WOLKITE UNIVERSITY

COLLEGE OF AGRICULTURE AND NATURAL RESOURCE

DEPARTMENT OF WILDLIFE AND ECOTOURISM MANAGEMENT

ASSESSMENT OF THE CONTRIBUTION AND CHALLENGES OF LAKE HAWASSA

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Annex 1. ADVISORS' APPROVAL SHEET

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ADVISORS' APPROVAL SHEET

This is to certify that the senior research entitled "ASSESSMENT OF THE CONTRIBUTION AND CHALLENGES OF LAKE HAWASSA

submitted in partial fulfillment of the requirements for the Degree of Bachelor of Science (BSc) with in department of Wildlife and Ecotourism Management undergraduate program and has been carried out by Asefash Abebe; Id. No AGR/046/09, under my/our supervision. Therefore, I/we recommend that the student has fulfilled the requirements and hence hereby can submit the senior research to the department.

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ABBREVIATION:

SNNPR-South Nation Nationalities and People Region

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ABSTRACT

Lake is a body of water surrounded on all side by land. Lake water is still or standing, meaning, it does not flow. Lakes are among the most fragile environments due to anthropogenic effects alongside natural phenomena that can trigger rapid environmental changes to their ecosystems. The purpose of this study was too recognized or identifies the contribution and challenges of Lake Hawassa .Both primary and secondary sources of data were used for this study. The primary sources include questionnaires, interview, and field observation. Based on the Data Lake Hawassa was affected by a lot of challenges such as urbanization, agricultural expansion, damping of wastes from factory and city. There is also degradations that affect Lake Hawassa such as reduction of water volume, reduction of fish production, water pollution and reduction of biodiversity. The contribution of lake Hawassa for community such as recreation, crop production, fishery production and horticulture production. Generally, to reduce challenges and increase benefits of lake Hawassa training should be given create awareness for community and there should be strong management with implementation of laws and policies for Lake.

Key words: Challenges, Contribution, Lake Hawassa

1. INTRODUCTION

1.1. Back Ground of the Study

Lake is a body of water surrounded on all side by land. Lake water is still or standing, meaning, it does not flow. Lakes are among the most fragile environments due to anthropogenic effects alongside natural phenomena that can trigger rapid environmental changes to their ecosystems. For instance, declining lake levels were indicative of climate-driven changes (W.illiamson, Saros and Schindler, 2009). Soil erosion and sediment deposition as well as pollution from municipal, industrial and agricultural waste are among the major menaces to which lakes are exposed (Lawniczak, et.al, 2011). Severe erosion and sedimentation may result in diminishing lake size and, in some cases can cause the disappearance of a lake body and induce changes in its fauna and flora population. Because lakes and reservoirs are low points in the landscape, they receive water and sediment inputs from the surrounding terrestrial catchment and the upwind air sheds (Williamson, et al., 2009). These inputs can influence the environments positively or negatively and bring about environmental change resulting.

Ethiopia has a number of lakes, most of which are fond within the rift valley, that are central for socio-economic development. Hawassa Lake is one of the rift valley lake that found in the central rift valley system. The Lake has total area of with the catchments area of 94 square kilometer, length of 16 kilometer width of 9 kilometer and its maximum depth is 22 meter. The lake is extremely rich in fauna diversity and population than any other water bodies in the country.

Changes in lakes can be manifested in surface area, volume or capacity changes and variation In the water quality depending on the dynamics in the contributing area, the size and shape of the Water body, and the geologic formation. The study of lake morphology is important not only to Understand spatial change in the shape and size of the lake, but also to comprehend its hydrologic and limnlogic characteristics (Schafer, et al.,2014). Historical morphometric studies in general provide information. Spatial and temporal changes in erosion and sediment deposition, as well as bathymetric characteristics. This information can be used to study and remedy the implications on both physical and biological (Fox Grover, etal.,2014).

Lake Hawassa is the back bone of Hawassa town. It is the important place for fishery activities which serve for both local and national market. Despite its importance in a wide spectrum of purpose, its natural ecosystem and water quality is highly affected by intensive and extensive agriculture activities in the watershed, industrial discharges, overgrazing and urban runoff which might end up into the lake either directly or indirectly. As a result, the Lake Hawassa watershed experienced changes in land cover rapidly, and natural resources have significantly diminished and are expected to continue.

