW) produce electricity and are the main power source in the region. Likewise, water from Lake Tana partially contributes to the Renaissance Dam that is expected to produce 6,000 MW.

### 1.3. Challenges of the natural and cultural resources

Even though Lake Tana and its surroundings are naturally endowed with various resources, nowadays they are highly exposed to man-made and natural challenges.

#### Uncontrolled agricultural expansion

Due to the increasing population growth, most of the wetlands are used for agriculture, which leads to a loss of these valuable areas in Lake Tana region. By losing its for the ecosystem essential wetlands, the lake cannot fulfill its beneficial functions any longer.



**Figure 18: Destructions caused by humans in Lake Tana region and its surroundings**

#### Deforestation

Cattle grazing freely and the increasing demand for fuel wood leads to the destruction of natural forests. This deforestation impacts the soil quality and leads to erosion as well as to a loss of biodiversity as habitats disappear forever.



**Figure 19: Fuel wood being taken to town from Zege and its surroundings**

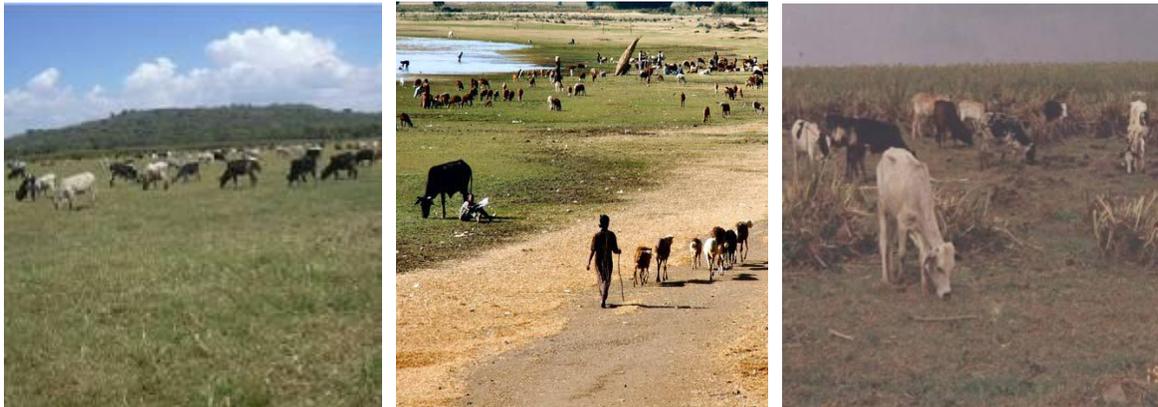
## **Reference Manual Lake Tana Biosphere Reserve Day**

### **Unregulated fishing**

Laws exist to protect the rich fish resources of Lake Tana from overfishing, e.g. prohibitions during the spawning season when the fish lay eggs. A continuous supply of fresh fish is only possible in Lake Tana if the species are able to reproduce.

### **Increasing rate of overgrazing**

As cattle husbandry in the area increases, overgrazing has become a great challenge. The grass cannot grow fast enough, resulting in a degradation of the grounds and pastures.



**Figure 20: Uncontrolled grazing**

### **Urbanization and lack of waste management**

The rapid urbanization in Lake Tana region causes rapid increases in the amount of garbage. As there is no proper waste management, the waste is thrown into the river in the end. Plastic and chemicals cannot be absorbed by plants etc., therefore water is getting polluted and causes sickness.



**Figure 21: Picture showing careless and random waste disposal**

### **Expansion of various exotic/invasive weeds**

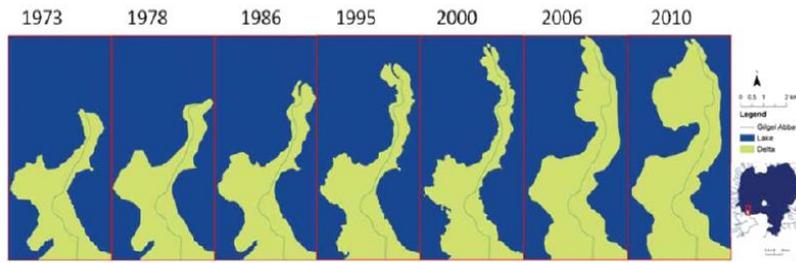
Among the exotic or so-called invasive weeds, the water hyacinth has been noted as the species posing the biggest challenge to the lake. By forming a cover on the water surface, it prevents the oxygen intake of the lake, decreasing water quality and for this resulting in fish loss. With a decreasing fish population, e.g. mosquitoes can reproduce faster and spread diseases such as malaria.



**Figure 22: The community is mobilized to remove water hyacinths**

### **Siltation**

Due to farming activities in higher regions, soil ends up in tributaries that flow into the lake. As a result of this change in land use systems, the lake suffers from an increasing siltation.



**Figure 23: Expansion of Delta of Gilgel Abay**



**Figure 24: Soil erosion**

### **Degradation of cultural and historical resources**

Due to a lack of knowledge and awareness among local communities, cultural and historical places are being damaged and robbed.

### 1.4. Consequences for the people of Lake Tana

In general, the size of the lake as well as the variety of fauna and flora are sharply decreasing. This decline has consequences on several aspects of the life of the local population.

One example is the decreasing fish production; the *varicorhinus beso* is nowadays uncommon to find in Lake Tana. The wetland grasses filla and papyrus have become rare and the use of papyrus is restricted only at the western shore of the Lake.

To ensure the transfer not only of historical knowledge but also of natural resources it is important to do everything that is possible to conserve the lake and its wetlands and implement a sustainable use of the available resources. Otherwise Lake Tana will share the fate of Lake Chad.

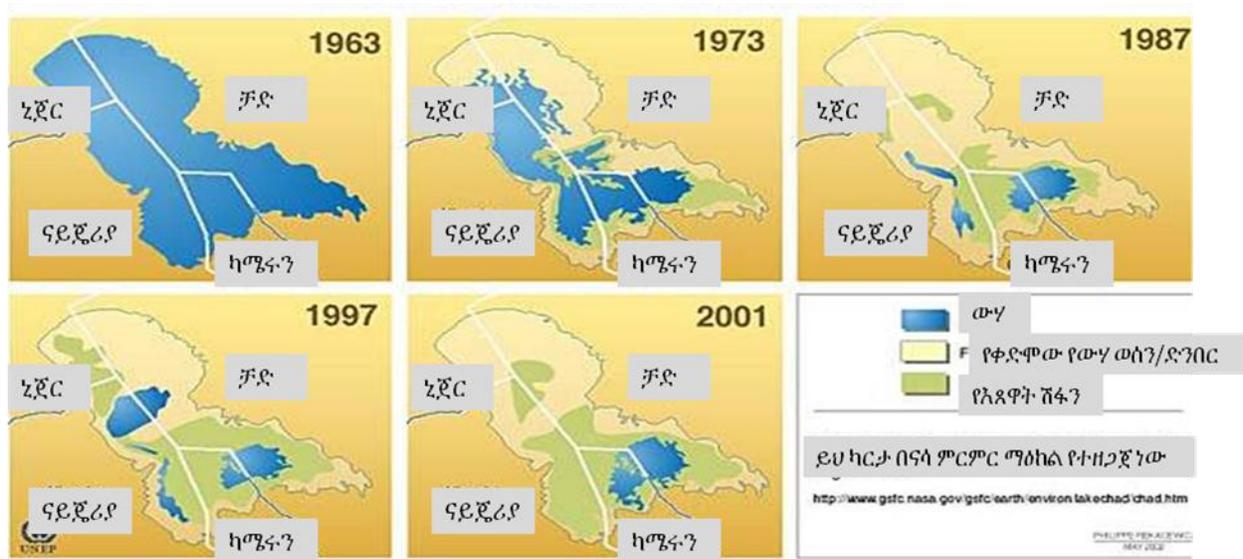


Figure 25: Another example of siltation - changes in Lake Chad area (1963-2010)

To permanently alleviate these problems and use the potential resources of the area, a major step has been the registration of Lake Tana area as a UNESCO biosphere reserve in 2015. The Lake Tana Biosphere Reserve provides the space for sustainable implementation of social and economic development schemes which are compatible with natural resource conservation.

## **2. Concept of a Biosphere Reserve**

Biosphere Reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. Potential sites are nominated by national governments and after the approval by UNESCO they become part of the worldwide network of biosphere reserves. Still, the sites remain under the sovereign jurisdiction of the states they are located in for further protection.

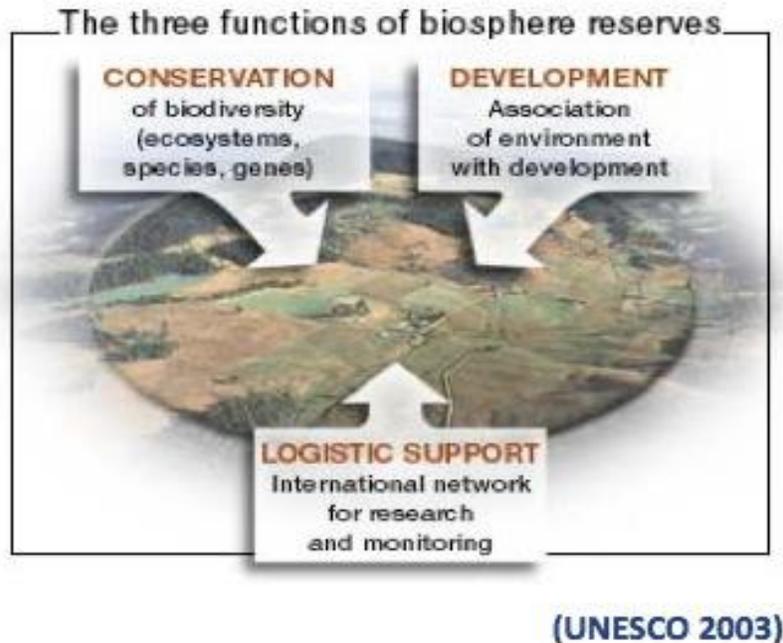
This approach enables a sustainable and integrated resource management and thus contributes to a peaceful coexistence of humans and nature. In a well-established biosphere reserve natural and social science researchers, environmental conservation and development teams, the local community and government leaders act in a coordinated manner to solve the complex problems of infrastructure development, fighting climate change and ensuring the conservation of biodiversity.

According to UNESCO, general criteria for establishing a biosphere reserve are:

- 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 in sustainable development on a regional scale
- It should have an appropriate size to support the three functions of biosphere reserves: conservation, development and logistics support
- It should promote these functions through appropriate land-use planning and zonation, recognizing legally constituted core areas, buffer zones and transition areas
- Public authorities, local communities and private interest groups should be involved and participate in the management of the biosphere reserve.
- In addition, provisions should be made for:
  - Mechanisms to manage human use and activities in the buffer zones,
  - A management policy and management plan for the area as a biosphere reserve,
  - A designated authority or mechanism to implement this policy and plan,
  - Programs for research, monitoring, education and training.

### **2.1. Three functions of an UNESCO biosphere reserve**

The main aim of a biosphere reserve is to combine nature conservation and sustainable economic development. Three major functions were identified as necessary to achieve sustainable development in the biosphere reserve.



**Figure 26: Three functions of the biosphere reserve**

### Conservation function

Due to high pressure exerted by humans on land and water resources, various plants, animals and ecosystems are deteriorating. This development cannot be the interest of any party as nature is the source of all our raw materials for food, medicine and buildings.

Taking care of the environment, conserving biodiversity and sustainably using resources in the biosphere reserve ensures that the community can benefit from it not only now, but also in the future. The activities of natural resource conservation include:

- Ensuring the conservation of landscapes, ecosystems, species and genetic variations, e.g. through the establishment of protected areas, community management, reforestation, etc.
- Encouraging the traditional use systems, e.g. small-scale fishing and traditional agriculture
- Understanding the patterns and processes in ecosystems through research and monitoring
- Understanding the significance of environmental services
- Awareness creation for decision makers, local communities and children.

## **Development**

As biosphere reserves are meant to be model areas for sustainable development, it is of high importance that the development of the region is supported - while keeping conservation in mind.

Pilot activities for alternative land use systems, alternative income generation measures, ecotourism development and the promotion of sustainable regional products are just some examples of what a biosphere reserve can do to promote its sustainable development. In addition, the community in the biosphere reserve should work on:

- Developing strategies leading to improvement and sustainable management of natural resources
- Promoting an economic development on local level that is culturally, socially and ecologically sustainable
- Enabling the conservation of natural resources through new strategies and systems.

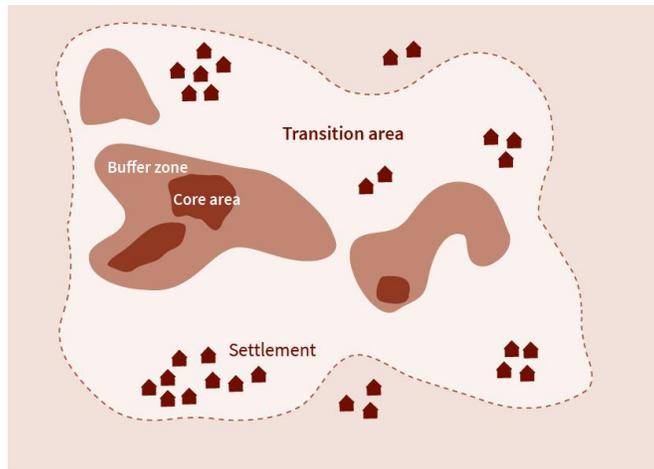
## **Logistic function**

The third function ensures that both actions are linked and receive the necessary support. The logistic function combines the support of input, local education, studies and research, specifically the administration and all actors in the area should:

- Provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development
- Share knowledge generated by research through site specific training and education
- Create awareness among the community, children, students, etc.
- Motivate the society's action on conservation of natural resources.

## **2.2. Zonation**

To carry out the complementary activities of biodiversity conservation and sustainable use of natural resources, biosphere reserves are organized into three interrelated zones: the core zone, the buffer zone and the transition zone. The allocation ensures the conservation goals to be achieved while defining the area where sustainable development shall be supported and where space is left for cities, streets and other legal human activities.



**Figure 27: Zonation of a biosphere reserve**

### **Core Zone**

The core zone covers around 3-10% of the overall biosphere reserve area and ensures the conservation function. It contains the most intact parts of the biodiversity where optimally only little human interaction took place.

These zones will be legally protected from further human interaction as part of the biosphere reserve proclamation. Core zones need to be decided upon together with the local communities, who agree on protecting the area in the future. Only monitoring and scientific research may be conducted in these places.

### **Buffer Zone**

The buffer zone is ideally the area surrounding a core zone. Activities here focus on protecting and securing the core zone while offering sustainable use of natural resources to the communities. The major purpose of the buffer zone is to keep the core zone intact and prevent harmful interaction.

Activities which do not compromise the integrity of the core zone are strongly promoted in the buffer zone, e.g. organic farming, ecotourism and sustainable community management of natural resources. Examples for such activities are scientific education and studies, community based eco-tourism activities, traditional fishery, non-industrial agro-processing activities, other improved agricultural activities, monitoring, evaluation, and awareness creation trainings.

### **Transition Zone**

The transition zone, also called development zone, is the third and usually the largest part of the biosphere reserve. Here all legal development activities are allowed. Still, nature friendly

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activities which do not contradict with the natural and cultural resource shall always be given the priority. The transition zone is the area where community, researchers, governmental and non-governmental organizations and other stakeholders cooperate and pilot activities to achieve the common goal of conservation and sustainable use of resources.

Transition zones usually include:

- Tourism and recreation facilities
- Human settlement (including urban centers)
- Economic activities
- Infrastructure

The size of each zone in the biosphere reserve varies from biosphere reserve to biosphere reserve. Some may have dispersed zones where more than one core or buffer zones in different places.

The concept of biosphere reserves was developed in the early 1970s when the UNESCO recognized 57 biosphere reserves for the first time. Currently there are 668 biosphere reserves including transboundaries in 120 countries all over the world.

- Africa: 79 biosphere reserves in 28 countries
- Arab and Middle East: 32 biospheres reserve in 12 countries
- Asia and Pacific: 152 biosphere reserves in 24 countries
- Europe and North America: 292 biosphere reserves in 37 countries
- South America and Caribbean: 130 biosphere reserves in 21 countries

In Ethiopia 5 biosphere reserves have been designated:

- Kafa Biosphere Reserve (2010),
- Yayu Biosphere Reserve (2010),
- Sheka Biosphere Reserve (2012),
- Lake Tana Biosphere Reserve (2015) and
- Majang Forest Biosphere Reserve (2017).

### **3. Lake Tana Biosphere Reserve**

#### **3.1. NABU**

In 2012 the German non-governmental organization The Nature and Biodiversity Conservation Union (NABU) started a project to establish a biosphere reserve at Lake Tana in collaboration with Amhara National Regional State.

For over a hundred years, The Nature and Biodiversity Conservation Union (NABU) has been promoting the interests of people and nature, drawing on its unwavering commitment, specialized know-how and the backing of 640,000 members and supporters. Africa, Asia and Caucasus form the geographical focus of NABU's international commitment. In respect of content, NABU's work connects ecologic and social aspects ranging from climate protection, conservation of habitat and species diversity, ecotourism and environmental education to capacity building, support to protected areas and biosphere reserves, poverty alleviation and strengthening of civil society.

NABU is currently implementing the project *'Community based Climate Adaptation and Biodiversity Conservation in the model area of Lake Tana Biosphere Reserve in Ethiopia'* which is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ).

#### **3.2. The beginning of the NABU Lake Tana project**

To assess the potential of the Lake Tana region as a biosphere reserve, a feasibility study was undertaken in 2011 by the Michael Soccow Foundation in collaboration with NABU. According to the study, Lake Tana and its surroundings had a very high potential to fulfill the criteria of a UNESCO biosphere reserve.

In 2012 NABU opened an office in Bahir Dar. The organization signed a four-year contract (2012 to 2015) with various offices of the Federal and Amhara National Regional Governments. The project received financial support from the German Federal Ministry for Economic Cooperation and Development (BMZ).

### 3.3. Project implementation (the first phase project 2012-2015)

#### Awareness creation

Since the concept of a biosphere reserve was new to the region in particular and the country in general, awareness creation workshops, trainings and domestic and international experience share visits were conducted accommodating the concerned bodies. Various leaflets and training manuals were prepared and disseminated for the concerned stakeholders/ participants.

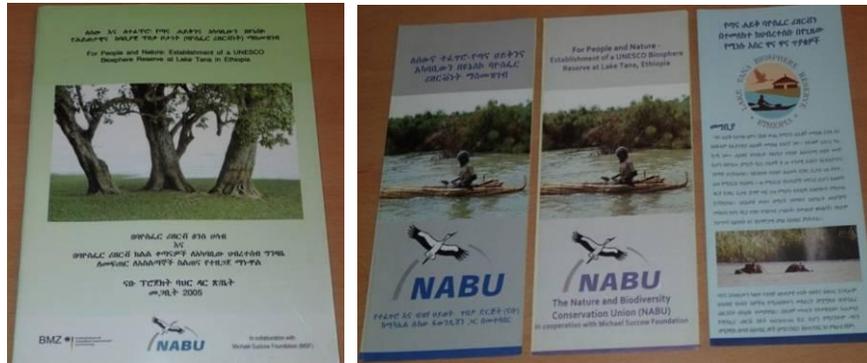


Figure 28: Awareness creation: some of the leaflets and manuals

#### Establishment of an Administration

Pursuant to the Amhara National Regional State Council Regulation No.126/2015, the administration of the Lake Tana Biosphere Reserve was assigned to the Amhara National Regional State Bureau of Culture, Tourism and Parks Development. In the course of the latest changes, the administration was assigned in 2016 to the Environmental Protection, Forest, Wildlife, Parks Conservation and Development Authority.

