



# Assessment on Lake Tana Biosphere Reserves in Zegae Peninsula, South and Central Gonder, Amhara Region, North Ethiopia

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**Abstract:** The assessment was conducted at Lake Tana boundaries of Gonder, Fogera, Libokemkam, Bahir Dar area, west Dembya, east Dembya and Derain order to investigate and document community knowledge on Lake Tana biosphere reserves and its significant factors. This study was carried out in 30 consecutive days of 2012 E.C. Data from interviewers was collected using random sampling method. A total of 129 individuals with 13 (10.07%) female and 116 (89.92%) male were interviewed. The collected data were analyzed by using SPSS software version 21. As respondent result showed that activities served from the biosphere reserve are farming 15 (11.6%), farming and animal rearing 48 (37.2%), vegetable and horticulture production 3 (2.3%), fishing 5 (3.9%), farming and vegetable 25 (19.4%), guiding tourists through water/by local boats and others 28 (21.7%). The Lake Tana biosphere reserves also provide financial, communal, supporting, ecological and spiritual services for the local society live in buffer zone of the lake. The lake is one of greatest potential for aquatic ecosystem, transportation activity, source of tourism developments home for different birds, fishes, hippos and other aquatic plant species. From the study area of all 18 kebeles Lake Tana biosphere reserve affected by *Eichhornia crassipes* 43 (33.3%), recession farming 1 (0.8%), erosion/sedimentation 1 (0.8%), pollution, invasive species 33 (25.6%) and free grazing 16 (12.4%). Eradication of wetlands, pollution, constrictions of buildings at the buffer zone of the lake, unsustainable utilization also factor for the Lake Tana biosphere reserve observed during the survey study. Lake Tana biosphere reserve is very crucial for the community interests of tourism specially peninsula and monasteries, irrigation and recreation. Sustainable conservation of the lake should be applied.

**Keywords:** Biosphere Reserves, Lake Tana, *Eichhornia crassipes*

## 1. Introduction

Lake Tana is located in north-east of Ethiopia and is the largest lake in the country. The lake is situated 1830 m above mean sea level (a.m.s.l) with its highest point at Ararat Plateau, which is 1994 m above mean sea level. 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 above mean sea level. According to various sources, many years back, the total area of the lake had been 6,602 sq km while now it has shrunk to 3156 sq km. The total area of the catchment

measures over 15,000 sq km. The width of the lake (from East to West) is 68 km while its length (North to South) is 73 km. The lake measures 14 m at its deepest point while the average depth is estimated to be 8 m [2]. The Lake is one of the foundation of the Blue Nile River, is geographically positioned in the north-western part of Ethiopia, between latitude 10°58'-12°47'N and longitude 36°45'-38°14'E. The total area covers of 3,200 sq km; the depth of 8 -14 meters and Lake Catchment covers an area of 16,500 sq km [5]. Lake Tana is amongst the mainly creative life-support systems in the humanity and is of huge socio-economic and

ecological significance to mankind. They are serious for the preservation of Aquatic biodiversity and perform a great role in the biosphere [5] Lake Tana region is home to 28 fish species, 300 different birds, 16 different mammals, 179 plant species and many other species of high importance for the local as well as the international community. The monasteries and churches on the islands of Lake Tana are of high architectural value. They serve as tourist attractions due to their paintings, church service serving materials, manuscripts, dress of former Emperors and annual religious celebrations [2].

The concept of biosphere reserve originated in 1974 and the biosphere reserve network launched in 1976. It includes 580 reserves and 114 countries. The objective of the network is achieving a sustainable balance between the sometimes-conflicting goals of conserving biological diversity, promoting economic. 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 approved by UNESCO and become part of the worldwide network of biosphere reserves [2]. Biosphere Reserves attempt to reconcile environmental conservation with sustainable development [1, 7]. An effective Biosphere reserve involves natural and social scientists; conservation and development groups; management authorities and local communities, all working together on this complex issue [6]. In June 2015, the United Nations Educational, Scientific and Cultural Organization (UNESCO) have registered Lake Tana as Biosphere Reserve. The lake is registered as UNESCO's Biosphere Reserve site for its being rich in biodiversity [5]. Biosphere reserve has great role for ecosystem conservation and sustainable development of one country [11, 4, 8]. For