The shores of Lake Hawassa were rich with huge trees and dense aquatic Macrophytes. Numerous birds and wild animals visited these and various fish species and hippopotamuses inhabited the open waters.

1.2. Statement Problem

People use lakeshore for talking walking and other recreation and sports activities such as boating and fishing. For habitat: to live different aquatic animal, reptiles and amphibians. For water source, for fishing activities

Lakes globally as well as in the study area have been greatly degrading due to natural and human factors. The main causes for the water quality deteriorations are anthropogenic and natural agents (Gebremariam, Z., 2002). Some of the natural and human induced factors which affect the quality of water for various purposes are geology, hydrology, natural, hazards, sedimentation/erosion, agricultural activity, industrial, mining, fishing, swage, discharge/dispose, deforestation and other commercial activities. Lake Hawassa is degrading progressively as a result there is a tremendous influence on the quality and quantity of the lake, biodiversity and environment as a whole. Specific challenge for the sustainability of lake Hawassa include urbanization, agricultural expansion activities, climate change, pollution from industry and domestic (city) waste. Therefore, this research work was proposed to assess those problems and its value to local communities.

1.3. Objectives of the Study

1.3.1. General Objective

The general objectives of the studies to assess the contribution and challenges of lake Hawassa

1.3.2. Specific Objectives

- To identify the challenges affecting Lake Hawassa
- To assess the contribution of Hawassa lake for local communities

1.3. Research Question

The result of this study would answer the following question

- ✓ What are the challenges affecting lake Hawassa?
- ✓ What are the contribution of of Lake Hawassa for local communities?

1.4 Significance of the Study

This research work will provide benefits for environmental managers as well as policy makers at all levels of the government in showing the challenges and benefits of Lake Hawassa. It will also helps for researcher as source and a base line information and also it will create an awareness for local communities by learning for people about contribution, value: like economic, environmental and aesthetic values of lake.

2. LITRATURE REVIEW

2.1 Definition of Lake

A lake is an area filled with water, localized in a basin that is surrounded by land, apart from any river or other outlet that serves to feed or drain the lake. Purcell, Adam (2008). Lake lie on land and are not part of ocean, and therefore are distinct from lagoons, and are also larger and deeper than ponds. Lake can be contrasted with river or streams, which are usually flowing. Most lakes are fed and drained by river and streams. Natural lakes are general found in mountainous areas, rift zones and areas with ongoing glaciation.other lakes are fond in endorhic basin or along the courses of mature rivers. In some parts of the world there are many lakes because of chaotic drainage patterns left over from the last ice age. All lakes are temporary over geologic time scales, as they will slowly fill in with sediments or spill out of the basin containg them.

Many lakes are artificial and are constructed for industrial or agricultural use, for hydro-electric power generation or water supply, or aesthetic or recreational purposes.

Lake is relative stagnant stretch of water which fills aground depression. The inflows are: rivers and runoff from the catchment area, atmospheric precipitation and supplied by ground water. The main source of out flow a Lake are: streams, evaporation from the Lake Surface and ground water. They are a heterogeneous water body with a very wide range of surface areas. Lakes are extremely heterogeneous with their physical, and biological features. The largest lake in the world are:

Caspian and Cuperior. The deepest Lake are: Baikal and Tanganyika.

Characteristic of Lake: Dissolved oxygen is the limiting factor, Water movement is due to the wild action, Vertical zone are present i.e. remain vertically stratified as epilimnion, thermocline and hypolimnion, High deposition and Physico-chemical parameter fluctuates in seasonal variation

Lake Classification

Lake are classification based on: Their formation: Lake originate in a variety of ways there are su bsidence of land below the ground water table, Isolation of a part of the ocean, Glacial erosion and deposition and Miscellaneous ways. The major process for formation: Geological Process: leading process, Chemical process: solution lakes and Biological process: beaver dam.

Their primary production: Eutrophication: the process of excessive enrichment of a water body by nutrition, Eutrophic: more productive lake and Oligotrophic: low primary productive.

The extent of mixing or circulation or cause of stratification: according to their mixing feature lakes can be classified as Holomitic: they completely mix as they have uniform temperature and density from top to bottom (based on depth). Oligomictic: lakes in which mixing is irregular, Amictic: lakes that never circulate. They are usually ice covered through the year. And meromictic: lakes where bottom water never mix with surface water (based on solution).