In addition, the Lake Tana Biosphere Reserve Council, consisting of 43 representatives of communities, religious institutions, organisations and government institutions, has been established. The council holds bi-annual meetings to discuss the development and conservation and other issues concerning Lake Tana Biosphere Reserve. It is the decision-making body of the Lake Tana Biosphere Reserve.

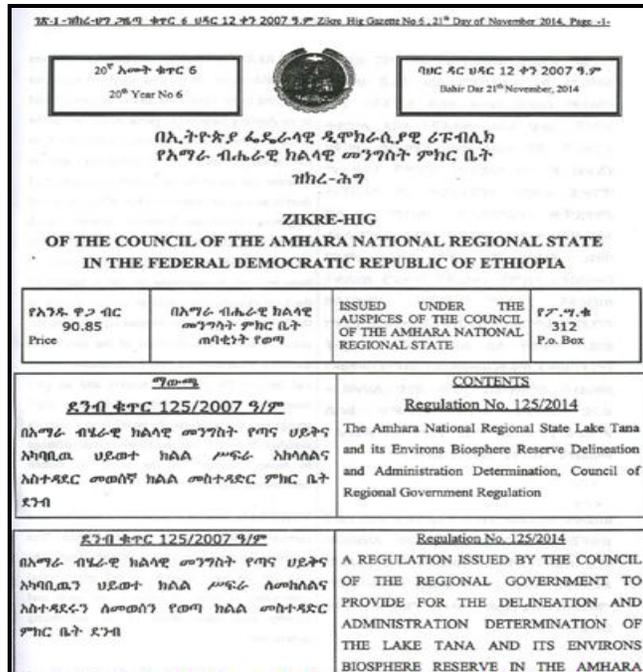


Figure 29: Legalization document for Lake Tana Biosphere Reserve by Amhara National Regional State Council

**Lake Tana Biosphere Reserve management plan**

A management plan to help the administration implementing the necessary activities in the Lake Tana Biosphere Reserve in a coordinated manner was prepared and sent to concerned bodies. In addition, 500 copies of a community movie explaining the current state of the Lake Tana Biosphere Reserve were prepared and distributed. A new monitoring scheme ensures that a better understanding of impacts and changes in the region are recognized early.

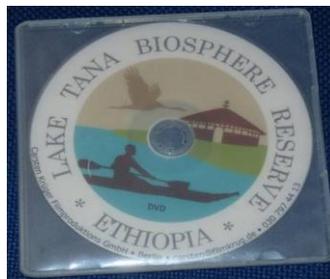


Figure 30: Audio-Video CD

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### Participatory Zonation

The zonation of the biosphere reserve contributes to a more efficient land use management and a sustainable co-existence of human and nature. For the participatory zonation more than 1,700 people were involved in deciding which area would become which zone. The participatory zonation was conducted with the following structure:

- Zonation Committee comprising 16 members from each kebele was established (see the composition of zonation committee in annex 1)
- Training of the trainers was conducted for 1661 Zonation Committee members
- The Zonation Committee members shared their knowledge to the wider community to finally decide together
- The Zonation Committee members and experts from the region took GPS readings in the field, based on which the proclamation for the biosphere reserve was written.

Overall, 697,200.99 hectares of land were registered and designated as biosphere reserve in three administrative zones (South Gondar, North Gondar and West Gojjam). Next to the Bahir Dar City Administration, 9 Woredas (Bahir Dar Zuria, Dera, Fogera, Libokekem, Gondar Zuria, Dembia, Alefa, Takusa and North Achefer) were included in the biosphere reserve. 137 kebeles unite in the Lake Tana Biosphere Reserve with the usual zonation comprising three land use zones: core, buffer and development zones. The core zone comprises of 3.3% of the total area and shall be totally free of being reached by humans due to its value for conservation of biodiversity (for detailed zonation of core zone, please refer annex 2). Only restricted activities, pertaining research and scientific studies, are allowed.

The buffer zone areas are mostly found around the core zones while sometimes they can be delineated independently. Buffer zones comprise 27% of the total area of the Lake Tana Biosphere Reserve. Activities such as ecotourism, agricultural activities and fishery are practiced. The development zone provides the largest biosphere reserve area with 69.7%. In this zone all activities are possible if they don't have any negative impact either on the natural resources development or on the sustainable use of them.

**Table 3: Lake Tana Biosphere Reserve zones**

<b>LTBR zones</b>	<b>Dry land (ha)</b>	<b>Body of water (ha)</b>	<b>Total area (ha)</b>
Core zone	7,699,619	15,141,965	22,841
Buffer zone	30,968,976	156,597,689	187,566,66
Transition zone	353,297,400	131,179,400	485, 476,806
<b>Total area (ha)</b>			<b>695,885,056</b>

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A biosphere reserve differs from other protected areas because it is owned and conserved by the community. Many national parks are keeping people outside with fences and guards, while the biosphere reserve is protected by the community itself and its behaviour. As local residents are aware of the benefits accompanying by a biosphere reserve, they are accepting the necessary infringements, e.g. non disturbance of core zones.

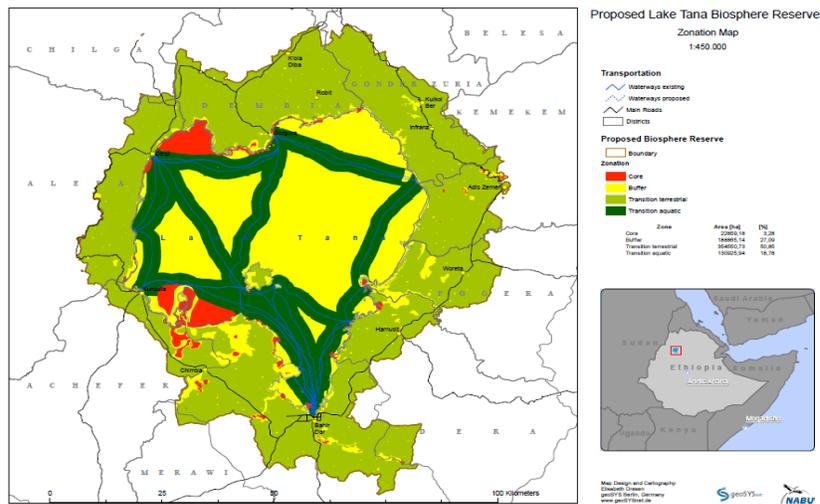


Figure 31: Map of the Lake Tana biosphere reserve boundaries

### Eco-tourism

Ecotourism was promoted as an alternative income source for the local residents. With increasing numbers of tourists in the Lake Tana region it's important to ensure a nature friendly tourism prevails. The measures taken include capacity training of local guides and boat captains, community based camp site services, handcraft selling and production centers and restaurant services. New workplaces as well as signboards and sanitary facilities have been established to support the communities' initiatives; maps have been created to guide tourists to these places.



Figure 32: Tourist map of Zege and signboards indicating tourist attractions

### Lake Tana Biosphere Reserve regional products

Since Lake Tana and its surroundings are rich of natural resources and agricultural commodities, 43 community members at Gedro near Bahir Dar, have started to produce herbs and spices such as Hibiscus and Rosemary for fragrant oils. The cooperative is marketing the organic produce as regional product of the Lake Tana Biosphere Reserve.

Another 81 people from Derbanta Kebele (Bahir Dar Zuria) and Tana Mistili (Dera) are producing organic honey by organizing themselves into two cooperatives. They also developed a branding for their products.



**Figure 33: Rosemary plants at farm land, honey produced by the local cooperative**

### Conservation of wetlands

Compared to the rest of Ethiopia, Lake Tana has the largest proportion of wetlands. NABU has been working extensively to conserve and use the wetlands of Lake Tana Biosphere Reserve appropriately and to transfer it to the next generation. A participatory management plan has been prepared for five wetlands. Among these, various environmental conservation and income generating measures were conducted. For a better land use 218 improved farming tools were provided to farmers and 120 households have participated in various income generating activities.

The communities have now taken over the right to use the wetland resources, but they are also responsible for its protection from overuse and harmful activities.

### Church forests and reforestation

Even though forest resources are declining in the area, some are preserved around churches. In order to keep these church forests intact as habitats for wildlife, but also as a source of seed, participatory natural resource management plans were prepared for five churches. Together with the church communities walls have been erected around the forests to protect the trees from free roaming cattle. Indigenous seeds were raised and enrichment planting took place to enlarge the forests.

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More than 300,000 seedlings were planted near churches and to avoid further destruction of forest for fuelwood, energy saving stoves were produced by local ladies and distributed to 1,000 households in Dera Woreda.



**Figure 34: Cultivation of nursery and distribution of energy saving stoves**

### **Conservation Agriculture**

To promote soil conservating agriculture, information packages for the implementation of this concept for different soils and the use of newly developed tools were created.

12 model farmers from Gondar Zuria, Bahir Dar Zuria and Semen Achefer Woreda participated and revealed encouraging results that made it possible to scale up the methods among other farmers through field day held on farm plots.



**Figure 35: Improved agricultural tool distributed to farmers during field day**

### **Promoting Lake Tana Biosphere Reserve**

Lake Tana becoming part of the global network of biosphere reserves, offered a great potential in promoting it as a tourist destination, but also as a model area for sustainable development.

Various activities have introduced the Lake Tana Biosphere Reserve to a large audience.

- Preparation, publication and distribution of Amharic and English leaflets
- Development of Lake Tana Biosphere Reserve Logo

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- Establishing [www.laketana.biosphere.com](http://www.laketana.biosphere.com) as an online information pool about the area
- Participation in various conferences, forums and fairs to promote the Lake Tana Biosphere Reserve.



Figure 36: Logo of Lake Tana Biosphere Reserve and leaflet

### Inauguration

Following all these endeavors aiming at sustainable development and conservation of resources in the area, the regional and federal government with the support from NABU applied to have the area registered by UNESCO as a biosphere reserve.

The application was filled in September 2014, registration formalities were met and ultimately the Lake Tana Biosphere Reserve was recognized as a UNESCO Biosphere Reserve on the 27<sup>th</sup> UNESCO meeting held in Paris on the 10<sup>th</sup> of June 2016.





**Figure 37: Inauguration Celebration for Lake Tana Biosphere Reserve**

### **3.4. Second NABU project on Community-based Climate Change Action (2016-2018)**

Climate change is the name for the current situation in which the recorded climate differs profoundly for more than a decade from expectations based on previous periods, e.g. the rainfall has so far always occurred in two seasons, but for the last 10 years it came later and shorter/heavier/etc. These perceived changes in climate have been proved by scientific research. The world will have to deal with a different climate in the years to come.

The current changes in climate have been caused by human activities like industrialization and the increased use of fossil fuels. The negative impacts of the changing climate have become widely visible especially in farming communities, on small islands and in under-developed countries.

The gases which were emitted by human activity causing the climate change are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrogen dioxide (NO<sub>2</sub>), hydrofluorocarbon (HFC), perfluorocarbon (PFC) and sulphur hexafluoride (SF<sub>6</sub>). Key features of climate change are the decline of rain, changing rain seasons and the change of temperature. In the following you can see other serious consequences of the increasing climate change:

- Loss or decrease of biodiversity
- Diminishing productivity and potable water sources
- Natural disasters such as droughts happen more often

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Lake Tana and its surroundings are highly affected by this problem. The following list includes some of the activities the second NABU project at Lake Tana will implement to minimize the harmful consequences of climate change:

### **Promotion of awareness for biodiversity and climate change among the residents of the LTBR**

- Green-your-Garden campaign: 100 Development Agenets trained, 10 nursery sites supported which produced 2,300,000 indigenous and multipurpose trees that were used to establish agroforst systems in home gardens of nearly 200,000 households within LTBR.
- Annual Lake Tana Biosphere Reserve Day celebration in schools: LTBR Day reference manual prepared and piloted with 50 schools within LTBR in 2017. Revision workshop with teachers and representatives of the Woreda offices of Agriculture in 2018. The revised manual will be distributed and LTBR day will be celebrated in 387 schools within LTBR in 2019.
- Inclusion of the concept of biosphere reseves and LTBR in universities: MoUs and reference manuals prepared with University of Gondar, Bahir Dar University and Debre Tabor University. 1st Natural Resources Management Department in Debre Tabor University already incorporated a full course in the curriculum.

### **Strengthening of Climate Smart Agriculture and erosion control**

- 101 gullies rehabilitated by the surrounding communities in the 10 Woreda of the Lake Tana Biosphere Reserve.
- 454 farmers are trained in the methods and practices of Climate Smart Agriculture.
- CSA toolbox was developed which helps farmers and Development Agents to select the best measures for the given conditions.

### **Conservation and sustainable management biodiversity**

- As continuation of the previous project a total of 9 churches in Dera woreda are now fanced and ist unique biodiversity protected. Reforestation activities support the rehabilitation of the forest and its wildlife. The participating churches are Ginda Temem Micheal, Rema Yohanes, Dembiso Abo, Wonchit Michael, Wagera Mariam, Abune Aregawi, Woiebela Kidanemariam, Aba Libanos and Fissa Michael.
- Local production of 300 legal fishing nets and distribution in exchange for illegal nets, which were burned within an awareness workshop on the effects of the use of small gilled nets.

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- Wetland Days and participatory protection and sustainable utilization concepts were developed and implemented in 2 ecologically important wetlands.

### **Sustainable Regional Product development**

- 2 new regional products – black cumin and pepper - were identified and are packaged identifying it as a product made in LTBR. Gebeba Dembosgie multipurpose cooperative is now producing black cumin and even processing black cumin oil locally, Chemera integrated farmers cooperative are producing pepper.
- The project continued its support to four organized communities Zege peninsular and started working with 2 groups at the Blue Nile Falls and one group at Guzara Castle offering community based tourism services. In addition local sustainable tourism infrastructures at Gorgora a promotion of bike routes in Bahir Dar is promoted.

### **Community-based management and the promotion of the civil society in biodiversity conservation**

- Local community consultations were conducted in each of the 10 LTBR Woreda which identified major challenges of LTBR. Representatives of each Kebele participated in these meetings. The outputs were presented to the LTBR Council in Bahir Dar in 2018.
- 24 locally organized local community groups and 3 local developmental organizations benefitted from the community project support and received up to 35,000 ETB for their small-scale projects on biodiversity conservation and sustainable regional development.

### **Monitoring, nature rangers and capacity building**

- 10 Nature Rangers (one for each Woreda in the LTBR) and 1 Nature Ranger Manager are employed. The Nature Rangers inform the community of sustainable behaviour, procedures and measures, conduct biodiversity monitoring and support the LTBR activities.
- A citizen science program assessed the population of Grivet monkeys, hippopotamus, Nile monitor and Nile Crocodiles in the LTBR, as well as monitored the water quality of the Lake. The program adds valuable data for the LTBR monitoring and was conducted by university professionals of DTU, UoG and BDU together with the local community.

### **Information campaign**

- Various leaflets and posters produced and a LTBR website and facebook site is running.

## **4. Benefits of Lake Tana being a UNESCO Biosphere Reserve**

The recognition of Lake Tana as UNESCO biosphere reserve in 2015 offered the area a special status - it is one of 668 biosphere reserves in the world.

The recognition helps to promote economic development in the Lake Tana catchment, fosters a more effective conservation of natural resources and biodiversity as well as integrates conservation endeavours in the area. The establishment of the Lake Tana Biosphere Reserve will aim to achieve the following:

- Sustainable conservation of the ecosystems of Lake Tana and its surroundings
- Minimizing threats to biodiversity and ecosystems of the Lake Tana region as well as natural and cultural antiquities
- Enabling the community to benefit lastingly from the natural and cultural resources
- Creating various new job opportunities using the great potentials of natural resources in the area such as ecotourism, fishery and the manufacturing of agricultural products; thereby helping the society to enhance its quality of life
- Coordinating stakeholders to create a better future for the area
- Undertaking awareness creation activities in local communities for nature conservation, sustainable development and on various technical topics
- Facilitating an immediate benefit for local communities from micro and small enterprises through cooperative systems
- Attracting domestic and foreign donors and researchers to find out solutions for various local problems
- Sharing information and attracting research
- Working on the basis of a good administrative structure and a coordinated development plan
- Contributing to the realization of a governmental strategic plan on green economy (e.g.: ecotourism, fish production on ponds, wetland management and agroprocessing)

## **5. Celebrating the Lake Tana Biosphere Reserve Day**

The Lake Tana Biosphere Reserve was recognized by UNESCO on 9<sup>th</sup> June 2015. In order to celebrate the new status and spread the idea within the region, the Lake Tana Biosphere Reserve Day shall be celebrated in schools across the region.

### **5.1. Reasons for celebrating**

The Lake Tana Biosphere Reserve Day is celebrated annually on June 9<sup>th</sup> (9<sup>th</sup> June) referring to the day the Lake Tana Biosphere Reserve has been officially recognized. The reason for celebrating this day at schools is to raise awareness for the ecological importance of Lake Tana region not only within the pupils but also their families and friends.

Every school can participate by organizing some nature friendly activities, discussing topics of nature conservation and/or the biosphere reserve or showing the community movie of Lake Tana Biosphere Reserve.

### **5.2. Topics to be addressed**

The Lake Tana Biosphere Reserve Day celebration aims at introducing students to nature, the Lake Tana Biosphere Reserve and current challenges. Celebratory activities during that day should focus on providing further information, giving students the possibility to experience nature and/or the effects of the current challenges and - most important - to show them opportunities on how to protect Lake Tana.

During a three-day workshop, the following topics for activities during the Lake Tana Biosphere Reserve Day were identified:

- Lake Tana Biosphere Reserve
- Decrease of biodiversity, Deforestation, Overgrazing and Overfishing
- Invasive species, e.g. waterhyacinth
- Erosion and Siltation
- Agricultural expansion e.g. into wetlands
- Climate Change

In this chapter, we have put together some activity plans that you might like to use to celebrate the day with the pupils at your school. Don't forget to invite the whole community to celebrate.

## 6. Lesson Plans for celebratory activities

### 6.1. Biosphere Reserve - Question and answer game about LTBR

*Time needed: 60 minutes*



**Figure 38: Question and answer game**

#### Background

The more young people learn about the biosphere reserve and its benefits, the more they will support its goals in nature conservation and regional development. By linking animals, plants, landscapes and wetlands with people's daily life, they will feel closer to their environment and surroundings and will help to conserve it (and its benefits).