sustainable development Biosphere Reserves should be demonstrating how goals are achieved on environmental, economic and social dimensions [14]. Every biosphere reserve must contain one or more core which is protected by law [11]. Biosphere Reserves is a sample of Good science it can lead to better outcomes in safeguarding people and environment [14]. The livelihood and culture of great numbers of citizens in the world are, in approximately each nation of the humankind. A most important segment of fisheries manufacture, nearly everybody hunt, much wooded area manufacture and an important part of ecotourism elements of heritage and environmental quality [10]. It is significant to pressure, nevertheless, that it is not sufficient just to protect the populations of plants and animals that are in a without delay line disheartened [12]. The problems of climate change and resource degradation has become crucial in order to make the environment sustainable. Conservation of the natural and man-made resources in this 21st century is not a voluntary choice for many countries and people within each country [12]. The Lake Tana Biosphere Reserve is a hotspot of biodiversity and it is part of the two biodiversity hotspots; Eastern Afromontane and Horn of Africa biodiversity hotspots [15]. The study investigates and document community knowledge on Lake Tana biosphere reserves and its significant factors. This study helps in base line information about Lake Tana biosphere reserves.

## 2. Materials and Methods

### 2.1. Materials

Materials during the study were Notebook, questioner, laptop, digital camera were used during the survey.

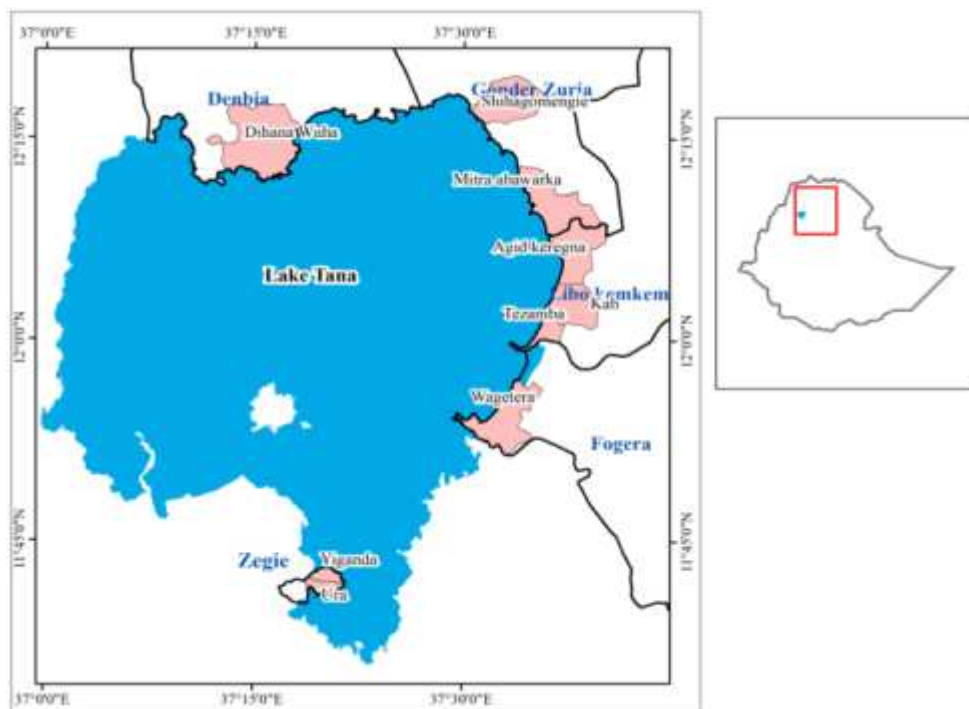


Figure 1. Map of study area.