Their climatic distribution: there are tropical pole and subtropical

2.2 Factor Affecting lakes

Lakes are important to really a very fragile ecosystem. Human activity has been playing a serious role in the decline of the quality of aquatic and near shore ecosystem.

Deforestation: when comparing 1972 forest cover to 2000:- 82% forest decline was estimated in the area and the situation is increasing at alarming rate (Gessese, 2007).As a result, erosion and sedimentation processes disrupt the hydrological functioning of the lake.The western part of the catchment is highly eroded and most deforestation.

Pollution: Cause pollution limited capacity of industrial and municipal waste management, low, public awareness, rapid population growth and urbanization (increment of waste).

Pollution can be of great concern to lake ecology. Substance like mercury, dioxins and polychlorinated biphenyls that result from industrial processes have been released in to the lake for decades. Some of these chemical and pollutants have resulted in decreased biodiversity in the lake.

Development pressure: more people living around the lake means potentially more water pollution if were not careful about reducing our impact through better living habitats and workplace practice. It is also likely to lead to more pressure on the nature ecosystem that surround the lakes and their tributaries.

Invasive species: invasive species have been identified as the second most significant threat to bi odiversity, second only to habitat loss. When these species establish themselves in place when na tural controls do not exist the result can be catastrophic for native species of plant and animal. The impacts of invasive species on ecosystem services have attracted worldwide attention. Despite the

overwhelming evidence of these impacts and a growing appreciation for ecosystem services, however, researchers and policymakers rarely directly address the connection between invasions and ecosystem services. Various attempts have been made to address the ecosystem processes that are affected by invasive species (*Heather and Jeffrey. 2007)*, but the links between these mechanisms and ecosystem services are largely lacking in the literature. Invasive alien animal species was practiced for years in the world for economic, social, biological and ecological purposes without consideration of the deleterious impacts on the aquatic environment.

2.3Role/importance of lakes

Lakes are the best available freshwater source on the earth's surface. Lakes are valued as water source and for fishing, water transport, recreation and tourism.

Lakes as a water source: water use is distributed for household use, industrial use and agricultural use. Lake water is also invaluable as a source of hydroelectric power generation. Lakes for fishing: brackish water lakes tha connect to these have large fish harvest. Lake has the highest fish harvest among freshwater lake. Lakes support a number of fishing industry businesses.

Lake as Natural balance Preserve Reservoir: is presently used as a flooding control pond although it was originally built as a mine pollution sedimentation pond for the Asio copper mine.

Lake as Biodiversity Conservation Areas: Lake are not homes just for fish but also waterfowl and many other life form. That are: plant species, amphibians, reptile, birds and mammals.

Lakes as Tourist and Recreation Locations: people feel relaxed around water as symbolization by the expression water and greener. People use lakeshore for talking walking and other recreation and sports activities such as boating and fishing.

3. MATERIALS AND METHODS

3.1. Description of the study area

Hawassa is a city in Ethiopia which is the capital city of south nation, nationalities regional state and Sidama Zone and it is located 273km south of Addis Ababa, capital city of Ethiopia and 130km east of Sodo, 75km north of Dilla. It has a latitude and longitude of 7º 3N 38º28E coordinates and an elevation of 1708 meters. Lake Hawassa lies at the western side of Hawassa city, the capital (SNNPRS) at an altitude of 1680m, 275km south of Addis Ababa in the central part of the Ethiopian Rift Valley (6^0 33' - $7^0$33'N and $38^0$22'-$38^0$29'E). The lake has a surface area of 90km^2, a catchment area of 1250km^2, a maximum depth of 22m and a mean depth of 11m (Elizabeth, *et. al*, 1994).The area is characterized as dry, sub-humid climate and receives the highest rainfall mainly from March to September, wet season. The maximum temperature was recorded from January to April and from October to December, dry season. The minimum temperature occurs during wet season. The maximum amount of mean annual rainfall goes up to 1150mm .The Lake lies at the lowest portion of the caldera, along with a previously extensive wetland, lake Shalla and Shalla swamp. Topographically, Lake Hawassa is closed basin with no outflows, but water may seep away through underlying volcanic ash and pumice. Lake Hawassa is the smallest of the Ethiopian Rift Valley lakes, but it is highly productive.