#### Preparation

- Prepare the questions. Think about further questions that should be asked/discussed that might have a relation to what the students already learned about the biosphere reserve
- Think about a possible prize for the winners: small sweets, maybe you can connect it to another game (the group can choose a tree to plant, get a special task, etc.)
- Make two groups of students that play against each other
- Maybe adapt the questions according to the age of the students or add new ones on the things you have already learned about the LTBR

#### Method

## **Reference Manual Lake Tana Biosphere Reserve Day**

- Ask your students the following questions while counting points for the group with the correct/nearest/most answer(s). The answers are shown in green.
- How big is the LTBR? → **Almost 700,000 ha**
- How big is the share of core zones, the strictly protected areas without human activities, from the total LTBR area? → **3%**
- The so-called transition zone of the biosphere reserve covers 70% of its total area. What does this mean? → **Greater activities are allowed as long as resources are used in a sustainable manner**
- How does the region benefit from the official recognition as an UNESCO biosphere reserve? → **International and national attention, knowledge share in the network of worldwide biosphere reserve, international model region, rising interest as area for research and tourism, creation of a sustainable and long-lasting economy, educational opportunities**
- What are the main benefits for the residents in the LTBR? → **Income and job generating, support of businesses (e.g. tourism), rising interest by international and national people regarding the area for research, tourism, local foods.**
- How do local resource management schemes benefit daily life and income? → **Trainings increase productivity and protect natural resources; the safe environment provides clean water and soil as well as the support of local and adapted species.**
- What can your families do to contribute? →
  - **Discuss issues with your family, friends and neighbours**
  - **Take part in the offered trainings**
  - **Improve your homestead and farmland by planting indigenous or multi-purpose trees**
  - **Increase cut and carry feeding**
  - **Care for waste disposal**
- Lake Tana is a key location for birds migrating between Europe, Asia and Africa. How many bird species are recorded here? → **More than 300**
- But the area is not just important for all plant and animal species. Why is Lake Tana the life blood of Ethiopia? → **It provides a huge part of the country's freshwater (50%)**
- Which is the biggest animal that benefits from the vast water ways? → **Hippopotamuses**
- LTBR is also home to the African rock python, Africa's largest snake. How long can they grow? → **Up to 6 metres**
- The population of which plant is planned to increase, as it is not just important for the local ecosystems, but also for building the Tankwa boats? → **Papyrus**

## **Reference Manual Lake Tana Biosphere Reserve Day**

- Fishing, handicrafts - there are a lot of income creators in the region. Nevertheless, which one is the main source of income for around 90% of people living in the LTBR?  
→ Agriculture
  - Which local products represent the tradition and special attributes of the region and might therefore be sold successfully by the planned LTBR brand? → Coffee, honey, fish, Teff, Forega
  - What attributes make the LTBR so special and worth protecting? → Rich cultural heritage and unique biodiversity, valuable water resources for the whole country
  - What are the three main functions of a biosphere reserve according to the UNESCO?  
→ Conservation, development, logistic support
  - What is the aim of the conservation function of a biosphere reserve? → Protecting cultural diversity and biodiversity, including genetic variation, species, ecosystems and landscapes and securing services provided by such diversity
  - What is the aim of the development function of a biosphere reserve? → Fostering economic and human development that is environmentally and socially sustainable and culturally appropriate
  - What is the aim of the logistic function of a biosphere reserve? → Facilitating demonstration projects, environmental education and sustainable development education and training, research, and monitoring. While education, research, monitoring and capacity enhancement are seen as components of the logistic or knowledge-generation function of biosphere reserves, they are also integral to the conservation and development functions.
1. What problems came along in the last years caused by pollution, overuse, large-scale agricultural interventions and urbanization making it harder for the community to create a sufficient income? → Soil degradation, disappearing animal and plant populations, human-wildlife-conflicts, invasive species, deforestation, erosion
- Now you can count up each group's points and find out who is the winner.

### **Learning outcome**

- Knowledge of the LTBR and its habitants
- Understandings of the concept BR and its usefulness
- Knowledge and support of the LTBR's goals

## 6.2. Biosphere Reserve - Zonation game

Time needed: 60 to 90 minutes

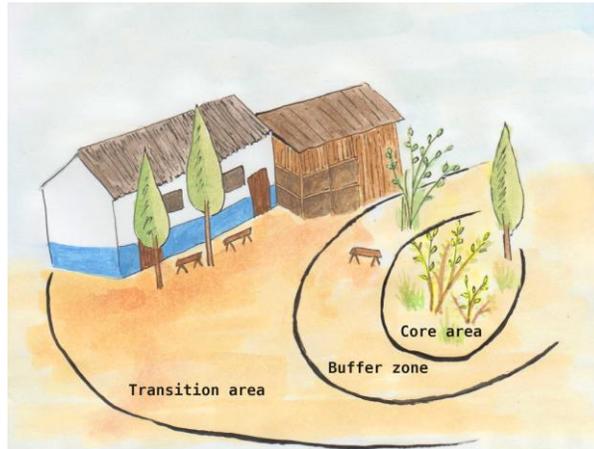


Figure 39: Zonation game

### Background

Every biosphere reserve has a core, a buffer and a transition zone with certain rules. The fundamental understanding for the concept behind biosphere reserves within the communities is important to maintain and enhance the Lake Tana Biosphere Reserve. By taking the idea of a biosphere reserve to the schoolyard, children are in the middle of the planning process and design their “school biosphere reserve” according to the three different biosphere zones.

### Preparation

- Take a look at your schoolyard and think about your ideas where the zones could be
- 3 paper sheets and 3 pens in different colour

### Method

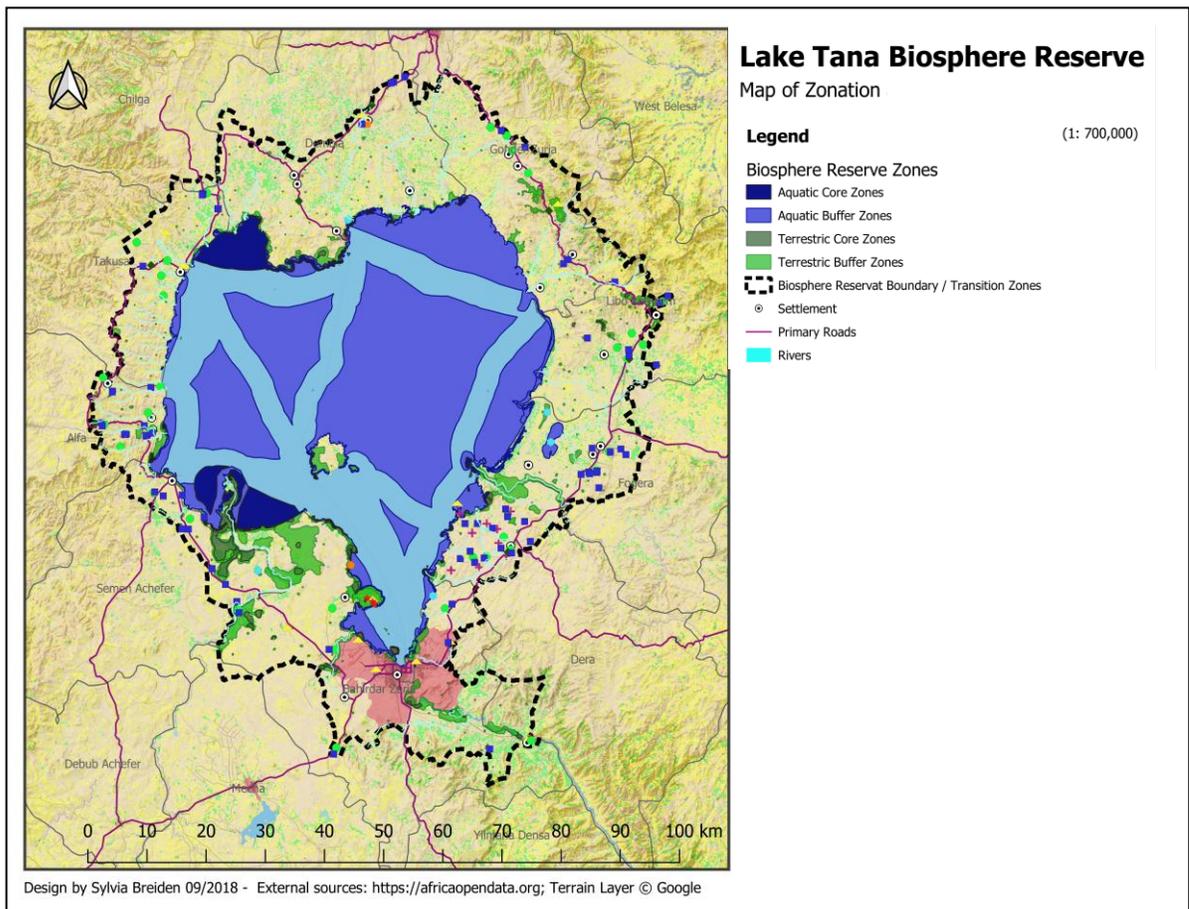
- Ask the students whether they know about the different biosphere zones
- Show the students a picture of the LTBR’s zonation to explain the concept (what is a core, buffer, development zone?) *Check Annex 6 for the Do’s and Don’ts*
- Divide the students into three groups, each group represents one of the biosphere zones
- Let the students decide where to set their zones in the schoolyard. The zone shall roughly be drawn on a piece of paper

## Reference Manual Lake Tana Biosphere Reserve Day

- The students have to explain where and why they decided the areas to be a special zone. Discuss together with the class if the decision makes sense or if the zone should change or be adjusted
- After finally deciding about the zonation, the sheets can be posted on the classrooms walls

### Learning outcome

- Knowledge about the sense of zonation in biosphere reserves
- Knowledge about the different goals of the three zones
- Reflection and awareness about the common surroundings and environment



**Figure 40: Zonations of the LTBR**

### 6.3. Biosphere Reserve - Picture competition

*Time needed: 30 to 60 minutes*

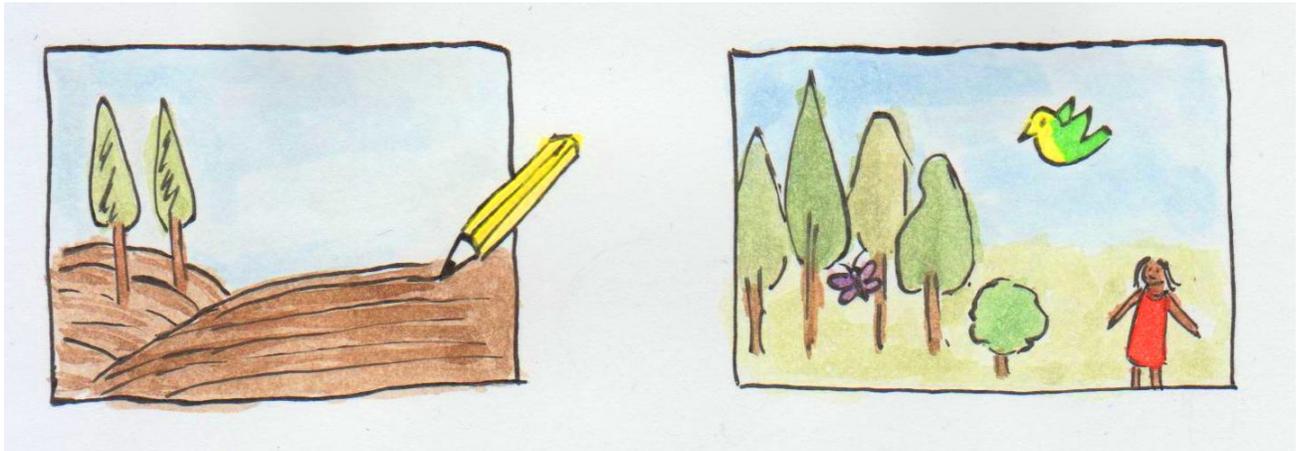


Figure 41: Picture game

#### Background

To raise the awareness and support for the protection of the Lake Tana Biosphere Reserve the students must learn about it. If they understand why things are done, what restrictions and benefits exist, they will support the biosphere reserves efforts.

#### Preparation

- Two sheets of paper and pens for each student

#### Method

- Let the students paint a picture about how they see the LTBR at the moment
- Talk with your students about the LTBR. Ask them what they now about it, what species live there, why was it created, what are it's goals, etc.
- Let the students paint another picture about how the LTBR will look in 10 years
- Discuss the results:
  - What is expected?
  - What needs to be done to support the community?
  - What kind of projects could support this?
  - What can be done by each person to support the LTBRs protection?

#### Learning outcome

- Knowledge of the LTBR and its habitants
- Understandings of the concept BR and its usefulness

- Knowledge and support of the LTBR's goals

#### **6.4. Decrease of Biodiversity - Insect search/ Tree shaking game**

*Time needed: 30 to 60 minutes*

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##### **Background**

Insects are very important for the function of an ecosystem. They are pollinating crops and fruit trees. They are food for birds and other animals.

Different tree species are inhabited by different insect species. Most times exotic tree species are inhabited by much fewer species than native species.

##### **Preparation:**

- Looking for an area with at least three different tree species, at least one should be native to Ethiopia (non-ornamental tree)
- A white cloth of about 1m to 1m
- A paper and a pen for the teacher

##### **Method**

- Take your group of students to a tree.
- Let two students hold the cloth spread out under a branch of the tree. Describe that another student (or the teacher, when the child should be too small) will shake the branch hard. Insects and spiders will come down
- Let everyone/groups estimate how many insects and spiders will be found on the cloth. Write down the estimated numbers
- Then let someone shake the branch. Let one or two children count the number of animals on the cloth while two others hinder the animals to creep off the cloth
- Write down the number and compare it with the estimated number. Declare the student(s) as winner(s) who have estimated best.
- You can also not only count the numbers of animals, but also the number of species, the students can differentiate. This will give them a feeling what biodiversity means
- Then go to the next tree species and do the same. Repeat it with the third tree species
- Discuss the results:
  - Are there differences between the tree species?
  - Tell them which tree species are native and which are not native. Let them discover the difference concerning the insect number found.
  - Tell them about the importance of insect species for crops and fruit trees.

## ***Reference Manual Lake Tana Biosphere Reserve Day***

- Tell them about the importance of insects as food for birds and that Lake Tana is a biosphere reserve because of its many bird species.

### **Learning outcome**

- Getting a feeling for how many insects live in the surrounding
- Seeing the importance of trees for insects
- If there are native and exotic species: learning about the importance of native tree species
- Learning what biodiversity is and why it is important



**Figure 42: Tree shaking game**

- Hold white paper underneath a tree, shake the tree well, analyze which insects you see on the white sheet

## 6.5. Decrease of Biodiversity - Leaf collecting game

*Time needed: 20 to 60 minutes*

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### Background

Plants are the base of food webs, animals depend on plants. Many animals feed on a single or on few plant species, therefore plant diversity is the reason for animal diversity. Many plant species also have functions for humans: As food, medicine, fuel, carving wood, nutrition for bees, home for helpful birds and insects, etc. Plant species richness also means a beauty to look at. Seen as a whole, there are many reasons why biodiversity of plant species is desirable.

### Preparation

- Look for one or two areas you want the students to explore. That may be the school grounds, roadside greenery nearby, a church forest (ask priest first!) or some other kind of public area. Make sure the students will be safe in the area (traffic, open water). Make sure that there is no extremely poisonous plant in the area (otherwise mark it and explain to the students not to touch this one).
- A paper and a pen for the teacher, a clock or mobile phone to take the time
- If needed something to mark the limits of the chosen area

### Method

- Divide the students into groups of two to six each. Show them the boundaries of the game
- The aim is to find as many plant species as possible, but to respect plants and only take one leaf as a proof of their finding. Each species counts one point, each species brought twice in one group counts minus two points, exceeding the boundary of the marked grounds counts minus five points. That means that the students within one group have to compare within the group if they have already taken this species before picking a leaf!
- Give them a time limit of 6 to 10 minutes, depending on the size of the marked grounds. Let them start in the middle of the area (otherwise groups will follow each other)
- When the time runs out each group spreads its findings on a open piece of ground. The teacher or one of the other groups looks for duplicated species and counts the points. Write down the winner and the number of species found
- If the aim is to compare two different areas, repeat the game at the second area

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- Discuss the results:
  - Would the students have thought that the number of plant species is that high (or low) in the explored area?
  - What does the result mean for them? Are there nutritional plants among the species found? Flowering plants with insects (e.g. bees)? Tree or grass species preventing soil erosion? Plants looking nice or interesting?
  - If two areas were compared: Which area is more diverse? Which area do the students like more and why?
- Let the students wash their hands after the game (in case of poisonous plants)!

### Learning outcome

- Training observation skills and team work
- Getting a feeling for how many plant species live in the surrounding
- Different plant species serve for different purposes in nature
- If you have compared two areas: getting an impression of how areas with different plant species diversity look like.



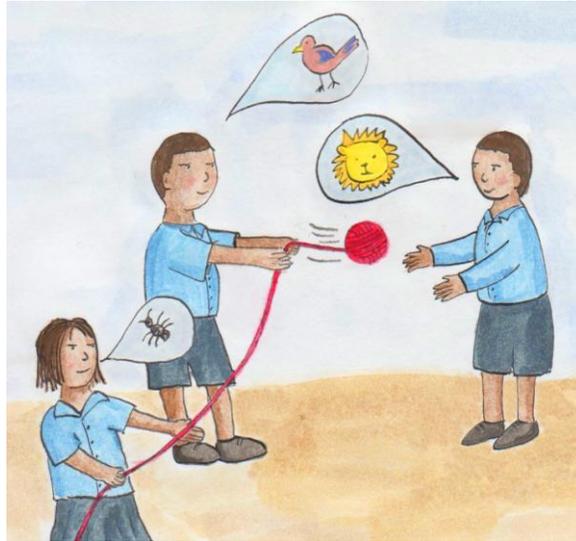
**Figure 43: Collect as many different leaves as possible, the group who found the most, wins.**

### Things to remember

If two or more areas are compared, you can also play the game in a more scientific way: If the explored area has the same size each time (e.g. 50 m x 50 m), the number of species found can be taken to characterize the habitat. By this students can find out the most and the least diverse kind of habitat in their surrounding and discuss the reasons of the species number. This might also lead to the protection of the most diverse habitat by the students (keep in mind that there are also some habitats like wetlands which are not rich in plant species, but nevertheless very important for nature conservation because of their animal make-up or their special features).

## 6.6. Decrease of biodiversity - Food web

*Time needed: 30 minutes*



**Figure 44: Food web game**

### Background

Everything is connected in nature! We all eat and live in the same space. This game helps children to think of how the plants and animals are connected and depend on one another.

### Preparation

- A ball of string
- A piece of paper for each student (optional)

### Method

- Ask the students to make a list of animals and plants that can be found around them and ask them to choose one each. The students can either write or draw their chosen species on a piece of paper. If you have no paper, the students can just say the name of the species (or act it out)
- Ask the students to think of ways their species might be connected with each other. Producers like plants need the nutrition that is provided by the bacteria. Herbivores eat plants. Carnivores eat other animals as prey.

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- Have the students stand and hold the piece of paper with their species on it. Have one student read the species on his/her piece of paper and then toss a ball of string to plants another student, keep on holding the end of the string. Have the student (that was throwing the ball of string) state how his/her species is connected to the one holding the ball of string now (e.g. the leopard is connected to the Grivet monkey because it is its prey). The student holding the string tosses the ball now to someone else but still holds onto a piece of it. Continue the exercise until everyone has caught the ball of string and is now holding a piece of it. Have the last student throw the ball of string back to you.
- You should now have a representative 'web' of string with every student holding a species and a piece of the web. Have everyone pull the string so the web is taut. Tug on your piece of the string and ask if anyone felt the tug. Have some others tug on the string and see who else feels it. Ask what that tug might stand for. The tug can stand for disturbances like deforestation activities by humans or more heavy weather due to climate change. You can ask some students to sit down, representing that the species has gone extinct. Ask what impact this has on the other species. Ask the students where humans should go in the web.

### **Learning outcome**

In nature everything is connected and depends on everything else. If one species is lost the web will become instable and at one point even collapse. We are a part of that net and need it for our survival. It is therefore important to conserve biodiversity and ecosystems for us and for future generations to come.

## 6.7. Deforestation - Plant a model forest on the school ground

*Time needed: Longer term activity*



**Figure 45: Plant a model forest**

### Background

The area around Lake Tana used to be covered with forest. Due to an increase of the population the demand for wood (firewood or construction wood) and farmland has also risen. Therefore, wide ranges of former forests got cut down; this phenomenon is called deforestation.