## 2.2. Study Area Description

Lake Tana is Ethiopia's largest lake and source of Blue Nile River with the area of *ca* 3200 km<sup>2</sup>. The survey study was conducted in 18 kebeles and 8 districts with the buffer zone of the lake at Amhara region. The lake is located in Amhara Region capital city of Bahir Dar town up with touching of different Gonder kebeles. During this survey study Fogera, Libokemkam, Bahir Dar zuria Gonder zuria, west Dembya, east Dembya, Dera and Chahit were assessed. In Bahir Dar zuria includes Zegae 01, Oura kidanmihiret, Yeganda keblaes far from 30 km from capital of Amhara region Bahir Dar city and in Fogera district study undertaken in Wagetera keblae which far 45 km from Bahir Dar. Other study area were South Gonder zones of west Dembya district (Goregora, Dehana wawa, Tanawaga, serbadeblea kebeles), west Gonder Dera (mitsil mary kebele) district and Gonderzuria (mitwakeblae).

## 3. Data Collection

Data was collected for 30 consecutive days of 2012 E.C. the study area were selected based on random sampling method which are closed to Lake Tana biosphere reserve. Information was obtained from interview of structured questioners to local community using random sampling method selection of the interviewers. A total of 8 district with 18 kebeles living adjacent to Lake Tana biosphere reserve were included. A total of 123 local people representing different age class and sex group were interviewed. Questioners are particularly suitable tool for approaching studies of local knowledge, attitude and practice of biosphere reserves [3]. The local community living adjacent the biosphere reserve was asked about the factor and challenge of Lake Tana biosphere reserves. Field observation, photo camera capturing, taking notes, was done to enhance qualitative data.

## 4. Data Analysis

Data analysis was done both quantitatively and qualitatively. Collected data were refined, edited, coded and entered in to statistical package for social sciences (SPSS software package version 21). Descriptive statistics such as frequencies and percentage were presented using table, figure chart, graphs and words.

## 5. Results and Discussion

### 5.1. Age Group of Respondents

All age group of the local community was participated during the interview. Highest numbers of respondents belongs to under the age group of 26-37 and list number of respondent recorded in the age group of 36-45 (figure 2). This is due to the vultures and interest of respondent to give thus information during the survey. In terms of sex category a total of 129 individuals with 13 (10.07%) female and 116

(89.92%) male were interviewed. Majority of the female was respond list questions putted on the questioners and they mostly respond the questions by saying I have no idea.

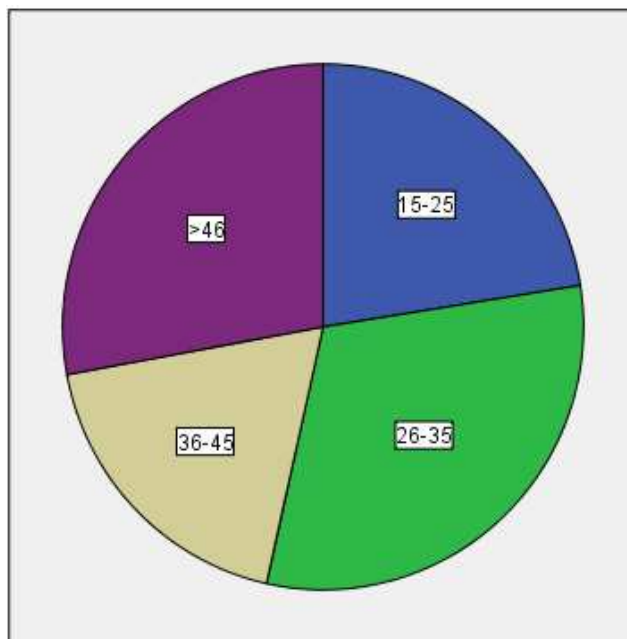


Figure 2. Age group of respondents.

### 5.2. Educational Status of Respondents

From the respondents illiterate belongs to 72 (55.8%), elementary school 42 (32.6%), secondary school, 2 (1.6%), preparatory school 6 (4.7%), diploma 4 (3.1%) and degree 3 (2.3%). Majority of respondent's educational status belongs to illiterate and elementary school and a few numbers of respondents are recorded as primary school diploma and degree. Because most of local community participated in the questioner was native and they are not give much attention for education and mainly they were farmers.