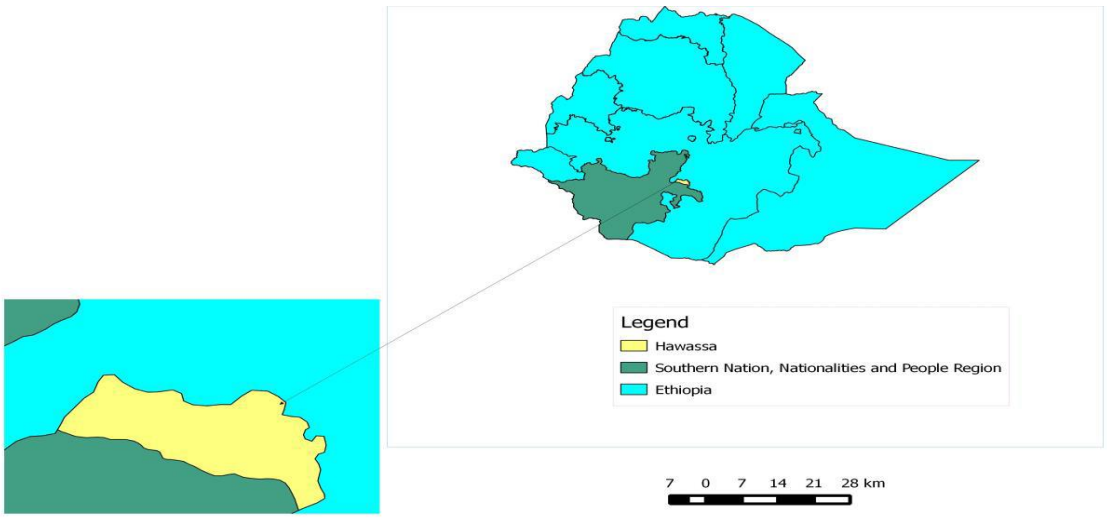


Figure 1: Geographical Location Map of Hawassa (developed by Ermias Kifle, 2014).

Lake Hawassa is one of the many freshwater shallow lakes found in the central Ethiopian Rift Valley. The sum totalities of aquatic and terrestrial habitats adjoining the lake facilitate for the rich diversity of flora and fauna compared to other Ethiopian Rift valley lakes. Scores of species with sundry forms of plants, animals and micro-organisms make the lake extremely bio-diverse. The littoral area is covered with emergent and submerged macrophytes those serve as shelter, thrashing and proliferation zones for several benthonic and pelagic zoo-planktons such as Protozoans, Rotifers, Crustaceans, and several weed bed fauna like annelids, insects as well as fishes (Tilahun et al., 1996, EFASA-2013). The lake is among one of the biggest bird sanctuaries in the rift and homeland for several hundred species of water birds, including local and Palearctic migrants with large population of Marabou storks. The animal population includes large hippopotamus, otters, monitor lizards, Vervet and Columbus monkeys surviving on Lake Ecosystem. Six varieties of fishes are abundantly found in the lake of which the native African species Tilapia (*Oreochromis niloticus*) are dominant. The lake is a major source of income through eco-tourism while the inhabitants depend on the lake for fishing and recreation.

3.2. Methods of Data Collection

Both primary and secondary data sources were used for this study. Interview, questionnaire and field observation was employed to collect primary data for the study. Secondary data was gather from cultural and tourism office, related documents, written and unwritten materials, internet sources, research reports, text books, and other published and unpublished papers.

Questionnaire: first questionnaire was prepared for interviewing the respondent. This research data collection method was used for the data collection from local community, farmer, cultural and tourism office, Fisherman. Those local community are the major part of research and they know about the benefits and challenge of Lake Hawassa

Interview: Interviews was conducted by preparing check lists as a question to Interviewer in order to guide respondents' ideas, local community, cultural and tourism office are interviewed to forward their ideas, opinions feelings and knowledge regarding to the benefits and challenges of Lake Hawassa.