### Preparation

- Select and prepare the model area
- Organize time, labour and budget resource
- Tip: The Environmental club could be responsible for the organization but small groups of students or each class could take care of one tree.
- Check beforehand that the water system is sufficient for the amount of trees you want to plant
- Hoe, rack, spade, watering can
- Different types of seedling (vegetable, fruit, indigenous trees)

### Method

- May: Prepare the model forest area for the plantation and start your own compost so you have enough nutrients for it
- June: Get seedlings from Lake Tana Biosphere Nursery (NABU)
- July: Plant the trees together with the students (the distance between two trees should be 3 - 5 meters). To maximize the learning effect you can use the Lake Tana Biosphere Reserve to invite parents (and inhabitants) of your town and plant the trees together

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- September: Remember plants need to be cultivated during school vacation
  - Discuss the process of your new forest with the students
  - Why are indigenous plants important?
  - What are the benefits of trees for us?
  - What can be done to protect the forest?
  - How long does it take for a tree to grow? How long does it take for the forest to grow back?

### **Learning Outcome**

A healthy forest is important for the wellbeing of all of us! Because trees

- Hold the soil with their roots
- With their long roots they pull water from deeper layers of earth and make the water accessible for us
- Give us shade and clean the air from pollution
- Are home for many animals, big ones like the Grivet monkey and small ones like thousands of insects
- Provide us with fruits and vegetables

To combat this challenge of deforestation we need to:

- Replant our forest
- Find alternative resources for fire and construction (solar power or biogas for energy supply)
- (Plantation of fast-growing indigenous plants, e.g bamboo)
- Reduce the number of cattle on our land

### **Things to remember**

- If you want to cultivate seedlings yourself you can do so as well. As indigenous trees you could plant: Albizia gummifera, Cordia Africana, Millettia ferruginea, Rhamnus prinoides or Acacia Abyssinica. For the first tree species you should start cultivating in March, for the last two in December and January, so you can plant all of them in July!
- You could also start your own compost at the school ground for fertilization of the forest! Therefore, you could start in October so there is already enough compost when you start planting your trees.

## 6.8. Overgrazing - Area closure (in school)

*Time needed: 3-4 weeks*



**Figure 46: Area closure game**

### Background

Overgrazing occurs when plants (e.g. grass) are disturbed in their growth by cattle. When there are too many animals on a small area, the plants cannot recover fast enough after they got eaten. The dying of plants has a big impact on the ecosystem, overgrazing reduces biodiversity, productivity and is one cause for desertification and erosion.

### Preparation

- Find an area that students often walk on

### Materials

- Something to fence in a small area in school

### Method

- Let the students fence in a small outdoor-area that is walked on a lot (e.g. way between classrooms). Make sure that nobody enters this area for 2-3 weeks
- Let the students mark another area that the students often walk on, but don't fence it!
- After 3-4 weeks let the students compare the different areas and the impacts on the plants (in the fenced area the plants will be probably grown and recovered)

### Learning outcome

The students learn that restricted areas have a positive impact on plants. For a sustainable agriculture it is very important to have restricted areas to let the plants grown and recover.

### Things to remember

You could also fence a larger part of the school grounds permanently and document the progress with different student groups, etc. How long does it take until the first trees grow?

## 6.9. Overgrazing - Experiment on soil compaction

*Time needed: 60 minutes*

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### Background

Overgrazing occurs when plants (e.g. grass) are disturbed in their growth by cattle. When there are too many animals on a small area, the plants cannot recover fast enough after they got eaten. The dying of plants has a big impact on the ecosystem, overgrazing reduces biodiversity, productivity and is one cause for desertification and erosion.

### Preparation

Build two equal hills from dry soil (in the school area)  
→ Don't compact the soil! – It has to be loose

### Materials

- Dry soil
- (Shovel)
- Water

### Method

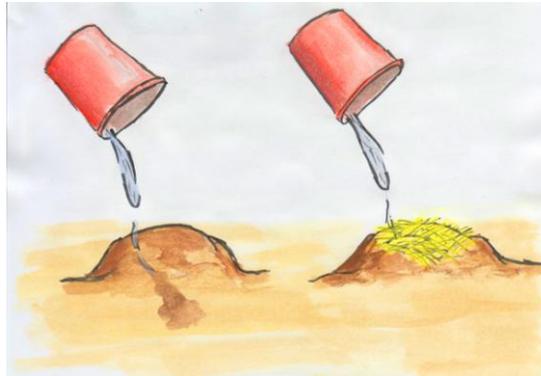
- A student walks only one time over the hill
- A second student walks multiple times over the other hill
- Students can now compare the hills and see the differences between the soils under high and low pressure
- After that a student pours water to both hills to show the effect of water seepage
- The students can see the water flows away on the surface of the compressed hill
- On the loosened hill the students can see that the water seeps in the ground

### Learning outcome

- The students see the effects of soil put under different pressure. The hill on which was frequently walked on is an example of too much cattle in an area
- Overgrazing causes strong, compacted soil that is no more permeable to water
- Consequently, the plants have not enough water to recover and grow
- To prevent overgrazing, it is necessary to reduce the number of cattle and set up restricted areas to let the plants recover

## 6.10. Soil erosion - Experiment on soil erosion

*Time needed: 60 minutes*



**Figure 47: Experiment on soil erosion**

### Background

Soil erosion is a massive challenge for the Lake Tana Region. One cause is rain on bare earth washing away the top layer of the soil. With this simple experiment you can show your students the different effect rain has on bare soil and on soil which is covered by vegetation. Thus, your students can learn why vegetation is important to prevent soil erosion.

### Preparation

- Provide the materials before starting the experiment
- Find a place to conduct the experiment like a table, so every student can see

### Materials

- Dry soil
- Bucket of water/watering can
- Litter/straw

### Method

- Let the Students make two hills of dry soil
- Cover one of the hills with the litter or straw, let the other one bare
- Let another student pour water first over the hill with bare soil then over the covered hill
- Ask all the students: What was the difference between the two hills? And why?

### Learning outcome

Students should understand that:

- Open soil results through overgrazing

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- Rain can easily wash away open soil which leads to erosion
- Through erosion the fertile soil gets lost which leads to problems for the farmers
- The rain washes the soil into Lake Tana where it causes negative effects for plants and animals there
- Plants hold the soil with their roots and therefore prevent it from erosion

#### **Things to remember**

The experiment can be also conducted with existing hills on the school ground. So keep the eyes open for hills with and without plant cover.

### 6.11. Soil erosion - Windbreaker game

*Time needed: 30 minutes*

#### Background

When plants are removed from land due to too many cattle or farming, the soil has nothing to hold it in place. Wind and rain blow or wash the fertile top layer of the soil away, leaving nothing but rocks. This game shows how the effect of the wind can be reduced through planting trees to act as a wind break.

#### Preparation

- Dry soil
- A flat surface, e.g. table or a large piece of paper

#### Method:

- A student places two piles of soil on the flat surface



**Figure 48: Two piles of dry soil**

- A second student blows one of the piles in one direction over the flat surface



**A student blows on the soil – a lot of soil erodes and a gush of dust emits**

- A third student places their hand in front of the second pile representing the wind breaker. The second student should blow the second pile of soil in the same direction as the first



**A student blows on the other soil –while another student holds his hand as windbreaker behind the soil pile. All dust directly collects in the wind breaker (e.g. a line of trees). No fertile soil is lost and no dust emitted.**

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- The third student removes their hand to show the pile of soil that has collected in front of it
- Ask the students to describe what they see, comparing the effect of the wind on the first pile and the second. Are there just larger stones left on the first pile? How much soil has collected behind the student's hand?
- Discuss the consequences of soil erosion if no wind breaks are put in place. Have the students seen erosion gullies in their own local area? Have they seen the water in the streams turn brown from the rainfall? Do they know about the threat to Lake Tana that it's slowly filling up with soil from the fields and might dry up completely?
- Discuss with the students how the trees and plants hold the soil in place with their roots and lessen the strength of the wind with their leaves
- Discuss the best places to put wind breaks along the edges of fields and along streams in your local area. Can the students identify any places where they could be planted?
- Do the students know other ways of preventing soil erosion? They could discuss different ploughing methods, setting small amounts of land aside for wild plants to grow, terracing, keeping soil covered with plants or mulch all year round, combining different crops and plants etc.

### **Learning outcome**

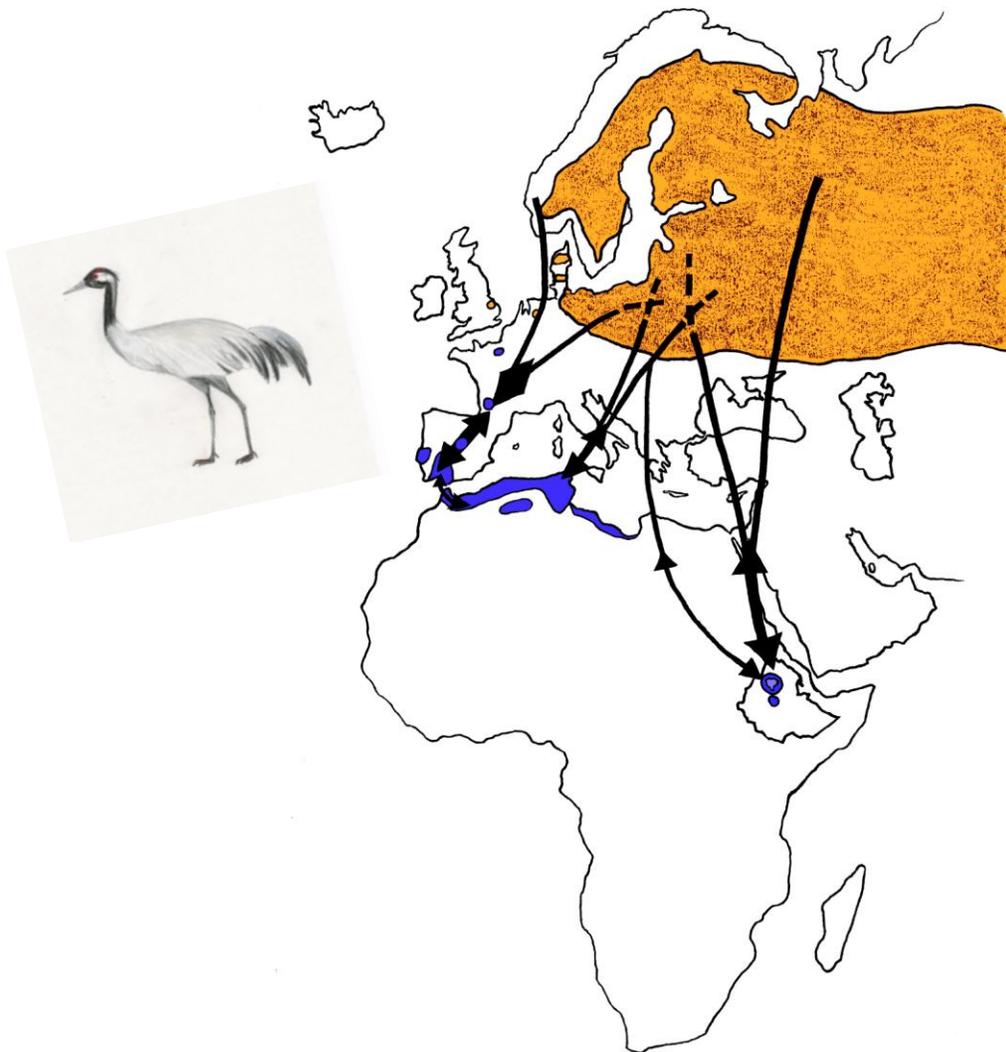
- The top layer of the soil is valuable. It contains important nutrients that are necessary for plants and crops to grow. When this top layer is removed through wind, water, deforestation, overgrazing and farming we call it "soil erosion".
- The effect is that fewer nutrients are available and the soil is less productive. This means the plants and crops grow smaller and are more vulnerable to drought and disease.
- The soil is washed away into streams and causes the siltation of the lake. The lake is polluted with too many nutrients and also will fill up with soil.
- Plants, grasses and trees help to prevent soil erosion. Their roots hold the soil in place and stop it from being washed away by the rain or blown away by the wind. Their leaves lessen the intensity of the wind.

## 6.12. Agricultural expansion into wetlands - Flyways of the Eurasian Crane

*Time needed: 3 hours*

### Background

Lake Tana, especially the wetland, is a very important place for migratory birds. The best species to demonstrate this may be the grey crane (*Shimella*) since a large part of the population breeding in the east and north east of Europe spending winter season at Lake Tana. This concerns about 50,000 of the 300,000 grey cranes in the world.



**Figure 49: International flyways of Eurasian crane (*Grus grus*)**

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But the wetlands of Lake Tana are in danger: Expansion of agriculture, overuse of papyrus, pollution and a rising water level because of erosion (and resulting siltation) deplete the surface of intact wetlands.

### **Preparation**

- Look for a free space at your school wall and ask the headmaster if you are allowed to paint the proposed picture on it
- Buy or organize a small and a larger brush and wall colours, at least black, white (to mix grey) and red
- Look for someone (student, teacher, parents) who is artistically gifted and let him or her paint outlines of Africa and Europe in black on the wall. Draft the outlines of breeding and winter areas with a pencil to avoid serious mistakes when students are asked to paint them in colours during the activity

### **Method**

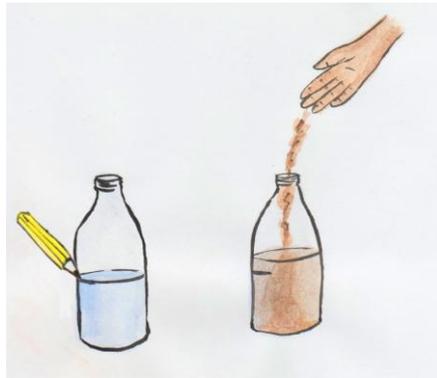
- Ask the students whether they know birds living in Lake Tana region in winter time, but not in the summer. Ask them whether they know where these birds are in summer
- Next question is why the birds come to Lake Tana in winter - and not e.g. to Addis Ababa or to the Simien Mountains. The answer should be that there are wetlands all around Lake Tana which are necessary for these birds to feed in
- Ask the students who of them knows the Grey Crane (Shimella). Does anybody know where the Grey Crane breeds? Probably not. Let a student paint the breeding area of the Grey Crane in red on the map
- Let another student paint the winter areas of the Grey Crane and the migration routes. Place the heading "Grey Crane connects Africa and Europe", the annotation "50,000 in the wetlands in winter" near Lake Tana and "World total number 300,000" somewhere else
- Students may also place a Grey Crane near the map. Other migratory birds depending on wetlands are e.g. several duck species and the Common Snipe

### **Learning outcome**

- Seeing the international importance of the Lake Tana wetlands
- Learning about migratory bird species

### 6.13. Siltation - Water Bottle Experiment

*Time needed: 60 minutes*



**Figure 50: Experiment on soil erosion – the line shows the water in the right bottle rose, due to the soil intake.**

#### Background

Siltation or siltification describes the pollution of water by dissolved soil and is often caused by soil erosion.

As a result of deforestation and intensive agriculture the soil loses its stability and is floated away by the rain. Rivers and lakes fill up with soil which has a significant impact on the ecosystem. Muddy water doesn't let enough sunlight through and the plants cannot grow. Therefore the food for fish is missing, causing a decrease of fish population. The water level increases and farmers next to the lake lose their land. Lakes becomes shallow and can dry up completely.

#### Preparation

- Dry soil
- Two water bottles (transparent)
- Pen/marker
- Water

#### Method

- One student fills both water bottles with the same amount of water and marks the water level
- Another student puts a handful of soil in one of the bottles
- Now the students can compare the clean water and the water containing soil

## ***Reference Manual Lake Tana Biosphere Reserve Day***

- Let the students develop a chain of siltation effects (discussion: What are the consequences of siltation?)

### **Learning outcome**

- The students see how water becomes cloudy and is displaced through the addition of soil which symbolises the effect of siltation. Through discussion they learn that siltation is often caused by soil erosion and has negative consequences for the environment. These consequences can be serious and include the loss of fish and farming land next to the lake and the drying up of the lake itself.
- To prevent siltation it is necessary to reduce soil erosion by planting trees and having sustainable agriculture with less cattle and protected areas.

### 6.14. Siltation - Chain of siltation effects

*Time needed: 60 minutes*

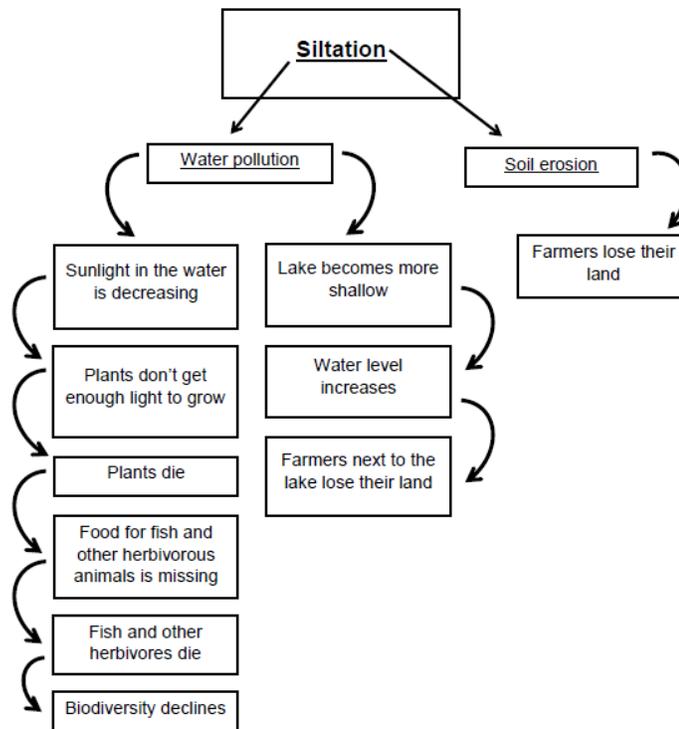
#### Background

Siltation or siltification describes the pollution of water by dissolved soil and is often caused by soil erosion.

As a result of deforestation and intensive agriculture the soil loses its stability and is washed away by the rain. In rivers and lakes the water fills up with soil which has a significant impact on the ecosystem. Muddy water doesn't let enough sunlight through and the plants cannot grow. Therefore the food for fish is missing, causing a decrease of fish population. The water level increases and farmers next to the lake lose their land. Lakes becomes shallow and can dry up completely.

#### Preparation

- Material: Paper sheets, pens, glue
- Prepare cards for the following components (for each group of students)



**Figure 51: The Problem of Siltation**

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### **Method**

- Ask your students what they know about siltation and explain it roughly
- Divide the students in groups of 6-8 people
- Students shall now try to find out the chain of siltation effects using the cards
- Finally the groups glue their chain on a sheet of paper and hang them at the front of the classroom
- Check the different outcomes and explain more about siltation effects to the class and how they have an impact on humans

### **Learning outcome**

- What is siltation and how does it work?
- How can siltation impact animals, plants, but also humans?

### 6.15. Overfishing - Running game

*Time needed: 45 minutes*



**Figure 52: Overfishing-Running Game**

#### Background

Fish stocks in Lake Tana are rapidly declining. Unfortunately, there is a threat of danger that in a few years no (edible) fish will be left, although people still have to live from Lake Tana's resources in future. There are many reasons for the decline of fish population. Apart from the increasing silting caused by sediment input and eutrophication, illegal fishing is an important factor. Traditional nets catch too many small fish to interfere with reproduction. This game clearly illustrates how the fish population in Lake Tana develops under different conditions.

#### Preparation

- A place on the school ground to race and play tag
- The game has 2-3 different phases, each 10-15 minutes: Phase 1, phase 2, discussion
- No material needed

#### Method

- You mark a limited playing field
- Two of the students are the fishermen, the others the fish (ratio 1:10)
- The fishermen try to catch the fish; whoever has been ticked must stand still and count to 30, during this time he/she is out of game. After that he/she may play again (symbolizing the reproduction of fish)

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- In all probability the game can be continued forever with only 2 catchers, since all fish may play again after a certain time.
- In phase 2 the number of fishermen is massively increased, e.g. to 10 (minimum ratio 5:10 or more)
- The fishermen try to catch the fish again and they have to stand still again for 30 seconds when ticked. Most likely there will be no fish left to tick after a short time
- It is important to have a short discussion about the consequences after both phases of the game. In this way, students can find out for themselves what happens when the pressure from fishing is too massive (no fish left!)