### 5.3. Knowledge and Perception of Local Community for Lake Tana Biosphere Reserve

Respondent result showed that activities served from the biosphere reserve are farming 15 (11.6%), farming and animal raring 48 (37.2%), vegetable and horticulture production 3 (2.3%), fishing 5 (3.9%), farming and vegetable 25 (19.4%), guiding tourists through water and others 28 (21.7%). Income generation source in the study area recorded as farming, fishing, fruit and vegetable production, petty trading and collaborating with each other as shown in figure 2. In the area of south Gonder and central Gonder fishing, irrigation, farming is among the main activities practiced due to the availability of Lake Tana in the area. The result from the interviewer showed that Lake Tana for Zegae 01, Oura Kidanmihert and Yiganda community is the source of income generation like fishing, irrigation, fruit and vegetable production, and indirectly from guiding tourists. In the area of south Gonder central Gonder, Bahira Dar area Zegae

peninsula and west Gonder have different stands and trends are done. In the areas of Zegae 01, Yiganda and Oura Kidanmihert the main values used from the lake are trading and guiding tourists, farming specially fruit and vegetable

production, fishing. Guiding tourist activity also practiced in the area. Similar study conducted the concept of Biosphere Reserves related to tourism and should be an important activity for the society [6].

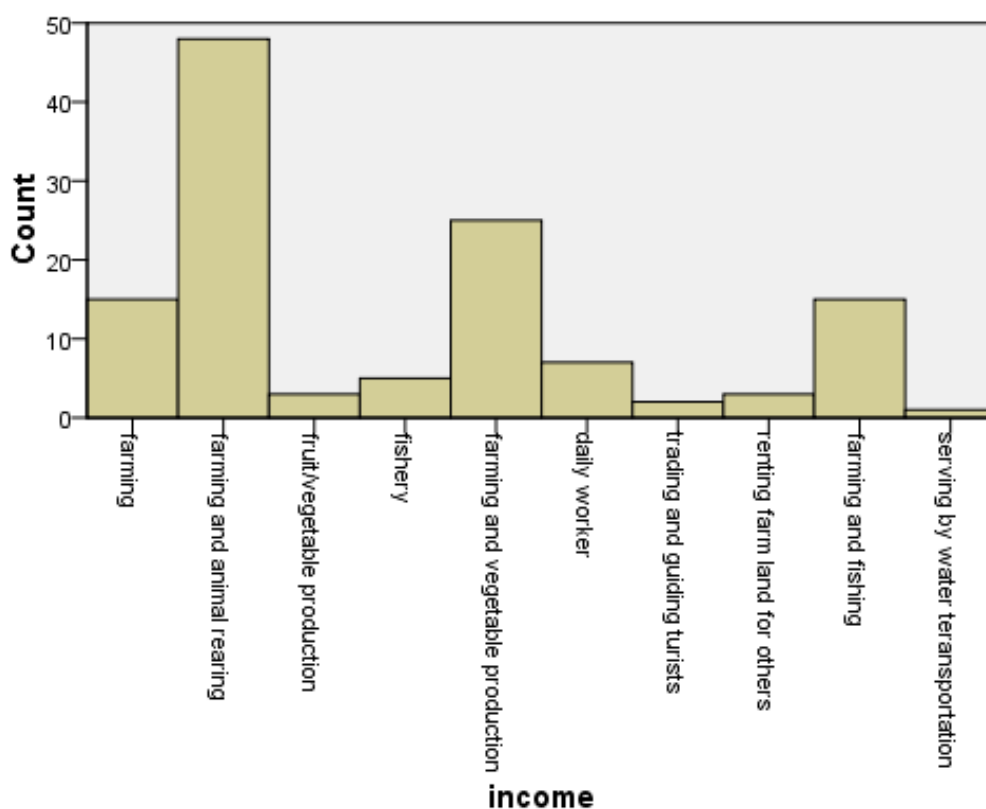


Figure 3. Income generation activities practiced at Lake Tana.