Field Observation: This method of data collection was used in order to identify and enumerate challenges and benefit of Lake Hawassa. Furthermore, it is very important to get deep understanding about the challenges and benefit of Lake Hawassa and used to identify the challenges that encountering the study area as well as to collect real accurate data from the field through directly. By this method the researcher was able to distinguish which challenges that effects of Lake Hawassa.

3.2.2. Study Design and Sampling Technique

Lake Hawassa is found in Hawassa city administration of (SNNPRS). From south nation nationalities and people's region, Hawella Tula sub-city of Hawassa city administration were selected for this study purposively. From 12 kebeles of Hawella Tula sub-city, one kebele, namely Chefasine and one kebele from Haik dar sub-city, namely Gudumale kebele were selected purposively because of the reason that the largest portion of the lake Hawassa challenges is found in chefasine kebeles and more of tourism activities found in Haik dar sub city. In addition A purposive sampling technique was also employed to select sample respondents who were perceived to be aware of detailed points raised during the survey. Therefore, the researcher selected 7 peoples for environmental conservation office and and 38 respondents from two kebeles.

The sample size of the study was determined based on the formula as follow (Israel, 1992):

$$n = \frac{\mathrm{N}}{1 + \mathrm{N(e)2}}$$

Where; N = the total population

n = the required sample size

e = the precision level which is = (± 10%)

Haik dar total house holder =5000

Hawella tulla sub city total house holder =6655 totally =11655 house holder

Based on above formula

e=the precision level with (9%)

n=11655\1+11655 $(0.09)^2$=123, Due to time constraint I have select 45respondent

3.2.3. Data Analysis

The data was analyzed by using simple descriptive (qualitative) method and quantitative (numerical) method. The study were interpret the data based on the survey questionnaire, interview and filed observation. The data were analyzed by using simple descriptive statistics such as mean percentage and the data would be presents on tables, charts, picture and percentage also further represented by using grapes and other diagram in order to analyses more information about our research study.

4. RESULT AND DISCUSSION

4.1 Demographic characteristics of respondents

Demographic characteristics of respondents of the study have been mentioned in table 1. The researcher used different category such as; age, sex and educational status to describe the respondents. According to sex category 30 (67%) were male and 15 (27) female were participated. According to age category 15-30 were (22%), 31-45 (44%), 46-60 (27%) and > 61 (7%) were identified. Regarding to the educational level, most of respondent 30 (73%) were literate and 15 (27%) were illiterate.

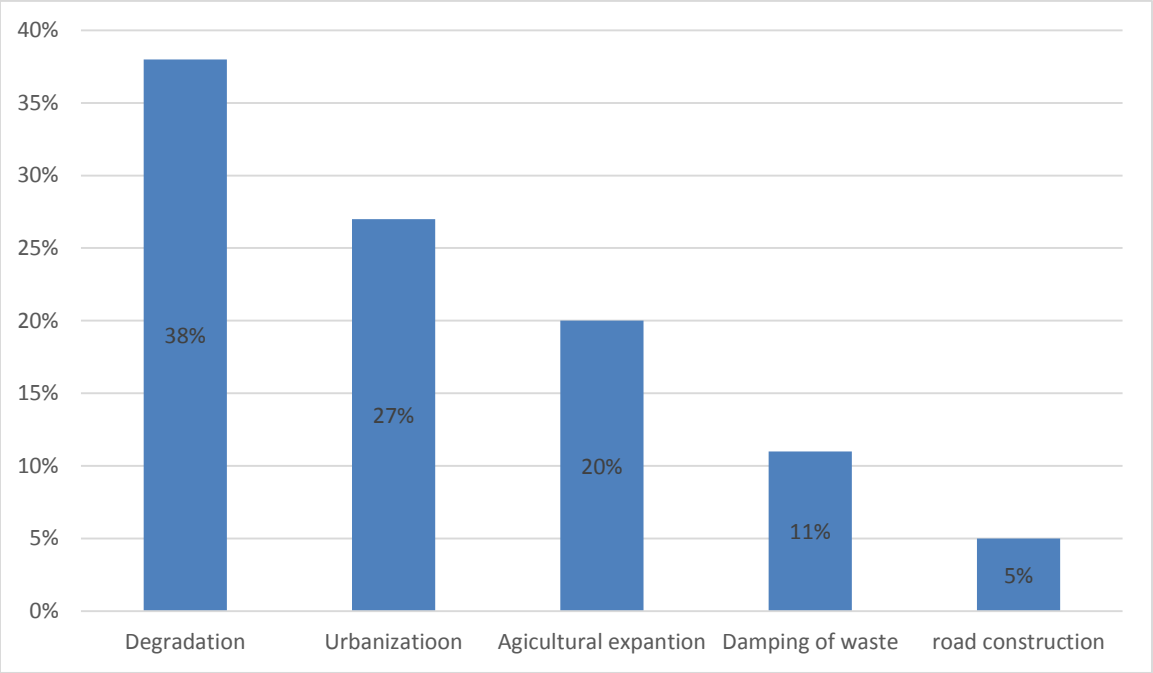
Table:-1, Demographic information of respondents