### **Learning outcome**

The game makes it quite easy for children to learn how sustainable fishing works and which consequences a high hunting pressure can have on fish stocks. By moderating the game, the children realize that the fruits of the lake must be used sustainably if they want to continue to benefit from them in the future. They learn that every fisherman also has a responsibility to ensure that he (or his children) will still be able to catch fish from the lake in a few years' time.

## 6.16. Invasive species - Water hyacinth discussion and poem

*Time needed: 60 minutes*

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### Background

When a plant or animal is introduced into an environment where it does not belong, it can disrupt the delicate balance of the ecosystem. The new species can prosper and multiply, competing with native plants and animals and making it harder for them to survive.

Water hyacinth is native to South America where grows harmlessly in streams and lakes and is known for its pretty flowers. In other regions such as North America, Asia and Africa, the plant spreads quickly, particularly in nutrient-rich areas. It causes problems in many sectors including fishing, transport and supply of drinking water.

### Preparation

- Material: A ball
- An area where everyone can sit in a circle
- This activity helps children first to learn through discussion. The discussion is facilitated by the ball. Gently throw the ball to the first child to speak. When they have finished, the child then gently throws it to the next person when it is their turn to talk.
- The activity is concluded through a “group poem” where each participant makes up a line of a poem in sequence.

### Method

Discussion – 3 rounds, each 10-15 minutes

- Take the ball and start the discussion explaining how exotic species can be introduced deliberately or accidentally. Ask the children to think of ways and the reasons a species might be introduced into an environment.
  - Examples could include:
    - Planting flowers in the garden because they are pretty.
    - Planting agricultural plants because they produce a good crop.
    - Accidental introduction of the water hyacinth to rivers in Ethiopia when it escaped from garden ponds and has spread by boats and water currents.
- Explain that exotic species are called invasive if they become a problem and spread quickly. Ask the children to think of the consequences this can cause.

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Examples could include:

- Water hyacinth occupying the lake shores where many fish (and birds) lay their eggs. This leads to less eggs being laid and hatching and then less fish. This is a threat to the livelihoods of fishermen.
  - Water hyacinth blocks the paths taken by water transport boats which can lead to delays and an increase in operating costs.
  - Water hyacinth disrupts the ecological balance of the lake and removes oxygen and nutrients that other plants and animals need.
  - Water hyacinth provides a habitat for mosquitoes and water snails that carry diseases such as malaria and bilharzia.
- Ask the children to think about what can and should be done better.  
Examples could include
    - Only planting or introducing native species (which plant species are native?)
    - Removing the invasive species
    - Creating products/demand for the invasive species

### **Group poem**

- Stay in the circle. Explain that you will now be saying a group poem, where each line is made up by a different person.
- Ask each child to say a line of a poem and then throw the ball to another student.
- You could start the poem with something like  
“Water hyacinth is growing in our beautiful Lake Tana,”
- You could end the poem with something like  
“Together we can make our lake beautiful again.”

### **Learning outcome**

This activity encourages participants to learn the consequences of invasive species based on the example of the water hyacinth. It is important not to introduce invasive species in the first place, but if they are already present they can only be tackled through removal. Removal is often very complicated as all parts (including roots and seeds) have to be removed for it to be effective.

**Note:** Open water has many hidden dangers, especially for those who cannot swim, and it is advised that children should not be encouraged to go into the lake to remove the water hyacinth themselves.



**Figure 53: Water hyacinth free floating (left) and covering large parts of Lake Tana (right)**

## 6.17. Invasive species – Quiz game about native and non-native species

*Time needed: 45 minutes*

### Background

A non-native species can become harmful to its new ecosystem, if it is very competitive and suppresses native species. This happens when there is no natural control by predators or others in the new habitat. Often there is not much knowledge about which of the plants and animals around are native and which are not. Deepening this knowledge helps to better understand the processes and dependencies in biological systems and how important it is to have a balanced ecosystem.



**Figure 54: Endemic bird species: the yellow-fronted parrot (left) and the black-winged lovebird (right)**

### Preparation

- Material: Pictures/ drawings with plants and animals of the area, non-native and native ones; 4 signs “non-native” and “native”, “invasive” and “non-invasive”

(Some invasive plant species in Ethiopia: water hyacinth, water spinach, parthenium weed, prosopis, lantana weed, *Euphorbia stricta*, *Cyperus rotundus*;

Some endemic plant species: *Acacia negrii*, *Erythrina brucei*, *Millettia ferruginea*, *Vepris dainellii*;

Some endemic animal species: ethiopian wolf, mountain nyala, abyssinian woodpecker, black-winged lovebird, blue-winged goose, wattled ibis, yellow-fronted parrot)

- Place: Outside or in the classroom

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### **Method**

First place the pictures/drawings on the ground/on the board and discuss if the students know them, where and how they live etc. Then you explain the terms “native” and “non-native” and place the signs at opposite sides of the room or on trees outside. Then you show one species after the other, and the children are supposed to run to the “native” sign, if they believe the species is native and to the other if not. Place the pictures/ drawings to the corresponding signs and when all are placed bring them together and discuss.

After this explain the term “invasive”. You can sit in a round with the pictures in the middle and discuss which species might have negative impacts on its new habitat. Bring some information about few important invasive species (referring to water hyacinth is advised).

### **Learning outcome**

The goal of this quiz game is to deepen the knowledge about native and non-native species in the area and to understand which species might or already have problematic impact.

## 6.18. Invasive species - Cause and effect game (Water hyacinth)

*Time needed: 30 minutes*

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### Background

The water hyacinth is an aquatic plant from South America, which was released in many lakes in Africa also in Lake Tana. Water hyacinth can cause severe problems to the ecological balance of a lake. This game will help the students will learn about causes and effects of water hyacinth and how to take action.

### Preparation

- Find a place on the school ground to race and play tag. Mark the field by drawing a big circle on the ground - this will be Lake Tana.
- Bring paper and pencil

### Method

- The children will play race and tag with different roles to learn about the relationships in a healthy ecosystem and an ecosystem disrupted by water hyacinth.
- The game has three different rounds (each about 10-15 min). Every round should be introduced with an explanation and ended by summing up the lessons learned.

### First round (Healthy Ecosystem)

- Divide the children into fish and water plants native to Lake Tana (ratio 1:20).
- The fishes try to eat the water plants.
- If a fish eats a plant (catches it) the plant has to wait outside the field and count to 20 to get back into the field. This represents the time it takes for the plant to grow back.
- Let the children play for a couple of minutes. The fish should not be able to catch all of the plants.
- Gather the children around you, ask them what they learned, and explain what a balanced ecosystem is. Why couldn't the fish eat all the plants? In a healthy ecosystem, the numbers of species will stay balanced over time. The fishes cannot eat all the plants but the fish will regulate the plants' growth. The species in an intact ecosystem depend on each other and regulate each other.

### Second round (The Water Hyacinth)

- In this round, the water hyacinth is released to the lake. There will be again fish and native water plants, but also one water hyacinth.
- Because the water hyacinth is not native to Lake Tana, it has no natural enemies. This means the fish cannot eat it.
- The water hyacinth can catch both fish and plants and transforms them into water hyacinth themselves. This represents the negative impact water hyacinth has both on native plants and on fish.
- If the water hyacinth catches someone, they have to hold on to each other's hands. The line of pupils represents the dense mats water hyacinths form.
- The only way one can prevent becoming a water hyacinth, is to name a cause or effect of water hyacinth to Lake Tana. Every student who can name a new cause or effect can stand outside the lake as a warrior against water hyacinth.
- If half of the children are warriors against water hyacinth they win the round!

Make a break after the second round and collect all the causes and effects the children knew and write them down, extend the list if necessary. Make one list for causes and one for effects.

Examples of **causes** for the spread of water hyacinth:

- Pollution of water through untreated input of waste water to the lake. The nutrient input fosters the growth of water hyacinth
- Input of suspended sediments e.g. through soil erosion, which reduce the water quality for native plants
- Fast growth of water hyacinth
- Every part of water hyacinth can grow back to a full plant

Examples for **effects** of water hyacinth to Lake Tana:

- Decline in fish stock
- Water hyacinth forms dense mats which block the sunlight from reaching native water plants
- Depletes oxygen in the water, which can cause to fish die
- Threatens aquatic biodiversity
- Water loss due to evaporation
- Blocks the fishing industry and water transport
- Decline in fish stock
- Restrict water flow

Do your students know other causes and effects of water hyacinth that are not mentioned here?

### **Third round (Water Hyacinth Warriors)**

The third round will be played as the second round. The only difference is that the children just learned causes and effects of water hyacinth and this should make it easier for them to name them. Therefore, a strong group of water hyacinth warriors should form outside the lake which prevents the water hyacinth from spreading!

After the third round ask the pupils, what kind of actions can be done to reduce the problems of water hyacinth in Lake Tana. Write it in a third column. You can even mark which cause or effect the action addresses.

### **Actions**

- Spread the knowledge about the causes and effects of water hyacinth in your community and at home.
- If collecting water hyacinth from the water, make sure to remove the whole plant
- Reduce waste water input to the lake
- Stop soil erosion to diminish sediment input

## 6.19. Climate Change – Greenhouse effect game

*Time needed: 30 minutes*

### Background

Without the natural greenhouse effect life as we know it could not exist on earth as the global average temperature would be  $-18^{\circ}\text{C}$ . When solar radiation reaches the earth's surface, thermal radiation will be sent back into space. In the atmosphere, some gasses like  $\text{CO}_2$  reflect this radiation, keeping it in the atmosphere and rise the global surface temperature to  $+15^{\circ}\text{C}$ . The increase of those greenhouse gasses ( $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ ) in the atmosphere is caused by human activity and leads to a global warming with tremendous consequences.

### Preparation

- Material: 1 role card per child (1<sup>st</sup> round: 1 earth, 1 sun, 3-5 sunrays; rest: N,  $\text{O}_2$ ,  $\text{CO}_2$ ; 2<sup>nd</sup> round:  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ , 1 human) → number of role cards must be adapted to number of children

### Method

- Classroom or outside
- 2 rounds – first is about the natural greenhouse effect, second about the anthropogenic greenhouse effect
- 1<sup>st</sup> round – natural greenhouse effect:
  - The students get role cards.
  - The child representing the earth stands in the middle, the gasses build an atmosphere around it; the sun stands outside and its rays go through the atmosphere to the earth and are reflected, so go through the atmosphere again out of the circle.
  - Now the natural greenhouse gas effect can be explained and the  $\text{CO}_2$  kid(s) are instructed not to let the sunrays out of the atmosphere again. About half of the sunrays should stay in the atmosphere.
  - It should be emphasized, that without greenhouse effect life on earth would not be possible, as global average temperature would be  $-18^{\circ}\text{C}$  instead of  $+15^{\circ}\text{C}$ .
- 2<sup>nd</sup> round – anthropogenic greenhouse effect:
  - Now humans come to earth, so the child representing humans joins the earth and imitates typical activities causing emissions like driving, flying, eating, consuming. Other kids can join it.

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- Consequently, more and more kids come as greenhouse gasses in the atmosphere (role cards must be distributed before the game starts) and hinder more and more sunrays to pass the atmosphere again. The child representing the earth starts to sweat (acting).

#### **Learning outcome**

The students learn in a creative way the mechanisms behind the greenhouse effect and the role humans play in it.

## 6.20. Climate Change – Activity with Consequences of Climate Change

*Time needed: 20-30 minutes*

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### Background

The climatic changes we are facing are tremendous and global:

- Glacier melting
- Sea level rising, existential problems for flat islands, coastal and delta areas
- Increase of droughts and drought areas
- Loss of fertile soil
- Increase of tropical storms, heavy rainfalls, floods.

### Preparation

- Material: Activity cards (cards with consequences of climate change, see above), paper, pencils, watch

### Method

- Classroom
- Students are divided into two groups.
- Every child gets an activity card with one consequence of climate change.
- By turns, every pupil has to explain its term to its group, either
  - Pantomimic
  - By description (there are some Tabu words on the cards, which are not allowed to be used for description)
  - or by drawing it.
- If the group doesn't get the right term within two minutes, it is the others group turn. If there is still more time, another child from the same group can start to explain its term, until the two minutes are over.

### Learning outcome

The students get to know the diverse effects of climate change.

### **6.21. Field trips/school ground activities**

- Drawing five different plant species
- Distinguishing eatable from not eatable fruits
- Distinguishing which animals are dangerous which are not
- Distinguishing which plants to use for composting or not
- Listening to the sounds of nature which are made by humans, plants or animals
- Feeling different nature materials without watching them, e.g. stones, wood, leaves or feathers
- Collecting water hyacinth
- Field trip to areas with and without overgrazing
- Field trip to areas with and without terracing

### **6.22. Other Potential activities for the celebration**

Many different activities can be performed prior to, on the date of and after the celebration to create awareness among the school and surrounding communities.

Below some possible activities are listed, but each school and/or teacher may add further activities and ideas where possible. Let's use this opportunity to celebrate Lake Tana and the Lake Tana Biosphere Reserve!

For example you may:

- Explore what happens to solid and liquid waste, how to avoid it and how best to dispose of it
- Arrange a waste collection around the school, the nearest river or Lake shore and ensure the rubbish is disposed of properly
- Use existing material such as the Lake Tana leaflet, the 10 frequently asked questions on the Lake Tana Biosphere Reserve, the homepage or the community movie to create awareness among the school's community on the current situation
- Plant indigenous trees around the school compound or on communal land and teach the students how to take care of the development of the seedlings
- Conduct question and answer sessions about trees and wildlife in and around Lake Tana
- Display the logo of the Lake Tana Biosphere Reserve on the wall of the school
- Organize a drawing competition between students on wildlife, natural habitats and man-made resources or develop competitive games on biodiversity and related themes

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- Install additional dust bins in the area and inform the community about proper waste disposal. Please remember the waste bins need to be emptied regularly and the waste should either be handed over to professional waste handlers or burned outside of the village

Though it is our common duty and responsibility to use Lake Tana appropriately and transfer it to the next generation, an annual recognition and awarding ceremony shall be held in the Woreda Education Office to award one school in each woreda which had shown the best performance in celebrating the annual Lake Tana Biosphere Reserve Day. Their celebration should also contain documented data and an information transfer to other involved parties.

**Lake Tana is our life – let's do our part and protect it!**

## **7. Annexes**

### **Annex 1. Zonation Committee Members from each kebele**

1. A representative of the Woreda administration - Chair person
2. The kebele Administrator
3. The Deputy Administrator of the *kebele*
4. The kebele Security administration head
5. Kebele Manager
6. Natural Resource Expert, Development Agent (DA)
7. Surveyor (Environmental protection Staff) - Secretary
8. Kebele Police Representative
9. Land Administration and use committee chair person
10. Social Court Presiding Judge
11. A representative of the youth
12. Religious leader, Christian
13. A representative of Women
14. Religious leader, Muslim
15. Communal Land Committee chair person
16. Arbitrary elder chair person

## Reference Manual Lake Tana Biosphere Reserve Day

### Annex 2. The areal coverage of core zones and their respective kebel

No.	Core Zone/ Reserves	Area/ha	Woreda	Kebele
1	Aba Gerima Island	155.9987	Bahir Dar City	Shimibit
2	Millennium park Abay River Island	6.050541	“ ”	Shum Abo
3	Beles mesk	8.436828	Alefa	Dengel Ber
4	Warkawesen Kuante Jankaw	10.65739	Alefa	“
5	Menekuse Dinday	54.99657	Alefa	“
6	Ahcha mangur, Wenbera Eyesus	98.50416	Alefa	Dengel Ber & Ahcha Mangur
7	Yigoma Huletu	16.581229	Bahir Dar Zuria	Yigoma huletu
8	Daki Sanctuary	62.557336	“ ”	Dahana Mesenta
9	Tomit Sanctuary	13.13578	“ ”	“ ”
10	Millennium park, Sebatamit	65.919193	“ ”	Sebatamit
11	Lijome drekuna wuhaw	6155.483693	“ ”	Lijome
12	Lata Amba 1	101.323895	“ ”	Lata Amba
13	Deq-Goza	27.821685	“ ”	Deq
14	Deq-Gurer	5.459437	“ ”	“
15	Deq -Leketa	25.90507	“ ”	“
16	Deq menast Tetiy	19,00631	“ ”	“
17	Gorgora sanctuary	82.442525	Dembia	Gorgora
18	Gurgara to Chemera-Derekuna wuha	8133.635193	Dembia nad Takusa	Chemera, Tezeba, Genbara, Aberjiha, Dahina wawa, Mange, Fantayu Narchacha, Gurandi Wenbaba
19	Jarjer sarye 1	122.212001	Denbia	Jarjer Abanova
20	Megech River enterance	122.637254	“ ”	Tana woyina and Adisge
21	Bebirbira-Tana woyna	25.708146	“ ”	Tana woyina
22	Jarjer Sarye 2	1.719992	“ ”	Jarjer Abanova
23	Nedadit- Achera	65.797928	“ ”	Seraba dablo and Achera
24	Dirma River Mouth	143.4816	“ ”	Seraba Dablo and Abrhajira Dahna wawa
25	Abalay-Achera	43.960121	“ ”	Achera
26	Kuli Forest	20.299139	Alefa	Amchaho
27	Aba Bailo Forest	27.09179	Libo kemkem	Agid Kirgna
28	Jinjero Mountain	4.757619	“ ”	Kab
29	Kolelat-Sendo Forest	55.965623	“ ”	Wusha Tirs
30	Gimajer Forest	1.983771	“ ”	Yifag
31	Silkesa	3.293764	“ ”	Ginaza Silkisa
32	Aba Mata Kala Yohannes	18.720962	“ ”	Tara Gedam
33	Awstatiwos	4.638048	“ ”	“ ”
34	Ezkias	1.480897	“ ”	“ ”
35	Wenbera	36.079119	“ ”	“ ”
36	Ararat	25.948095	Bahir Dar city	Urta
37	Gami Mesk	19.939237	“ ”	“ ”
38	Lumami	104.1482	“ ”	Weramit
39	Enfranz sanctuary	165.23392	“ ”	Weramit, Wegelsa and Yibab
40	Millennium Park- Addis Alem	31.748162	“ ”	Addis Alem