In the other side in the areas of south Gonder of Farta district Wagetera keblae irrigation and vegetable production are practiced. There is also a conflict of interest between groups and individuals in terms of resource utilization. Especially in the area of Wagetera keblae there are different problems facing for the community in terms of faire and equitable utilization of the resources. In Wagetera keblae Guiding tourists, fishing and recreation are not practiced due to not available of transportation and large coverage of *Eichhornia crassipes*.

#### 5.4. Role of Lake Tana Biosphere Reserve

All respondents 129 (100%) agreed that Lake Tana have great role for our live. The role express in different ways either visible or invisible. The majorrole listed by respondents isrecreational, ecotourism potential (diversity of plants, fishes, and birds), manmade and natural sites, (churches, monasteries), and landscape of the lake. Research conducted by [9], in most biospheres reserves of Ethiopia biological diversity conservation is more effective and species diversity also effective.

#### 5.5. Challenges for Lake Tana Biosphere Resources

As respondent result show Lake Tana biosphere affect by

different factor, *Eichhorniacrassipes* 43 (33.3%), recession farming 1 (0.8%), erosion/sedimentation 1 (0.8%), pollution, invasive species 33 (25.6%), free grazing 16 (12.4%). During the survey different problems were observed and collected from the interviewers in biosphere resource of Lake Tana. The problems are different from district to district and village to village. Except Bahir Dar area of Zegae 01, Oura Kidanmihert and Yiganda all the study area were under the problems of *Eichhornia crassipes*

And another common problems recorded during the study were giving less attention for sustainable utilization of lake Tana and its products like fishing activities and using irrigation. There were many questions were raised by interviewers in all study sites those questions were infrastructure specially rod, light and training. The training issue rose by most informants specially informants whose income sources were depending on fishing. They were requested to get further knowledge and skill to modernize their fishing activity and saving fish distribution and diversity loses. Similar study conducted by [13], Biosphere Reserve is facing unprecedented their ecological integrity. Unsustainable activities leading to habitat destruction and fragmentation of wildlife corridors are major challenges confronting this fragile ecosystem. Most biosphere reserves are heavily exploited mainly due to logging and agricultural use.