Variables	**Section /categories**	**Respondents**	**Percentage (%)**
Sex	Male	30	67
	Female	15	33
	Total	45	100
Age	15-30	10	22
	31-45	20	44
	46-60	12	27
	>61	3	7
Educational level	Illiterate	7	16
	Male	4	57
	Female	3	43
	Literate	38	73
	Primary	9	24
	Secondary	11	30
	Degree and diploma	17	45
	Above degree	1	3

Source: Field Survey

4.2 Major Challenges that Affect Lake Hawassa

Challenges that affect Lake Hawassa are urbanization, agricultural expansion, damping of waste from factor and city and road construction



Source: field survey (2019)

Figure 2, challenges that affect Lake Hawassa

According to the Figure 2 , the major challenges that affecting of lake Hawassa was Degradation,17(38%), urbanization as reported by 12 (27%) of the respondents that was followed by agricultural expansion, 9 (20%), damping of wastes from factors and the city, 5 (11%) and road construction 2 (5%). Additionally, most of the respondents said that lack of awareness about and its importance was another factor that effect of Lake Hawassa. Some interviewed informants also added that water diversion for irrigation especially during dry season and lake water extraction for watering urban plantation were another factors affecting of Lake Hawassa.

4.3 Impacts of degradation on Lake Hawassa

Degradation is loss of habitat. Water quality degradation mostly a result of diffuse source

contaminate and the spatial and temporal variability associated with this source.

Respondents were asked to mention the threats of Lake Hawassa and responded as shown in the table below.

Table 2. **Impacts of degradation on Lake Hawassa**

Degradation that affect of Lake Hawassa?	No of respondents	Percent %
Reduction of lake water volume	14	31
Reduction of fishery production	10	22
Lake water pollution	12	27
Reduction of biodiversity	9	20

Source field survey (2019)

As shown in the table 2, most of the respondents i.e. 14 (31%) said that the degradation that affect of Lake Hawassa is reduction of lake water volume, reduction of fishery production 10 (22% of the respondents), reduction of biodiversity 9 (20% of the respondents) and lake water pollution (20%).The result of present study show that the major factors affecting of lake Hawassa were urbanization as respondent followed by degradation, agricultural expansion, damping of wastes from factors and the city, and road construction. They had reported that urbanization and agricultural activities were responsible for the largest extent of lake losses in the worldwide

This may be due to that when urbanization increases more land is needed for settlement and building infrastructures such as roads, factories. In addition to these, due to food security problem people need land for cultivation. The result of the current study reveals that degradation of lake causes negative impact lake Hawassa such as reduction of lake water volume, reduction of fishery production, reduction of biodiversity and lake water pollution(Gemechu Bekele, 2010).

4.4 Conservation Practices to Save Lake Hawassa

Table 3.Conservation Practice applicable of Lake Hawassa

Respondents were asked to mention whether there was conservation practice in Lake Hawassa and responded as follows