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No.	Core Zone/ Reserves	Area/ha	Woreda	Kebele
41	Legidiya 1	431.504696	North Achefer	Legidia
42	Legidiya 2	266.824997	" "	" "
43	Bête Menzo Island	3.048614	Dera	Korata
44	Mitsli Fasiledes	8.370984	" "	Tana Metsli
45	Tinshu Ginjaba Deset	2.394509	" "	Mirafit
46	Abay River Mouth sanctuary	12,23373	Bahir dar city	Shum Abo
47	Lata Amba 2	158.920325	Bahir Dar Zuria	Lelata Amba andDahina Mesenta
48	Yiganda sanctuary 2	167.899839	Bahir Dar city	Yiganda
49	Debranta-Wenjeta sanctuary	25.667337	Bahi Dar Zuia	Debranta and Wenjeta
50	Debranta sanctuary	268.491057	" "	Debranta
51	Sekelet lijome bushy area	54.189176	" "	Sekelet and lijome
52	Sekelet sanctuary, including water body	143.877767	" "	Sekelet
53	Astumit sanctuary 2	69.187862	North Achefer	Astumit
54	Sekelet sanctuary and water body 2	52.734601	Bahir Dar zuria	Sekelt
55	Astumit sanctuary	1674.517395	North Achefer	Astumit
56	Yitem Forest	21.592869	Dera	Mirafit
57	Tana Kirkos sanctuary	2.776852	Dera	Tana mitsli
58	Goy	19.9131	Takusa	Goy
59	Mendeaba Forest	85.773241	Libo kemkem	Aaaaaberjeha
60	From Dengecha fisash to Lam maderia	14.313936	Dera	Mirafit
61	Mirafit-kurt	3.618555	Dera	" "
62	Lata Amba 3	129.969913	Bahr Dar Zuria	Lata Amba
63	Astumit water body	2315.254144	North Achefer	Astumit
64	Ababayehu Forest	21.931482	Libo kemkem	Angot
65	Amba Mountain	50.87497	Libo kemkem	Agela
66	Millennium Park-Dasera	61.723427	Bahir Dar city	Dasera
67	Enfranz-Yibab	1.811684	" "	Yibab
68	Dana Mesenta	4.726501	Bahr Dar Zuria	Dahina Mesenta
69	Yiganda sanctuary	29.615655	Bahr Dar City	Yiganda
70	Gelda river mouth and Bosit	149.08903	Dera	Korata
71	Gubgube Forest and Water Boy	251.61717	" "	Tana Mitsli
72	Ahun Weta	143.935625	Dera and Fogera	Wagetera and Tana Mitsli
73	Tana kirkos Water body	37.20811	Dera	Tana mitsli
74	MirafitAbara	23.523606	" "	Mirafit
75	Kunzila zuria sankta	3.487723	North Achfer	Kunzila zuria
76	Kunzila zuria St. George Church Area	10.308146	North Achefer	Kunzila zuia
77	Kunzila zuria, mouth of the hydro electric power dam	16.911221	" "	" "
78	Korata sanctuary	11.129201	Dera	Korata
	<b>Total</b>	<b>22841.58</b>		

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### **Annex 3. List of the Lake Tana Biosphere Reserve Council members**

1	Representative of the Amhara National Regional State President (Head of State)
2	Amhara National Regional State Finance and Economic Development Bureau
3	Amhara National Regional State Culture, Tourism and Parks Development Bureau (secretary)
4	Amhara National Regional State Agriculture Bureau
5	Amhara National Regional State Water Resource Development Bureau
6	Amhara National Regional State Education Bureau
7	Amhara National Regional State Environmental Protection, Land Administration and Use Bureau
8	Bahir Dar University Vice President for Research and Community Service
9	University of Gondar Vice President for Community Service
10	Debretabor University Vice President for Community Service
11	Amhara National Regional State Institute of Agricultural Research
12	Organization for Rehabilitation and Development of Amhara (ORDA)
13	North Gondar Zone Administrator
14	South Gondar Zone Administrator
15	West Gojjam Zone Administrator
16	Bahir Dar City Administration
17	Dera Woreda Administrator
18	Fogera Woreda Administrator
19	Libo Woreda Administrator
20	Gondar Zuria Woreda Administration
21	Dembia Woreda Administration
22	Alefa Woreda Administration
23	Takusa Woreda Administration
24	North Achefer Woreda Administration
25	Bahir Dar Zuria Woreda Administration
26	North Gondar Zone Area Community representative
27	South Gondar Zone Area Community representative
28	West Gojjam Zone Area Community representative
29	GIZ (German Cooperation Organization)
30	Abbay Basin Authority
31	Amhara Region Islamic Affair
32	Ethiopian Orthodox Tewahido Church North Gondar Diocese
33	Ethiopian Orthodox Tewahido Church South Gondar Diocese
34	Ethiopian Orthodox Tewahido Church West Gojjam Diocese
35	Ethiopian Orthodox Tewahido Church Bahir Dar C. Diocese
36	Tana Haik No.1 Fish Producers Association
37	Merkeb Union Cooperative Association
38	Bahir Dar Hotels Association
39	Lake Tana Transport Association
40	Tana Sub-Basin Organization
41	Local Tour Operators Association (Bahir Dar, Zeghie)
42	Bahir Dar Jibba Renters Association
43	NABU, Bahir Dar Office

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**Annex 4. Kebele and woreda comprising the Lake Tana Biosphere Reserve**

<b>Name of woreda</b>	<b>Kebeles in the woreda</b>
Dera	Tana Mitsli, Korata, Zara, Mirafit, Jigna, Wenchet, and Hamusit Town.
Fogera	Nabega, Shena, Kidist Hanna, Shaga, Wagetera, Woreta Town, Woreta Zuria, Kohar Michael, Kohar Abo, and Abuhana kokit
Libo Kemkem	Kab. Teza Amba, Tara Gedam, Yifag Zuria, Ginaz and Selkisa, Wush Tirs, Agid Kirgna, Angot, Agolahana mantogera, Tibaga, Bura, Shina Tsion, Gendawuha, Banbiko sendeye, Yifag Town, Addis Zemen Town.
Gondar Zuria	Mitra Aba Warka, Sihor Sar Wuha, Chehra Mantero, Lanba Arbaytu, Shaha Gomengie, Frika Danguri, Maksegnit Town, Enfiranz Town, Tach Tedda, Minchir Gebriel, Hamsa Fejid, minziro, Tsion Sagewach, Debre Selam, Jijibahiri ginb, Zengaj, Lay Yeduge, debesanina Tikara, Sebha Gebriel, Sendaba, Gubaye Mariam,
Dembia	Abrihajira Dahina Wawa, Seraba Dablo, Achera, Gorgora Town, Mange, Fantaye Narchacha, Tezaba, Tana Woyina, Adisge, Jarjar Abanova, Gurande wenbaba, Wekerako, Arabia Diba, Gur amaba Michael, Guramba Bata, Gobaba Chilo Salij, Girarge, Kola Diba Town, Atakilt Telefot, Jangua, Meskele Kiristos, Chuahit Town, Chenker, Darno Gwarno, Garhe Jibjiba, Sufan kara
Takusa	Chachna Alwa, Chemara Banberwa, Mekonta Ayviga, Delgi Town, Goyrob Gebaya, Chankie Bergen, Sevi Serako, Achera, Kurabas
Alefa	Acha Mangur, Atuga, Essey Debir, Amchaho, Dengel Ber, Tara kezen
Semen Achefer	Degel ber Town, Kunzila Zuria, Chimba, Estumit, Ligdia, Kunzila Town, Wenberia Eyesus
Bahir Dar Zuria	Lijome, Sekelet, Debranta, Wenjeta, Dek, Dehina Mesenta, Latamba, Robit, Wegelsa, Yibab, Yemoshet, Yigoma Huletu, Sebatamit, Gombat, Yigodi Tentela, Yinesa Sostu
Bahir Dar	Urra, Weramit, Shimbit, Sefene Selam, Addis Alem, Maji Debre Nigist, Dasira, Hidar 11, Belay Zeleke, Shum Abo, Wereb, Zenzelima Town, Yiganda, Zege Town, Tiss Abbay, Fasilo Kebele, Ginbot 20 Kebele, Gish Abay Kebele, Tana Kebele, Werkmisa

Annex 5. List of Trees, Shrubs, Birds, Mammals and Reptiles of Lake Tana

List of Common Tree and Shrub Species

#	Species Name	Family name	Category	Endemics
1	<i>Acacia abyssinica</i> Hochst. ex Benth.	Fabaceae	Tree	NE
2	<i>Acacia albida</i> Delile	Fabaceae	Tree	NE
3	<i>Acacia brevispica</i> Harms	Fabaceae	Scrambler	NE
4	<i>Acacia hockii</i> De Willd.	Fabaceae	Shrub	NE
5	<i>Acacia seyal</i> Del. var. <i>Seyal</i> Delile	Fabaceae	Tree	NE
6	<i>Acanthus arboreus</i> Forssk. var. <i>ruber</i> Engl.	Acanthaceae	Shrub	NE
7	<i>Acanthus polystachyus</i> Delile	Acanthaceae	Shrub	NE
8	<i>Acanthus senni</i> Chiov.	Acanthaceae	Shrub	NE
9	<i>Acokanthera schimperi</i> (A. DC.) Schweinf	Apocynaceae	Shrub	NE
10	<i>Albizia gummifera</i> (J.F. Gmel.) C.A.Sm.	Fabaceae	Tree	NE
11	<i>Albizia malacophylla</i> (A. Rich.) Walp.	Fabaceae	Tree	NE
12	<i>Albizia schimperiana</i> Oliv.	Fabaceae	Tree	NE
13	<i>Alisma plantago-aquatica</i> L.	Alismataceae	Herb	NE
14	<i>Allophylus abyssinicus</i> (Hochst.)	Sapindaceae	Tree	NE
15	<i>Apodytes dimidiata</i> Arn.	Icacinaceae	Tree	NE
16	<i>Bersama abyssinica</i> Fresen.	Melinthaceae	Tree	NE
17	<i>Bridelia micrantha</i> (Hochst.) Baill.	Euphorbiaceae	Tree	NE
18	<i>Buddleja polystachya</i> Fresen.	Loganiaceae	Tree	NE
19	<i>Calpurnea aurea</i> (Ait.) Benth.	Fabaceae	Shrub	NE
20	<i>Carex peregrine</i> Link	Cyperaceae	Herb	NE
21	<i>Carissa edulis</i>	Apocynaceae	Tree	NE
22	<i>Carissa spinarum</i> L.	Apocynaceae	Shrub	NE
23	<i>Cassia petersiana</i> Bolle in Peters	Fabaceae	Shrub	NE
24	<i>Celtis africana</i> Burm. f	Ulmaceae	Tree	NE
25	<i>Centella asiatica</i> (Linn.) Urb.	Apiaceae	Herb	NE
26	<i>Chionanthus mildbraedii</i>	Oleaceae	Tree	NE
27	<i>Citrus auranteus</i> L.	Rutaceae	Shrub	NE
28	<i>Clausena anisata</i> (Willd.) Benth.	Rutaceae	Shrub	NE

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#	Species Name	Family name	Category	Endemics
29	<i>Clerodendrum myricoides</i> (Hochst.)	Lamiaceae	Shrub	NE
30	<i>Clusia abyssinica</i> Jaub and Spach.	Euphorbiaceae	Shrub	NE
31	<i>Coffea arabica</i> L.	Rubiaceae	Tree	NE
32	<i>Croton macrostachyus</i> Del	Euphorbiaceae	Tree	NE
33	<i>Dichrostachys cinerea</i> L.	Fabaceae	Shrub	NE
34	<i>Diospyros abyssinica</i> (Hiern) P. White	Ebenaceae	Tree	NE
35	<i>Diospyros mespiliformis</i> A. DC.	Ebenaceae	Tree	NE
36	<i>Dodonaea angustifolia</i> L.f.	Sapindaceae	Shrub	NE
37	<i>Dombeya torrida</i> (J.F. Gmel.) Bamps	Sterculaceae	Tree	NE
38	<i>Dovyalis abyssinica</i> (A. Rich.) Warb.	Flacourtiaceae	Shrub	NE
39	<i>Ehretia cymosa</i> Thonn	Boraginaceae	Tree	NE
40	<i>Embelia schimpri</i> Vatke	Myrsinaceae	Shrub	NE
41	<i>Erythrina abyssinica</i> Lam. ex DC.	Fabaceae	Tree	NE
42	<i>Erythrina brucei</i> Schweinf	Fabaceae	Tree	E
43	<i>Eucalyptus camaldulensis</i> Dehnh	Myrtaceae	Tree	NE
44	<i>Eucalyptus globulus</i> Labill.	Myrtaceae	Tree	NE
45	<i>Euclea racemosa</i> subsp. <i>schimperii</i> (A. DC.) P. White	Ebenaceae	Shrub	NE
46	<i>Euphorbia ampliphylla</i> Pax	Euphorbiaceae	Tree	NE
47	<i>Euphorbia tirucalli</i> L.	Euphorbiaceae	Tree	NE
48	<i>Ficus ovata</i> Vahl	Moraceae	Tree	NE
49	<i>Ficus sur</i> Forssk.	Moraceae	Tree	NE
50	<i>Ficus sycomorus</i> L.	Moraceae	Tree	NE
51	<i>Ficus thonningii</i> Blume	Moraceae	Tree	NE
52	<i>Ficus vasta</i> Forssk.	Moraceae	Tree	NE
53	<i>Flacourtia indica</i> (Burm. f) Merrill	Flacourtiaceae	Shrub	NE
54	<i>Fluggea virosa</i> (Willd.) Voigt.	Euphorbiaceae	Shrub	NE
55	<i>Galiniera saxifraga</i> (Hochst.) Bridson	Rubiaceae	Shrub	NE
56	<i>Gardenia volkensii</i> K. Schum	Rubiaceae	Shrub	NE
57	<i>Grewia bicolor</i> Juss.	Tiliaceae	Shrub	NE
58	<i>Grewia vilosa</i> Willd.	Tiliaceae	Shrub	NE
59	<i>Guineense</i>	Piperaceae	Tree	NE
60	<i>Hagenia abyssinica</i> (Bruce) J.F. Gmel.	Rosaceae	Tree	NE
61	<i>Heteromorpha trifoliata</i> (Wendl.)	Apiaceae	Shrub	NE

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#	Species Name	Family name	Category	Endemics
62	<i>Hypericum revolutum</i> Vahl	Hypericaceae	Shrub	NE
63	<i>Juniperus procera</i> Hochst. ex Endl.	Cupressaceae	Tree	NE
64	<i>Justicia flava</i> (Forssk.) Vahl	Acanthaceae	Herb	NE
65	<i>Justicia ladanoides</i> Lam.	Acanthaceae	Shrub	NE
66	<i>Lantana camara</i> L.	Verbenaceae	Shrub	NE
67	<i>Lepidotrochilia volkensii</i> (Guerke)	Meliaceae	Tree	NE
68	<i>Maesa lanceolata</i> Forssk.	Anacardiaceae	Tree	NE
69	<i>Maytenus arbutifolia</i> (A. Rich.) Wilczek	Celastraceae	Shrub	NE
70	<i>Maytenus obscura</i> (A. Rich.) Cufod.	Celastraceae	Shrub	NE
71	<i>Maytenus serrata</i> (Thunb.)	Celastraceae	Shrub	NE
72	<i>Microchloa kunthii</i> Desv.	Poaceae	Tree	NE
73	<i>Millettia ferruginea</i> (Hochst.) Bak	Fabaceae	Tree	NE
74	<i>Mimusops kummel</i> A. DC.	Sapotaceae	Tree	NE
75	<i>Myrsine africana</i> L.	Myrsinaceae	Shrub	NE
76	<i>Nuxia congesta</i> R. Br. ex Fresen.	Loganiaceae	Tree	NE
77	<i>Olea europaea</i> (Wall. ex. DC) Cifferri	Oleaceae	Tree	NE
78	<i>Olinia rochetiana</i> Juss.	Olinaceae	Tree	NE
79	<i>Osyris quadripartita</i> Salzm. ex Decne.	Santalaceae	Shrub	NE
80	<i>Otostegia integrifolia</i> Benth.	Lamiaceae	Shrub	NE
81	<i>Oxyanthus speciosus</i> DC.	Rubiaceae	Shrub	NE
82	<i>Pavetta Abyssinica</i> Fresen.	Rubiaceae	Shrub	NE
83	<i>Phoenix reclinata</i> Jacq.	Palmaceae	Tree	NE
84	<i>Phytolacca dodecandra</i> L' Herit	Phytolaccaceae	Shrub	NE
85	<i>Pittosporum viridiflorum</i> Sims	pittosporaceae	Tree	NE
86	<i>Podocarpus falcatus</i> Thunb. R. Br. ex Mirb.	Podocarpaceae	Tree	NE
87	<i>Premna schimperi</i> Engl.	Lamiaceae	Shrub	NE
88	<i>Procera</i>	Apocynaceae	Tree	NE
89	<i>Prunus africana</i> Hook. f. Kalkm.	Rosaceae	Tree	NE
90	<i>Rhamnus staddo</i> A. Rich.	Rhamnaceae	Shrub	NE
91	<i>Rhus glutinosa</i> A. Rich.	Anacardiaceae	Shrub	NE
92	<i>Rhus retinorrhoea</i> Steud ex Oliv.	Anacardiaceae	Shrub	NE

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#	Species Name	Family name	Category	Endemics
93	<i>Ricinus communis</i> L.	Euphorbiaceae	Tree	NE
94	<i>Rosa abyssinica</i> R. Br. ex Lindl	Rosaceae	Shrub	NE
95	<i>Rothmannia urcelliformis</i> (Hiern) Robyns	Rubiaceae	Tree	NE
96	<i>Rumex nervosus</i> Vahl.	Polygonaceae	Shrub	NE
97	<i>Ruttya speciosa</i> (Hochst.) Engl.	Acanthaceae	Shrub	NE
98	<i>Salix subserrata</i> Willd.	Salicaceae	Tree	NE
99	<i>Sapium ellipticum</i> (Hochst.) Pax (Schellenb.)	Euphorbiaceae	Tree	NE
100	<i>Schefflera abyssinica</i> A. Rich.	Araliaceae	Tree	NE
101	<i>Scolopia theifolia</i> Gilg,	Flacourtiaceae	Shrub	NE
102	<i>Senna didymobotrya</i> Fresen.	Fabaceae	Shrub	NE
103	<i>Senna occidentalis</i> (L.) Link	Fabaceae	Shrub	NE
104	<i>Senna petersiana</i> (Bolle) Lock	Fabaceae	Shrub	NE
105	<i>Senna singueana</i> (Del.) Lock	Fabaceae	Shrub	NE
106	<i>Sesbania sesban</i> (L.) Merr.	Fabaceae	Shrub	NE
107	<i>Setaria atrata</i> Hack.	Poaceae	Shrub	NE
108	<i>Sideroxylon oxanthus</i> Hutch.and Bruce	Sapotaceae	Shrub	E
109	<i>Solanum giganteum</i> Jacq.	Solanaceae	Shrub	
110	<i>Stereospermum kunthianum</i> Cham.	Bignoniaceae	Tree	
111	<i>Syzygium guineense</i> (Willd.) DC.	Myrtaceae	Tree	
112	<i>Teclea nobilis</i> Del.	Rutaceae	Tree	
113	<i>Terminalia brownii</i> Fresen.	Combretaceae	Tree	
114	<i>Turraea holstii</i> Guerke	Meliaceae	Tree	
115	<i>Vepris dainellii</i> (Pich. -Serm.) kokwaro	Rutaceae	Tree	E
116	<i>Verbena officinalis</i> L.	Verbenaceae	Shrub	
117	<i>Vernonia amygdalina</i> Del.	Asteraceae	Tree	
118	<i>Vernonia leopoldii</i> Sch.Bip	Asteraceae	Shrub	E
119	<i>Vernonia auriculifolia</i> Hiern.V. sp.	Asteraceae	Shrub	
120	<i>Ximenia americana</i> L.	Olacaceae	Shrub	

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**List of Common Botanical Species**