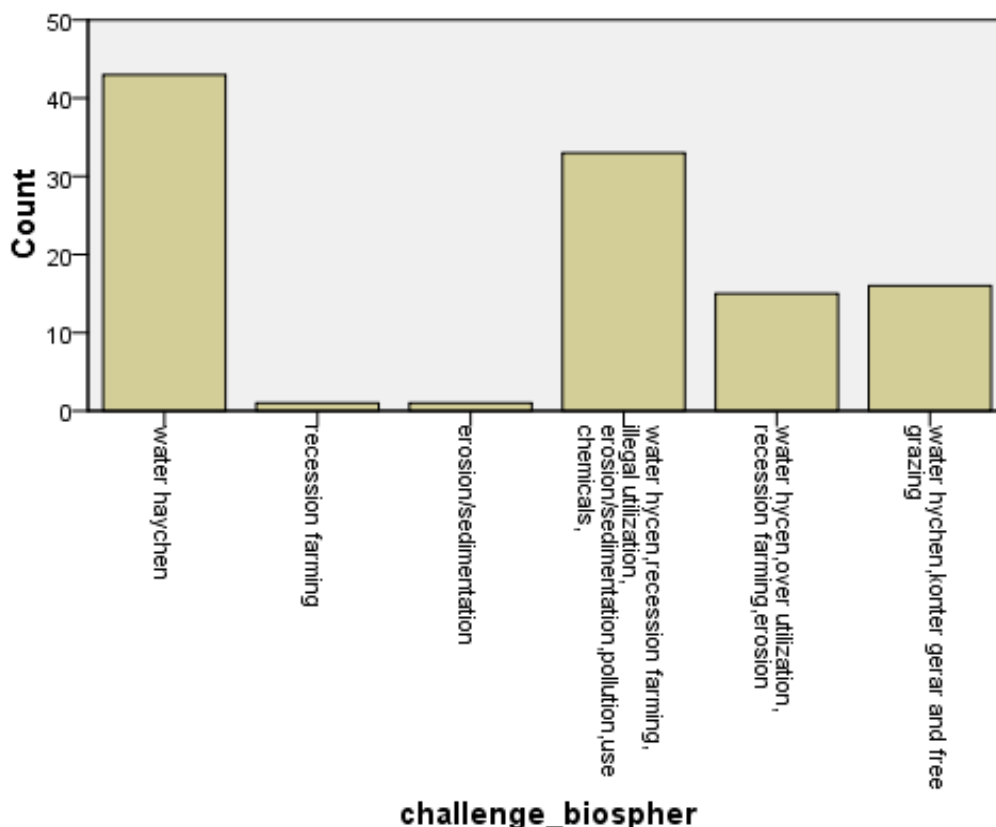


Figure 4. Main cause for Lake Tana biosphere resource diminish.

### 5.6. Community Awareness About Biosphere Reserve

In terms of training and awareness creation for the local community most of the respondents have no experience in participating in training regarding biosphere conservation it showed that 102 (79.1%) and the remaining 25 (19.4%) informant have limited awareness on conservation of lake Tana. In the areas which *Eichhornia crassipes* is existed peoples have knowledge and feel responsible to conserve the lake but they need a lot to know. In the study area which *Eichhornia crassipes* were colonized their lake the main question was how can we eradicate this invasive species? Or if no who is going to eradicate these invasive species from our areas?

In this survey study respondent forwarded that 53 (41.1%) there is community bi- low functional for the lake biosphere, 44 (34.1%) has no community bi- low and the rest respondents have no information about it. [6], reported that Biosphere Reserves are not government structures or entities. They typically includeland of which some parts are owned and managed by governments, and other parts owned by industry, private citizens and institutions, all of whom have voluntarily cooperated for a common purpose of ecological protection, sustained social and economic development, and learning about long-term management of living resources and ecological productivity. No ownership or legal rights are in any way changed by the creation of a Biosphere Reserve. But in this survey result showed that Lake Tana biosphere owned by community and government.

### 5.7. Respondents' Conflicts of Interest

From the total respondent 72 (55.8%) reflect there is conflict of interest and the remaining 57 (44.2%) no conflict happen. Conflicts of interest among the society happen in the area which peoples are direct dependent from the lake resources. Especially in Fogera district of Wagetera keblae frequently deviation were happen among the society on utilization of Lake Tana water for irrigation, fishing activities and others. In contrast people who lived around Zegae peninsula have no conflict due to their use mainly focus on selling of materials and guiding tourists.

## 6. Conclusions

Lake Tana is one of the excellence rich aquatic biodiversity, it is appreciably very important for out-research activity internationally and nationally purpose. The lake one of greatest potential for aquatic ecosystem, transportation activity, source of tourism developments especially water journey in the peninsula of monastery and cave, hydropower and irrigation development. The lake is a potential home for different birds, fishes, hippos and other aquatic plant species. Sedimentation, eradication of wetlands, pollution, constrictions of buildings at the buffer zone of the lake, unsustainable utilization and water hyacinth are the major threats recorded to Lake Tana biosphere reserve. The threats mainly arise due to giving less



concern for the lake, being direct needy on the Lake Tana resources/having no alternate for survival. So, giving critical concern for conservation and sustainable utilization of Lake Tana biosphere reserve helps to save communities of people who are dependent on the lake. Tourism, recession farming, irrigation, vegetable and fruit production, fishing are the major income source for the communities who lived in the boundary of Lake Tana biosphere reserve. Significant solution which have role to save the lake are eradicating invasive species (water hyacinth) from the lake and around, creating awareness on sustainable utilization of aquatic biodiversity, creating alternative income generation ways for the community and practicing participatory conservation methods.

## 7. Recommendations

The concerned body should focused on eradication of water hyacinth

Community should concern on conservation and sustainable utilization of lake Tana biosphere reserve.

Rules and laws must be rise and apply to protect the lake.

Awareness and training should be given for the society specially who are dependent on fishing and irrigation users.

Conservation of Lake Tana biosphere reserve should practiced by participating all community, governmental and non governmental institutions.

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