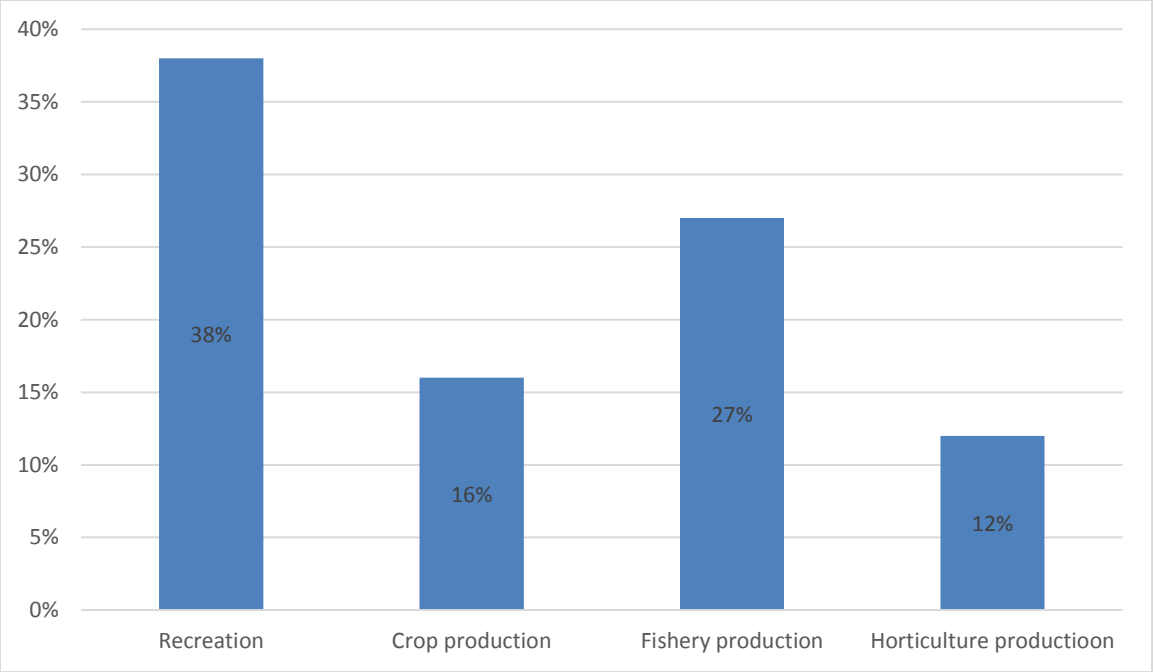
Conservation practices applicable of lake Hawassa?	Yes		No	
	No	%	No.	%
	32	71	13	29

Source: field survey (2019)

As shown in the table 3, most of the respondents i.e. 32 (71%) said that there are conservation practices of Lake Hawassa and the remaining 13 (29%) said that there is no conservation practices of Lake Hawassa. Environmental protection office of the Town were interviewed to mention whether their office has been involving in conservation practices and all of them responded that there is some conservation practices on lake Hawassa conservation by their respective offices. Such as fencing and by defining of lake about the benefit for people and they try to drain water from the lake and use the land for other purposes.

The result of present study showed that there is some lake conserve practices for Lake Hawassa but they mentioned that although some conservation activities exist, it is very weak. There is no strong conservation for Lake Hawassa. This may be because there is lack of awareness among community as well as government officials. Additionally, less attention given for management by concerned bodies of the government may be another cause for weak management of Lake Hawassa. The Hawassa regions environmental protection office gave great attention for other investments than for lake conserving activities. (MC Hugh *et al.,* 2007).

Benefit of Hawassa lake for local communities such as recreation, crop production, fishery production and horticulture production



Figure, 3 benefit of lake Hawassa

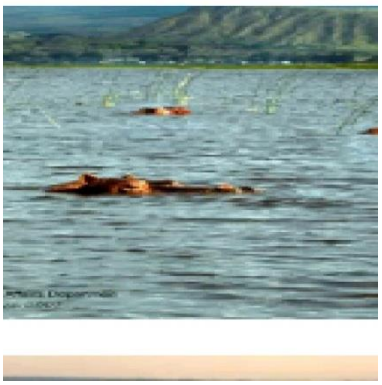
As indicated in the Figure 3, most of the respondents said that lake have importance for recreation 17 (38 %), crop production 9 (16 %), fisheries production 12 (27%) and 7 (16%) for horticulture production. Lake Hawassa provide enjoyment for visitors through by watching different bird species, like endemic birds such as Yellow-fronted Parrot (*Poicephalus flavifrons)*, Black-winged Lovebird (*Agapornis taranta),* Banded Barbet (*Lybius undatus)* and Forest Oriole (*Oriolus monacha)*, aquatic animals like Hippopotamus *(Hippopotamus amphibious*) and fish (such as *Oreochromis niloticus*), and bating and position of lake.