No.	Amharic name	English name	Botanical species	Family
1	ግራረ	Acacia	Acacia spp.	Fabaceae
2	ከሸሽሌ		Acanthus senni	Acanthaceae
3	ሰሳ		Albizia spp.	Fabaceae
4	ሸንከርት	Onion	Allium cepa	Liliaceae/Alliaceae
5	አሉማ		Amaranthus spinosus	Amaranthaceae
6	ለጫዛ	Ground nut	Arachis hypogaea	Fabaceae
7	አርክቶቲስ		Arctotis stoechadifolia	Asteraceae
8	ነጭሸህ		Argemone mexicana	Papaveraceae
9	ኒም	Nym	Azadirachta indica	Meliaceae
10	ዳያሲ		Bellis perennis	Asteraceae
11	ጥቅልጎማ	Cabbage	Brassica oleracea	Brassicaceae
12	ገሞጆ		Capparis tomentosa	Capparidaceae
13	በርበሬ	Pepper	Capsicum annum	Solanaceae
14	ፖፖ	Papaya	Carica papaya	Caricaceae
15	አጋም		Carissa spp.	Apocynaceae
16	ያበሻ ሰፍ		Carthamus tinctorius	Asteraceae
17	አርዘለባኖስ		Casuarina equisetifolia	Casuarinaceae
18	ክፍት	Khat	Catha edulis	Celastraceae
19	ሸግግራ	Chickpea	Cicer arietinum	Fabaceae
20	ያህያ ሸሸህ		Cirsium vulgare	Asteraceae
21	ሎሚ	Lemmon	Citris limon	Rutaceae
22	ትርጉጎ		Citrus medica	Rutaceae
23	ብርቱካን	Ornage	Citrus sinensis	Rutaceae
24	ልግጭጭ		Clausena anisata	Rutaceae
25	ቦና	Coffee	Coffee spp.	Rubiaceae
26	ጥንጅት		Combretum collinum	Comberetaceae
27	አቫሎ		Combretum molle	Comberetaceae
28	የጫ አንጉር		Commelina benghalensis	Commelinaceae
29	ዋንዛ		Cordia africana	Boraginaceae
30			Coreopsis spp.	Asteraceae
31	ግዳና		Croton macrostachyus	Euphorbiaceae
32	የፈረንጅ ጥድ	Junipres	Cupress lustinica	Cyperaceae
33	ደንገል	Papayrus	Cyperus Cyprus papyrus	Cyperaceae
34	እፀ ፋሪስ		Datura stramonium	Solanaceae
35	የደሬደዋ ዛፍ		Delonix regia	Fabaceae
36	ክትክታ		Dodonaea angustifolia	Sapindaceae
37	ለንቋጣ		Dombeya torrida	Sterculiaceae
38	ቀይ ባህር ዛፍ	Eucalyptus	E. Camaldulensis	Myrtaceae
39	የሽቶ ባህር ዛፍ	Red Eucalyptus	E. Citriodora	Myrtaceae
40	ቀንጥፍጥፍ		Entada abyssinica	
41	ቁልቁል	Cactus	Euphorbia abyssinica	Euphorbiaceae
42	ቅንጭብ		Euphorbia tirucalli	Euphorbiaceae
43	በለስ		Ficus carica	Moraceae
45	የጎ ማዛፍ	Rubber Tree	Ficus elastica	Moraceae

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No.	Amharic name	English name	Botanical species	Family
46	ሸላ	<i>Fig tree</i>	<i>Ficus sur</i>	Moraceae
47	ባንባ		<i>Ficus sycomorus</i>	Moraceae
48	ዋርካ		<i>Ficus vasta</i>	Moraceae
49	ግራቮሊያ		<i>Gravilla robusta</i>	Proteaceae
50	ኑግ	<i>Lean seed</i>	<i>Guizotia abyssinica</i>	Asteraceae
51	ከርባ/አጫላ		<i>Hygropahila schulli</i>	Acanthaceae
52			<i>Indigofera sp.</i>	Fabaceae
53			<i>Ipomoea purpurea</i>	Convolvulaceae
54	የጠንጃ ዛፍ		<i>Jacaranda mimosifolia</i>	Bignoniaceae
55	ጃትሮፋ	<i>Jatrofa</i>	<i>Jatropha curcas</i>	Euphorbiaceae
56	ጅጅ	<i>Junipres</i>	<i>Juniperus procera</i>	Cupressaceae
57	ስጫ		<i>Justitia schimperana</i>	Acanthaceae
58	ጓያ		<i>Lathyrus sativus</i>	Leguminosae
59	ግብር	<i>Lentill</i>	<i>Lens culinaris</i>	Fabaceae
60	ሉኪና		<i>Leucaena leucocephala</i>	Fabaceae
61	ማጎ	<i>Mangoe</i>	<i>Magnifera indica</i>	Rubiaceae
62	አጣጥ		<i>Maytenus gracilipes</i>	Celasteraceae
63	ሜሊያ		<i>Melia azedarach</i>	Meliaceae
64	ብርብራ		<i>Millettia ferruginea</i>	Fabaceae
65	እሸህ		<i>Mimusops kummel</i>	Sapotaceae
66	እንጆሪ	<i>Strawberry</i>	<i>Morus alba</i>	Moraceae
67	ሙዛ	<i>Bannana</i>	<i>Musa sapientum</i>	Musaceae
68	አደስ		<i>Mytenus communis</i>	
69	ጥቁር አዝማቺ	<i>Black Cummon</i>	<i>Nigella sativa</i>	Ranunculaceae
70			<i>Nymphaea caerulea</i>	Nymphaeaceae
71			<i>Nymphoides indica</i>	Poaceae
72	ዳማሳሲን		<i>Ocimum lamiifolium</i>	Lamiaceae
73	ዌራ	<i>Olive</i>	<i>Olea spp.</i>	Oleaceae
74	በለስ ቁልቁል		<i>Opuntia cylindrica</i>	Cactaceae
75	ሩዝ	<i>Rice</i>	<i>Oryza glaberrima</i>	Poaceae
76	አሸካይ	<i>Avocado</i>	<i>Persea americana</i>	Lauraceae
77	ዘንባባ/ሰሌን	<i>Palm Tree</i>	<i>Phoenix reclinata</i>	Arecaceae
78	ዝግባ	<i>Zigba</i>	<i>Podocarpus falcatus</i>	Podocarpaceae
79	ጥቁር እንጭ		<i>Prunus africana</i>	Rosaceae
80	ዘይቱን	<i>Guava</i>	<i>Psidium guajava</i>	Myrtaceae
81	ጌሾ	<i>Hobbs Tree</i>	<i>Rhamnus prinoides</i>	Rhamnaceae
82	ቀጋ		<i>Rosa abyssinica</i>	Rosaceae
83	ፅጌረዳ		<i>Rosa spp.</i>	Rosaceae
84	ሳስባንያ		<i>Sasbania sesban</i>	Leguminaseae
85	ጠፍ አዳም		<i>Satereja paradoxa</i>	Lamiaceae
86	ቁንዶ በርበሬ		<i>Schinus molle</i>	Anacardiaceae
87	ሰርክ አበባ		<i>Senna didymotrya</i>	Fabaceae
88			<i>Sesbania sesban</i>	Fabaceae
89	እንቧይ		<i>Solanum indicum</i>	Solanaceae
90	ድንቸ	<i>Potatoes</i>	<i>Solanum tuberosum</i>	Solanaceae
91	ዶክማ		<i>Syzygium spp.</i>	Myrtaceae
92			<i>Trifolium acaule</i>	Fabaceae

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<b>No.</b>	<b>Amharic name</b>	<b>English name</b>	<b>Botanical species</b>	<b>Family</b>
93	አ ብሽ		<i>Trigonella foenum</i>	Fabaceae
94	አ ቱቸ		<i>Verbena officinalis</i>	Verbenaceae
95	ግራዋ		<i>Vernonia amygdalina</i>	Asteraceae
96	የ ሴት ምላስ		<i>Xanthium spinosum</i>	Asteraceae
97	እንኮይ		<i>Ximenia americana</i>	Tiliaceae

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### List of Common Mammals and Reptiles

S/N	Local name	Scientific name	Common name
1	Nebir	<i>Panthera pardus</i>	Leopard
2	Midako	<i>Silvicopra grimmer</i>	Antelope
3	Kebero	<i>Canis aureus</i>	Common jackal
4	Tera Jib	<i>Hyaena hyaena</i>	Striped hyaena
5	Tinchel	<i>Lopus starkii</i>	Rabbit
6	Zinjero	<i>Papio Anubis</i>	Anubis baboon
7	Sesa	<i>Oreothragus oreothragus</i>	Klippspringer
8	Faro	<i>Ichneumia albicauda</i>	White-Tailed Mongoose
9	Silemetimat	<i>Genetta Sp</i>	Genet
10	Jart	<i>Hystrix cristata</i>	Crested porcupine
11	Aner	<i>Felis serval</i>	Serval cat
12	Awuchi	<i>Orycteropus afer</i>	Aardvark
13	Dikula	<i>Sylvicapra Sp</i>	Bushbuck
14	Asama	<i>Potamochoerus larvatus</i>	Bushpig
15	Bihor	<i>Redunka redunka</i>	Bohr reedbuck
16	Tera Tota	<i>Cercopithecus aethiops</i>	Vervet monkey
17	Gureza	<i>Colobus polykomos</i>	Colobus monkey
18	Shikoko	<i>Procavia capensis</i>	Rock hyrax
19	Ebab		Snakes
20	Zendo		Python
21	Arjano	<i>Veranus niloticus</i>	Nile monitor
22	Gumare	<i>Hippopotamus amphibies</i>	Hyppopotamus
23	Tirgn	<i>Civetictis civetta</i>	African Civet
24	Muchekay	<i>Orycteropus afer</i>	Ardvark
25	Kerkero/Riya	<i>Phacochoerus africanus</i>	Warthog
26	Filfel	<i>Trachytocytes spelender</i>	Mole
27	Ayt		Rat
28	Enkurarit		Frog
29	Gurt		Toad
30	Kemer Jib	<i>Proteles cristatus</i>	Aardwolf
31	Azo	<i>Crocodylus niloticus</i>	Crocodil

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**List of Common Bird Species**

#	Species or group name	Common name	Amharic/ local name	Remark
1	Avocet	Pied Avocet	አፈ ቁልጭ አባሳት	
2	Babbler	White rumped babbler	ነጭ ላኦላይ ጅራተ ከድን ማዳዎ	
3	Barbet	Banded Barbet	ሽልጭም ጋርዴም	E
4		Blackbilled Barbet	ጥቁር አንገት ጋርዴም	
5		Double toothed Barbet	ድርብ ጥርስ ጋርዴም	
6	Bateleur	Bateleur	ሞላላ	
7	Batis	Black headed	ራሳ ጥቁር ባቲስ	
8	Bee eater	Blue breasted	ሰማይ ደረት ንበበል	
9		Little	ትንሽ ንበበል	
10		Northern Carmine	ኮክማ ንበበል	
11	Bishop	Black winged	እራሳ ተርቱካን ጩባ	
12		Northern red	ቀይ ጅርባ ጩባ	
13		Yellow crowned	ቢጫ ዘወድ ጩባ	
14	Blackcap	Blackcap	ጥቁር ቆብ ዋብላር	
15	Boubou	Tropical (Ethiopian)	የኢትዮጵያ ዉረ-ያሬድ	
16	Brubru	Brubru	ተርብር	
17	Bulbul	Common	ተራ ጉትያ ወፍ	
18	Bunting	Ortolan	ስንደሽት በንቲንግ	
19		Cinnamon-breasted (rock)	የአለት በንቲንግ	
20	Bustard	Black bellid	ጥቁር ሀድ ከርከሜ	
21	Buzzard	Augur	ገዴ	
22	Camuroptera	Gray backed	ጅራቴ በጀርባ	
23	Canary	Yellow fronted	ግንባረ ቢጫ ካነሪ	
24	Chat	Mockin gcliff	ክንፈ ነጭ የቋጥኝ ወፍ	
25	Chiffchaff	Common	ቸፍቸፍ	
26	Custicola	Stout	የደጋ ሰሰቲካላ	
27	Citril	Africn	ጥላሽት አይን ሲትሪል	
28	Coot	Red knobbed	ቀይ አንገል ግንባር የወሃ ደሮ	
29	Coucal	Blue headed	አንግባሪቅ ሰማዊ ራሳ ከክል	
30	Cordonbleu	Red checked	ጉንጨቀይ ድንቢጥ	
31	Cormorant	Reed	ጅራተ ረጅም አሳ ወጊ	
32		White breasted	ደረተ ነጭ አሳ ወጊ	
33	Crake	Black	የሰይጣን ደሮ	
34	Crane	Black crown	ለጭጋ ሽሙ	
35		Common (Eurasian )	የደንቢያ ሽሙ	
36		Wattled	ባለ እንጥል ሽሙ (አባካሽ)	
37	Crombec	Northern	ጅራተ ጎማት ከሮግጫክ	
38	Crow	Cape crow	ጥቁር ቁራ	
39		Pied	ቡሬ ቁራ	
40	Cuckoo	African cuckoo	ግራጫ ከኩ	
41	Klaa's cuckoo	Klaa's cuckoo	አንግባሪቁ አረንጓዴ ከኩ	
42	Curlew	Eurasian	የአወሮፓ ረጅም አፈደፋት ማቁር	

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#	Species or group name	Common name	Amharic/ local name	Remark
43	Darter	African	ለመጥ	
44	Dove	African morning	የቆላ ዋኔ	
45		Blue spotted wood	ሰሞዋ ዮጠጠጠ ክንፍ ዋኔ	
46		Dusy Turtle	የደጋ ዋኔ	
47		Laughing	ትንሻ ዋኔ	
48		Lemon	የጫጫ ወላል ዋኔ	
49		Namaqua	ጥቁር ፊት ዋኔ	
50		Red eyed	ከኩ ማሐቴ ዋኔ	
51		Vinaceous	ወይንማ ዋኔ	
52	Drongo	Fork-tailed	ሸካ ጅራት ደሮንጎ	
53	Duck	African black	ጥቁር ዳክዬ	
54		Comb duck	እንጦጥ ማቁር ዝይ	
56		Ferruginous	የፈረጎሰን ዳክዬ	
57		Fulous	ሸክላማ ዳክዬ	
58		White backed	ጀርባ ነጭ ዳክዬ	
59		White faced	በቃ ፊት ዳክዬ	
60		Yellow billed	ቢጫ ማቁር ዳክዬ	
61	Eagle	African fish	አሳ አወጪ ንስር	
62		Long crested	ቁንጫውንስር	
63	Egret	Cattle	የከተት ሰቢሳ	
64		Great white	የወንዜው ሰቢሳ	
65		Little	ትንሹ ሰቢሳ	
66		Yellow billed	ቢጫ ማቁር ሰቢሳ	
67	Eremomela	Green-backed	አረንጓዴ ጀርማ ኢርሞሜ	
68	Falcon	Lanner	በፍ ጉንጨጫ ሰላ	
69	Finch	cut-throat	ቁርጥ አንገት ደንቢጥ	
70	Finfoot	African	ቀይ እግር ለመጥ	
71	Firefinch	Red –billed	ቀይ ማቁር የጋሮ ደንቢጥ	
72	Fiscal	Common	ተራ ሸሻይ	
73		Gray backed	ግራጫ ጀርባ ሸሻይ	
74	Flamingo	Greater	ቆልሞጥ	
75	Flycatcher	Abyssinian slaty	የአቢሲንያ ዝንቦ በል	
76		African Paradise	የገነት ወፍ	
77		Northern black	ጥቁር ዝንቦ በል	
78		Pale	ቦላ ዝንቦ በል	
79		Spotted	ነጠጠጠ ዝንቦ በል	
80	Francolin	Clapperton’s	ፊተ ቀይ ቆቅ	
81	Gallinule	Allen’s (lesser)	ሰሞዋ ግንባር የረግረግ ዶሮ	
82	Garganey	Garganey	ጋርጋኒ	
83	Godwit	Black tailed	ጫ ጥቁር ጅራት ጉዳት	
84	Goose	African pygmy	ደንክዬ ዝይ	
85		Blue winged	ክንፈ ሰሞዋ ዝይ	E
86		Egyptian	ይብራ (የግብጽ ዝይ)	
87		Spur winged	ቦሬ ዝይ (ዚብራ)	

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#	Species or group name	Common name	Amharic/ local name	Remark
88	Goshawk	Dark Chanting	አይባዎን ጥ ለቃሚ ጭት	
89		Gabar	ፊተ ብርቱካናማ ጭት	
90	Grebe	Greater crested	ትልቁ ባለ ቁንጮገርብ	
91		Little	የወሃ ጭጭት	
92	Greenshank	Common	ተራ የወንዝ ፏፌ	
93	Guineafowl	Hemeted	ጀግራ	
94	Gull	Black headed	ራስ ጥቁር ገል	
95		Great black headed	ትልቁ ጀርባ ጥቁር ገል	
96		Lesser black headed	ትንሹ ጀርባ ጥቁር ገል	
97	Hamerkop	Hamerkop	የወንዝ አሞቄ	
98	Harrier	Eurasian Marsh	የደንገል ጭሌሌ	
99		Montagu's	ጥቁር ማሞጃ ክንፈ ጭሌሌ	
100		Pallid	ግራጭ ጭሌሌ	
101	Herrier hawk	African	እንቁላል ለቃሚ ጭት	
102	Heron	Black headed	ጥቁር እራስ ሳቢሳ	
103		Black crowned night	የላሊት ሳቢሳ	
104		Goliath	ጉሊዮድ ሳቢሳ	
105		Green-backed	የቀጥረ ሳቢሳ	
106		Grey	ግራጭ ሳቢሳ	
107		Purple	አንገተ ሰጎግ ቡናማ ሳቢሳ	
108		Squacco	የረግረግ ሳቢሳ	
109	Hoopoe	Eurasian	የአወጅፓ እሞጃ ወፍጥ	
110	Hornbill	Abyssinian Ground	የአቡሲኒያ እርከም	
111		African gray	ቅራጭ አፈ ቀንድ	
112		Hemprich's	የወንዙው አፈ ቀንድ	
113		Silvery –cheeked	ጉንጭ ብራማ አፈ ቀንድ	
114	Ibis	African sacred	ነ ጭጋጋኖ	
115		Glossy	ወይና /ብርቅርቅ ጋጋኖ	
116		Hadedda	አደንቁር ጋጋኖ	
117		Wattled	የደጋ ባለ እንጥል ጋጋኖ	E
118	Ingigobird	Village	ደንቢጥ የሞቅቀል ወፍ	
119	Jacana	African	ትልቁ ስንዝራት	
120		Lesser	ትንሹ ስንዝራት	
121	Kestrel	Common	ጉንጭ ማሞጃ ሲላ	
122		Gray	ግራጭ ሲላ	
123	Kingfisher	African pygmy	ደንክዬ አሳ ዓሞቄ	
124		Giant	ግዙፉ አሳ ዓሞቄ	
125		Gray headed	ራስ ግራጭ አሳ ዓሞቄ	
126		Malachite	ዲንቢጥ አሳ ዓሞቄ	
127		Pied	ቦሬ አሳ ዓሞቄ	
128		Striped	ንቅሴ አሳ ዓሞቄ	
129		Woodland	የወንዙ አሳ ዓሞቄ	
130	Kite	Black	ጥቁር ማቁር ጭረት	
131		Black shoulder	ጥክሻ ጥቁር ጭረት	

