Wetland Management in the Central Rift Valley of Ethiopia: Analysis of Environmental Behavior, Economic Valuation and Stakeholders' Action

Fitsum Dechasa Kibret

A Dissertation Submitted to the Center for Environment and Development Studies, College of Development Studies

Presented in the Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Development Studies (Environment and Development)

Addis Ababa University,
Addis Ababa, Ethiopia
August, 2020

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Supervisors

Feyera Senbeta (Ph.D.), Associate Professor, Addis Ababa University, Ethiopia

Dawit Diriba (Ph.D.), Addis Ababa University, Ethiopia

Addis Ababa University,
Addis Ababa, Ethiopia
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Dissertation Approval

Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by Fitsum Dechasa entitled *Wetland Management in the Central Rift Valley of Ethiopia: Analysis of Environmental Behavior, Economic Valuation and Stakeholders' Action* and submitted in fulfillment of the requirements for the Degree of Doctor of Philosophy in Development Studies (Environment and Development Studies) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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_____	_____	_____
Chairman, Examining Committee	Signature	Date
Belaineh Legesse (Ph.D.)		13 August 2020
External Examiner	Signature	Date
Engdawork Assefa (Ph.D.)		14 August 2020
Internal Examiner	Signature	Date
Feyera Senbeta (Ph.D.)		12 August 2020
Principal Supervisor	Signature	Date
Dawit Diriba (Ph.D.)		12 August 2020
Co-supervisor	Signature	Date

_____

Chair of the Department or Graduate Program Coordinator

Author's Declaration

I, the undersigned, declare that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the dissertation, have been fully acknowledged.

Name: Fitsum Dechasa Kibret

Signature: 

Date: 12 August 2020

Place: Addis Ababa

Date of submission: 17 August 2020

This dissertation has been submitted for examination with my approval as University supervisor.

Supervisor name: Feyera Senbeta (Ph.D., Associate Professor)

Signature: 

Date: 12 August 2020

Supervisor name: Dawit Diriba (Ph.D.)

Signature: 

Date: 12 August 2020

Wetland Management in the Central Rift Valley of Ethiopia: Analysis of Environmental Behavior, Economic Valuation and Stakeholders' Action

Fitsum Dechasa Kibret,
Ph.D Thesis, Addis Ababa University, August, 2020

ABSTRACT

The wetlands of Ethiopia are under continuous degradation owing to human and natural factors. This study aimed to examine the current wetland management in the Central Rift Valley Lakes region of Ethiopia. The study employed data collected from 405 household surveys, nine participatory rural appraisals, 78 key informant interviews, and a review of policy documents and legal frameworks in Ethiopia. Multiple linear regressions, Sobel mediator test, multinomial logit, and random parameter logit models were used for the analysis of quantitative data, whereas thematic analysis was employed for analysis of qualitative data. The study results showed that most household respondents possess a relatively good level of knowledge of wetlands and their ecosystem services, favorable attitude, and intention to manage wetlands. The vast majority (94.1%) of the respondents confirmed the degradation of the wetlands, and 54.1% of the households reported a high level of pro-environmental behavior (PEB). Multiple linear regression analysis revealed that factors, namely age, household size, income, benefit from wetlands, number of livestock, farmland size, knowledge, attitude, participation intention, participation in an off-farm job and distance, were the key determinants of household PEB. Multinomial and random parameter logit analysis revealed that despite heterogeneity in preference, households ascribe the highest value for biodiversity enhancement; followed by improvement in the water. Age, education, income, location, and distance significantly predict household preference. Household average and aggregate willingness to pay values are U.S. $ 7.5 and 694,141 respectively for a change from the status quo to high impact improvement scenario. Stakeholder Analysis demonstrated that the management of wetlands is in the realm of multiple stakeholders that are classified as local stakeholders, government institutions, economic actors, research institutions, and external bodies. Weak coordination, conflicting and/or overlapping actions, interests, roles, responsibilities, and power asymmetry characterize the stakeholders' arena. Inconsistent institutional arrangements, vague provisions, and weak enforcement are other challenges. Thus, there is a need to improve and foster locals' PEB by designing proactive strategies such as environmental education and by initiating payment for environmental services. To ensure effective engagement of stakeholders in wetland management, multi-stakeholder mechanisms have to be developed at various levels through public-private partnerships.

Key Words: *Wetlands, Pro-environmental Behavior, Valuation, Stakeholders, Central Rift Valley*

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ABBREVIATIONS AND ACRONYMS

ASAP	Abijata Soda Ash Plant
ASC	Alternative Specific Constant
ASLNP	Abijata Shalla Lakes National Park
ATJK	Adami Tulu Jido Kombolcha
CE	Choice Experiment
CPRs	Common property/pool resources
CRV	Central Rift Valley
CS	Compensating Surplus
CSA	Central Statistical Agency
CSR	Corporate Social Responsibility
CV	Contingent Valuation
DAs	Development Agents
DCMs	Discrete Choice Models
E.C	Ethiopian Calendar
e.g.	For example
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
et al.	And others (from Latin *et alii*)
ETB	Ethiopian Birr
etc.	Et cetera
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GHI	Gross Household Income
GOs	Governmental Organizations
Ha	Hectares
IAD	Institutional Analysis and Development
i.e.	That is
IWMI	International Water Management Institute
KAI	Knowledge Attitude and participation Intention
KIIs	Key Informant Interviews
Km	Kilometers
Km^2	Kilometer square
LULC	Land Use/Land Cover
m.a.s.l.	Meters above Sea Levels
MAV	Multi-attribute Valuation
Mcm	Million Cubic Meter
MEA	Millennium Ecosystem Assessment
MLR	Multiple Linear Regression