Different bird species



Source (Google)

Mammals


A **B** **C**

Picture, 1 mammal and birds Species; Source (Google)

A and B are mammal found in lake Hawassa and C is boating activity

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

Hawassa lake provide different values to local communities such as recreation, crop production, fishery production and horticulture production. But there are many factors that affect of Lake Hawassa. The most important ones include: rapid urbanization, agricultural expansion, road construction and damping of wastes from the city and factories. Lack of awareness among the community and government official and less attention given by concerned bodies of the government are also another factors affecting Lake Hawassa.

Lake Hawassa has been reducing from time to time at an alarming rate due to the above mentioned factors. Conservation practices for Lake Hawassa, the practice is very weak. Impacts of degradation of Lake Hawassa include: lake water volume reduction, reduction of fisheries production, reduction of biodiversity and lake water pollution.

5.2. Recommendation

- The concerned governmental and non-governmental organizations should work cooperatively to reduce the degradation of Lake.
- To create awareness for the community about benefits or values of lake.
- Universities and other organizations should work together to create awareness for the community as well as other concerned bodies through trainings.
- The government should give attention for natural resources at large and Lake in particular besides the attention given for urban expansion and investments.
- Although there are some laws and policies on Lake Management in Ethiopia, the implementation is very loose. Therefore, government should work strongly for implementation of these laws and policies.
- Illegal damping of wastes should be prevented.

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APPENDIX

WOLKITE UNIVERSITY

COLLEGE OF AGRICULTURE AND NATURAL RESOURCE

DEPARTMENT OF WILDLIFE AND ECOTOURISM MANAGEMENT

Quaternary of To Whom It May Concern

Dear Respondents

The main objective of this questionnaire is to collect information about " ASSESSEMENT OF THE CONTRIBUTION AND CHALLENGES OF LAKE HAWASSA partial fulfillment for the BA (bachelor of art) degree in Wildlife and Ecotourism management at Wolkite University. The researcher will like to thanks in advance for all your cooperation and participation.

General Instruction

- No need of writing your name
- Use (√)Mark in the box of your choice for closed questions
- Write your answer for open question on the space provided.

Appendix I: Demographic characteristics

- Name of village (kebele) _____

- Sex male ☐ female ☐
- ✓ Household type: Male headed ☐ female headed ☐
- ✓ Age 18-25 ☐ 26-33 ☐ 34-41 ☐ 42-49 ☐ 50 ☐ and above
- ✓ Educational level: certificate ☐ college diploma ☐ Read and ☐ write only ☐ bachelor degree master and above ☐
- ✓ Marital status: married single ☐ divorced ☐ ☐ widowed ☐
- ✓ Religion: Orthodox Christian ☐ Protestant ☐ Muslim ☐ other ☐
- ✓ Occupational status

  Governmental employee ☐

  Business men ☐ Farmer ☐ Others ☐

Appendix II listInterview and questionnaires information

1. Are there challenges in Lake Hawassa?

A. Yes ☐ B. no ☐

2. If your answer for question number #1 is **YES** what are the challenge that affect lake Lake Hawassa?

A, expansion of urbanization B,expansion of agriculture

C, road construction D,factory or town waste E. Others

3, what are the other challenges of Lake Hawassa?

……
……..

……
……

4, what are the benefits of local community from Lake Hawassa?

A, for agriculture B, for recreation

C, for fishery D, all

5, what are other benefits of local community from Lake Hawassa?

.....

……..

6, is there any conservation activities on Lake Hawassa?

A, yes B, no

7, if your answer for the question number #6 is **YES** how to conserve?

……..

……..

7, which method uses to conserve Lake Hawssa?

A, to reduce illegal agriculture expansion B, to create awareness about benefits of Lake

8, what are the other methods used to conserve Lake Hawassa?

……..

……..

9, what are the effects affecting Lake Hawassa that are broghut by factory or town waste, expansion of agriculture and urbanization?

A, reduce the amount of Lake water B, pollution of Lake alter

C, reduce the fishery D, reduce different species from Lake

E, all

10, what are other results that affect Lake Hawassa by factor or town waste, expans ion and urbanization?

……..

……..

11,What is the dynamics of the existing status of Lake Hawassa?