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#	Species or group name	Common name	Amharic/ local name	Remark
132		Yellow billed	ቢጫማቁር ጫፊት	
133	Lark	Thekla	ቆንጫጭ ለርክ	
134	Lovebird	Black winged	ጥቁር ክንፍ ብርቅዬ በቀቀን	E
135	Maninkin	Bronze	ነሀስ ማኪን	
136	Martin	Brown throated	በኖማ አንገት ወንጨት	
137		Common house	ተራ ወንጨት	
138		Rock	የቋጥኝ ወንጨት	
139		Sand	የወንዜ አሸዋ ወንጨት	
140	Moorhen	Common	ቀይ ግንባር የወሃ ዶሮ	
141		Lesser	ትንሽ የረግረግ የወሃ ዶሮ	
142	Mouthbird	Specked	ንቅሴ ማጥ ወፍ	
143	Oriole	Abyssinian	የአባሲያ አሪአሌ	
144	Ospery	Ospery	እስፕረይ	
145	Owl	Abyssinaian long eared	የአባሲያ ጉጉት	
146	Oxpecker	Red billed	አፈ ቀይ አረጭ	
147	Parrot	Yellow fronted	ቢጫሪስ ብርቅዬ በቀቀን	E
148	Pelican	Great white	ትልቁ ነጭሻለ	
149		Pink-back	ትንሹ ሮዛ ሻለ	
150	Petronia	Bush petronia	ቁጥቋጥ ጨባ	
151	Pigeon	Bruce's green pigeon	ቢጫሆድ እርግብ	
152		Speckled	የጣራ እርግብ	
153		White collared	ባለነጭካሌታ እርግብ	
154	Pintail	Northern	ሞጫ ጅራት ዳክዩ	
156	Pipite African	Pipite African	የሳር ምድር የሰንደዶ ወፍ	
157		Plain –backed	ጀርባ ለጥ የሰንደዶ ወፍ	
158		Red –throated	ቀይ አንገት የሰንደዶ ወፍ	
159	Plantain eater	Easter	ቢጫማቁር ግራጫስከር	
160	Plover	African wattled	ባለ እንጥል ከልላት	
161		Black headed	ራስ ጥቁር ከልላት	
162		Black winged	ክንፈ ጥቁር ከልላት	
163		Common ringed	ጥቁር አግደም ደረት ከልላት	
164		Kittlitz's	ሽሮ ቀለም ደረት ከልላት	
165		Little ringed	ትንሽ ከልላት	
166		Spur winged	ነጭጀርማንድ ከልላት	
167		Three banded	ደርብ ጥቁር ደረት ከልላት	
168	Pratincole	Collared	ባለ ከራባት ፕራቲንኮል	
169	Prinia	Tawny flanked	የጓሮ ፕሪኒያ	
170	Puffback	Nothern	ኤነ ቀይ ኘፍባክ	
171	Pytilla	Red billed	ቀይ ማቁርፕቲሊያ	
172	Quails	Harliguine	ከልሌ	
173	Rail African	Rail African	በኖማ የወሃ ዶሮ	
174		Rouget's	ቂጠ ነጭየረግረግ ዶሮ	
175	Raven	Fan tailed	ጅራተ ማረፊት ቁራ	
176	Redhank	Spotted	ጠቃላት ረጅም እግር ፋፋይ	

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#	Species or group name	Common name	Amharic/ local name	Remark
177	Redstar	Common	ተራ ሬደስታርት	
178	Robin-chat Rueppell's	Robin-chat Rueppell's	የቁጥቆጦ ስር ሮቢንቻት	
179	Roller	Abyssinian	የአባሲንያ ምዝገታ ሮልር	
180	Ruff	Ruff	ግር የወንዝ ፋፍዬ	
181	Sandgrouse	Four banded	ድርብርብ ማሳጭ የአሸዋ ድርጭት	
182	Sandpiper	Common	ትንሻ የወንዝ ፋፍዬ	
183		Curlew	አፈ ደፋታ የወንዝ ፋፍዬ	
184		Green	ጥቁርማ ጀርባ የወንዝ ፋፍዬ	
185		Marsh	ረግረግ የወንዝ ፋፍዬ	
186		Wood	ጠቃጠቆ የወንዝ ፋፍዬ	
187	Seed eater	Streaky	ገብጫ ዘር በል	
188	Shikra	Little banded	አይነት ቀይ የጨበ ጭት	
189	Shoveler	Northern	አካፎ	
190	Shirke	Lesser grey	ግራጭ ሸሻይ	
191		Red backed	ቀይ ጀርባ ሸሻይ	
192		Red tailed	ጀራተ ቀይ ሸሻይ	
193		Wood chat	እራሳ ቸኮሌት ሸሻይ	
194	Snake –Eagle	Western banded	እባባ በል ንስር	
195	Snipe	African	የኢትዮጵያ ረጅም ማቁር ስናይፕ	
196		Common	ተራ ስናይፕ	
197	Sparrow	Swainsons's	ደበሻ ጨበ	
198	Sparrowhawk	Little	ትንሻ የጨበ ጭት	
199	Sparrowlark	Chestnut-backed	ጀርባ በናማ ጨበላርክ	
200	Spoonbill	African	ማኪያ አፍ	
201	Starling	Greater blue-eared	ጆሮ ሰማዊ ወምቄ	
202		Red winged	ክንፈ ቀይ ወምቄ	
203		Violet backed	ጀርባ ሀምቄ ወምቄ	
204	Stilt	Back winged	ጥቁር ክንፍ ረቸም ስቲልት	
205	Stint	Little	ትንሻ አጫ ስቲልት	
206		Termminck's	ሰታታ ጀርባ ነጭ ስቲልት	
207	Stonechat	Common	ተራ ስቶንቻት	
208	Storks	Abdim's	ሀምቄ ራዛ	
209		African open billed	አይነት ጥም ማቁር ራዛ	
210		Black	ጥቁር ራዛ	
211		Marabou	አባኮዳ/አባኪሾ	
212		Saddled billed	ሽልም ራዛ	
213		White	ነጭ ራዛ	
214		Wooly-necked	ሸሽ አንግት ራዛ	
215		Yellow billed	ቢጫ ማቁር ራዛ	
216	Sunbird	Copper	ሙዳብ አበባ ቀሳሚ	
217		Scarlet-chested	ደሞቅ ቀይ ደረት አበባ ቀሳሚ	
218		Tacazze	ተከዜ አበባ ቀሳሚ	
219		Variable	እስስተ ቀለም አበባ ቀሳሚ	
220	Swallow	Barn	የትምሽት ወንጭት	

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#	Species or group name	Common name	Amharic/ local name	Remark
221		Lesser striped	ደረተ ጩት ወንጩት	
222		Mosque	ሞቅክ ወንጩት	
223		Wire-tailed	ቀይ ራስ ወንጩት	
224	Swift	Nyanza	በኖማ ወንጩት	
225	Tcharge	Black crowned	ጥቁር ዘወድ ቻግራ	
226	Teal	Common	ተራ የአወድፓ ቲል	
227	Tern	Caspain	ቀይ ማቁር ነጭገል	
228		Gull billed tern	አሞላማ ነጭገል	
229		Whiskered	ግራጭግ ነጭገል	
230		White winged	ክንፍ ነጭገል	
231	Thick knee,	Sengel	የሴኔጋል ደግሰ ጸግር	
232	Thrush	African	የቆላ ጩ	
233		Groundscraper	የሞጮት ጩ	
234		Olive	የዛፍ ጩ	
235	Tinkerbird	Yellow fronted	በጭግንባር ቲንከርበርድ	
236	Tit	White backed	ጀርባ ነጭቲት	E
237	Trongon	Narina	ናትሪና ትሮንግን	
238	Turaco	White cheeked	ነጭክንፈ ነበልባል ዞሪት	
239	Vulture	Egyptian	ነጭጆፊ አጥሮ	
240		Hooded	በኖማ ራስ ጆፊ አጥሮ	
241		Ruppell griffon	የገደል ጆፊ አጥሮ	
242		White backed	ጀርባ ነጭጆፊ አጥሮ	
243	Wagtail	African pied	የአፍሪካ በሬ ጠልጠል	
244		Citrine	ትንጎ ጠልጠል	
245		Gray	ግራጭ ጠልጠል	
246		Mountain	የወንዝ ጠልጠል	
247		White	ነጭ ጠልጠል	
248		Yellow	በጭ ጠልጠል	
249	Warbler	Buff-bellied	የግራር ዋጥሊር	
250		Eurasian reed	የአወድፓ የደንገል ዋጥሊር	
251		Olivaceous	ወይራማ ዋጥሊር	
252		Sedge	የግጭ ዋጥሊር	
253	Wattle eye	Brown throated	በኖማ አንገት አይነ ጸርግብ	
254	Weaver	Baglafecht	አይነ ነጭጩባ	
255		Spectacled	ባለ ማፀር ጩባ	
256		Village	ጥቁር ጸራስ ጩባ	
257	Wheatear	Black eared	ጆሮ ጥቁር ዊቴር	
258		Red breasted	ደረተ ቀይ ዊቴር	
259		Northern	ተራ ዊቴር	
260		Pied	በሬ ዊቴር	
261	Whinchat	Whinchat	ዊንቻት	
262	White eye	African yellow	የአፍሪካ በጭ ነጭአይን	
263		Abysinian	የአብሲኒያን ነጭአይን	
264		Montane	የደጋ ነጭአይን	

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#	Species or group name	Common name	Amharic/ local name	Remark
265	Whydah	Pin tailed	ሞጫ ጅራት ዎደድ	
266		Exlamtory paradise	ደግቅ የገነት እሞጫት	
267	Widgeon	Eurasian	አወድጋ ዋገን	
268	Widowbird	Fan tailed	ጅራተ ማረፊት ዊዶ ባርድ	
269		Yellow mantled	ጥቁር ትከሻ ዊዶባረድ	
270	Wood-hoope	Black billed	ጥቁር ማቁር ጨረ ወደቶ	
271	Woodpecher	Bearded	ባረድድ ግንደ ቆርቆር	
272		Cardinal	ጉንጨንቅሴ ግንደ ቆርቆር	
273		Gray	ግራጨግንደ ቆርቆር	
274		Gray-headed	ግራጨረሰ ግንደ ቆርቆር	
275		Nubian	ኑቢያን ግንደ ቆርቆር	
276	Wryneck	Eurasian	የአወድጋ ራይኔኮ	

## Annex 6. Do`s and Don`ts of Lake Tana Biosphere Reserve zones



### Zonation of Lake Tana Biosphere Reserve (LTBR)

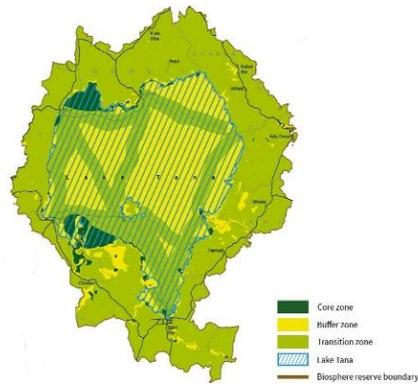
#### Core Zone

**DO's: Let nature take care of itself.**

According to Regulation 125/2014 by Amhara National Regional State, entering a core zones is only allowed for non-destructive activities, such as research. Even for these activities a special permit needs to be obtained from the Biosphere Reserve authorities.

**DON'Ts: Destructive and economic activities, such as**

- Hunting of wild animals or taking them away (including their eggs),
- Cutting, collecting or damaging of plants/trees
- lighting fires, smoking or slash and burn practices
- Picking up, taking away or damaging of any items, natural or manmade
- Fishing, farming, livestock grazing
- Mineral exploration, digging or sand extraction
- Any disposal of waste or other manmade materials
- Any type of construction works
- Damaging, changing or removing any boundary marks of a core zone



#### Buffer Zone

**DO's: Sustainable use of natural resources, e.g. traditional fishing and organic farming.**

- Traditional (seasonal) fishery, organic farming, beekeeping and similar activities
- Environmental research and education
- Recreation and eco-tourism

Only limited human activity is allowed and often guarded by community management systems and governed by utilization bylaws.

**DON'Ts: Harmful and destructive practices, such as**

- use of chemical fertilizer and pesticides
- washing of clothes and vehicles near water sources
- (infrastructure) construction (buildings, roads)
- mining, drilling and other large scale earth movement
- over-use of water and plants (e.g. for grazing)

#### Transition Zone

**DO's: All other, legal human activities.**

Nonetheless a focus on sustainable and ecologically sound practices should always be favoured and promoted to ensure Lake Tana Biosphere Reserve becomes model region for sustainable development.

**DON'Ts: Purely destructive and damaging activities, e.g. illegal according to Ethiopian law.**



Annex 7. FAQ's

Ten Frequently Asked Questions about the Lake Tana Biosphere Reserve



Lake Tana is Ethiopia's largest lake with its surface area of 3,673km<sup>2</sup>. The lake and its surroundings harbor a rich biodiversity. 21 of its fish species are endemic. It is home to globally threatened bird species such as the Wattled Crane (*Grus carunculatus*) and Rouget's Rail (*Rougetius rougetti*). It is also a site of global importance for migrating birds, including tens of thousands of Common Cranes (*Grus grus*) gathering here every year. Mammals of the area include the characteristic Hippopotamus.



Native forest patches around Lake Tana support many species of indigenous woody plants and important medicinal plants. The wetlands of the lake are dominated by Papyrus and other reeds, and provide invaluable habitat, flood protection and water purification functions.

37 islands with 19 ancient churches and monasteries located on the islands, make the area even more attractive. This entire cultural and natural heritage predestined

Tana to be registered as UNESCO biosphere reserve with a total area of almost 700, 000 hectares. It includes the whole lake and its shores. It stretches through three administrative zones (North Gondar, South Gondar, West Gojam), nine woredas (Bahir Dar City, Bahir Dar Zuria, Dera, Fogera, Libokemkem, Gondar Zuria, Dembia, Alefa, Taqusa, North Achefer) and 137 kebeles.

1. Why, when and by whom was Lake Tana established as a UNESCO Biosphere Reserve?

In September 2014 the federal government applied with UNESCO for a biosphere reserve status, which was granted in June 2015. Registration requirements were met by joint efforts of the ANRS regional government, supported by the German Nature and Biodiversity Conservation Union (NABU) in cooperation with Michael Succow Foundation and many local stakeholders.

Historical churches and monasteries, traditional forest conservation methods around the churches, biodiversity, endemic fish species, community living and their culture make this area unique, but are endangered due to unsustainable human activities. Protecting and preserving them was one of the main motives for establishing a biosphere reserve.

2. What and where are core / buffer / development zones of Lake Tana Biosphere Reserve?

Biosphere reserves typically consist of one or several core zone(s) of strictly protected ecosystems (only scientific research allowed), a buffer zone where limited human activity in such a way that it supports protection in the core zones is permitted (eco-tourism, agriculture, fishing), and a development zone where greater activity is allowed as long as it uses resources in a sustainable manner. Zones may be used in a variety of ways in order to support local needs and conditions.

At Lake Tana, 78 core zones were demarcated, which are mainly found along the lakeshore. Almost 300 individual buffer zones are identified, from individual Church Forests to large aquatic areas. The remaining area is designated development zone. In total, core zones occupy around 3%, buffer zones 27% and transition zones 70% of the Lake Tana Biosphere Reserve.

3. Whom shall I contact about Lake Tana Biosphere Reserve issues?

Pursuant to the regulation no. 125/2014, a regulation provided for Administration of Biosphere Reserves of Lake Tana issued at 'Zikre Hig' Publication, the Amhara Region Culture, Tourism and Parks Development Bureau is mandated to administer the biosphere reserve.

It is known that the Lake Tana Biosphere Reserve was demarcated with the participation of members of the zonation committees, representing each and every kebele administration as well as other local groups. Additionally, woreda experts, including those of EPLAU and CI, carry out important, implementation and information dissemination roles for the biosphere reserve. These offices can be contacted for biosphere reserve related issues.



4. What benefit do I get from living in the Biosphere Reserve area?

The biosphere reserve status usually draws national and international attention to a certain area leading to more investment and projects towards sustainable development. To name some which are already set in motion and which can benefit you directly:

- Income and job generating activities: e.g. support to eco-tourism, production of animal forage, pilot projects for alternative income activities.
- Support to businesses: promotion of Lake Tana as touristic site, umbrella brand for regional natural products, and support to community ventures.
- Establishment of local resource management schemes, e.g. wetland management committees, designation and management of Area Closures, indigenous seedling propagation and planting, cut-and-carry systems.

- Trainings in relation to *increasing productivity and protection of natural resources* by joint efforts of the local and international NGOs, universities and research institutions, government and the society;
- Ultimately, you and your family will also benefit from a *safer environment* and from the long-term maintenance of key natural resources, such as water and soil fertility, for your lives.

### 5. Will there be any resettlement of people and our land will be taken for the Biosphere Reserve?

No one shall face threat of being displaced from his or her legitimately owned plot. Biosphere Reserves aim at improving human livelihoods and sharing of benefits, as well as to protect nature and ecosystems; thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable. It is creating balance between nature and human activities thereby enabling them to live without one harming the other. Therefore, **inhabitants should properly and sustainably use** the natural resources available in the reserve area.



### 6. Is it forbidden to use fertilizer in the area?

It is common that fertilizer should be used for enhanced productivity. Therefore, there is **nobody who prohibits** one from using fertilizer in the Lake Tana Biosphere Reserve site. However, for the wellbeing of the lake, use of **organic fertilizer** is highly recommended in the area. Artificial fertilizers have the potential for polluting the lake. Some nutrients are washed away to the lake by leaching. Hence, **farmers are advised to use compost or organic fertilizer instead**. Trainings for soil- and environmentally friendly farming techniques will be offered at various sites from time to time.

### 7. Will all fishing activities be prohibited in the Lake Tana Biosphere Reserve area?

Usually, any fisherman can catch fish in all areas of the lake. **Fishing from places which are marked as core zones places is exceptionally prohibited**, in order to facilitate fish reproduction. Fishing from these locations disturbs and damages the future source of fish. As these places are quite small, the prohibition is not believed to cause scarcity on the source of fish for fisheries. Instead, **protecting such places ensure sustainability of fish catching** all across the lake. Furthermore, all fishing activity naturally has to comply with the rule and regulation of fish resource proclamation of the region. This includes attention to seasonal closures and the correct fishing gear.

### 8. How can we discharge waste (solid and liquid) without polluting Lake Tana?

Any waste matter released to the lake affects the functionality of the lake ecosystem and the services it provides to humans and wildlife. Individuals and organizations shall **purity waste matters before letting it go** into the lake. The society has to develop the habit of putting solid wastes into dustbins rather than randomly throwing them all around the lake and of not using the lakeside and rivers as car wash sites. Hotels and other organizations have to **treat liquid waste** before releasing to the environment. The concept of sustainable waste management should be enhanced by the city administration and other partners.

### 9. Who is responsible in protecting and guarding the resources of the Biosphere Reserve?

A Biosphere Reserves is a unique form of protected area due to the fact that it is **owned and protected by the local community**. Biosphere Reserve sites are not fenced or protected by rangers; they are simply protected by local communities and the interest of the society who make use of them. If the local people are well aware of its benefits, they have no difficulty protecting its wellbeing. It is the **responsibility of the community** to protect and use the resources in a sustainable way, supported by the designated local and regional committees.

### 10. How can I contribute to maintain our resources for our children and grandchildren?

The size and composition of fauna and flora living in and around the lake has been progressively decreasing. For instance, the ample fish resource which we had 20 years back is facing much scarcity currently. The kind of fish which is customarily called Bezo is currently non-existent. Papyrus and other wetland species are decreasing. Currently most of them are limited to the western parts of the Lake. It is feared that we are going to be left with only memories of how beautiful the lake once was. To truly **preserve its uniqueness for the coming generations** each and every inhabitant of the Lake Tana Biosphere Reserve should engage in sustainable practices both in their work as in their private life. For example:

- Discuss environmental observations and issues with your friends, family and neighbors;
- Take part in trainings that are offered;
- Improve your own homestead and farmland by planting indigenous or multi-purpose trees;
- Increase cut-and-carry feeding of your livestock;
- Care for waste disposal in and around your own home and business.



### For more information contact:

Culture, Tourism and Parks Development Bureau  
Lake Tana Biosphere Reserve Administration  
P.O.Box: 1616, Bahir Dar – Ethiopia  
Tel: +251 (0) 582202650/251 (0) 582221834  
Bahir Dar, Ethiopia  
Or visit our website at:

[www.laketana-biosphere.com](http://www.laketana-biosphere.com)



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