MNLM	Multinomial Logit Model
MS	Mean Score
NAT	Norm-Activation Theory
NBI	Nile Basin Initiative
NEP	New Environmental Paradigm
NGOs	Nongovernmental Organizations
NRM	Natural Resource Management
OARs	Open Access Resources
ONRS	Oromia National Regional State
PEB	Pro-environmental Behavior
PRA	Participatory Rural Appraisal
RP	Revealed Preference
RPLM	Random Parameter Logit Models
RUMs	Random Utility Models
RUT	Random Utility Theory
SD	Standard Deviation
SNNPR	Southern Nations Nationalities and Peoples Region
SP	Stated Preference
TEV	Total Economic Value
TLU	Tropical Livestock Unit
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
TRC	Theory of Rational Choice
TS	Total Score
VBNT	Value-Belief-Norm Theory
Viz.	Namely (from Latin *videlicet*)
WSM	Watershed Management
WTA	Willingness to Accept
WTP	Willingness to Pay

Articles Published and Manuscripts from this Thesis

This dissertation is based on the following articles and manuscripts:

1. Revision submitted as Fitsum Dechasa, Feyera Senbeta, Dawit Diriba Guta (2020). Knowledge, attitude and participation intention to use and management of wetlands: Evidence from the Central Rift Valley of Ethiopia. (In the journal of "*Environment, Development and Sustainability*" *Springer; Article ID: ENVI-S-19-00384_R1).* (Chapter 4; Section 4.2)

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4. Stakeholders' action and involvement in management of wetland resources in the Central Rift Valley of Ethiopia (manuscript). (Chapter 4; Section 4.5)

CHAPTER 1: INTRODUCTION

1.1. Background

Wetlands are ecotones that form unique interface between land and water. They are dynamic ecosystems, which disappear, reappear and re-create, as they are in a continuous state of temporal and spatial fluxes (Tekalegn, 2003; Businge, 2012). Their dynamic nature has made it difficult to define wetlands, and so creates varying interpretations among scholars of what constitutes wetlands (Yilma, 2003; IWMI, 2014). Among the many definitions, the widely accepted is the definition of the Ramsar Convention on Wetlands[1] which defines wetlands as: 'areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters' (Ramsar Convention Secretariat, 2006:7). Likewise, in the Nile Basin Initiative Wetland Management Strategy "wetland" refers to a broad range of different habitats and ecosystems including swamps, flood plains, seasonally flooded grasslands, the edges and shallow waters of rivers and lakes, estuaries and coastal marshes, as well as mangroves and peat bogs[2] (NBI, 2013). These definitions provide a broader scope that captures the variety and diversity of wetlands and describes characteristics that distinguish the different types of wetlands.

Globally there is great uncertainty about the number and extent of wetlands. However, estimates show that the global extent of wetlands is around 6% of the Earth's surface (NBI, 2013). Wetlands are the most productive ecosystem in the world and their role in providing ecosystem services[3] far exceeds those of terrestrial ecosystems (Ramsar Convention on Wetlands, 2018). As natural and economic resource wetlands provide multiple goods and services of global and local significances to the lives of millions of people worldwide (Heide, 2012; Nhamo, Magidi, & Dickens, 2017). They are recognized for their role in socio-economic development via supporting crop cultivation, fish harvesting, forest resource extraction, dry season grazing, and tourism or recreation services. In the Nile Basin, for

[1] It is the only international legal treaty that focuses on a single ecosystem; signed in 1971 and came into force in 1975 (Ramsar Convention on Wetlands, 2018). *Note:* Ethiopia is not a signatory to the Convention.
[2] A definition agreed by the riparian states of the Nile River: Burundi, the Democratic Republic of Congo (DRC), Egypt, Ethiopia, Kenya, Rwanda, South Sudan, the Sudan, Tanzania, and Uganda.
[3] Tangible goods and intangible services provided by wetland ecosystems

example, wetlands are source of livelihoods and food provision for large population, up to 70-80% (NBI, 2013). Wetlands are also a source of (fresh) water for domestic, irrigation and industrial uses; fuel wood, making household furniture; medicinal plants and raw materials for building construction (Tekalegn, 2009; Khan, 2011; IWMI, 2014).

Moreover, ecologically wetlands provide regulation services of ground water recharge and discharge, buffer the effects of floods, retain sediment and nutrient thereby control siltation, store excess water and thus act as buffers against drought, waste decomposition, water purification. Owing to providing these services wetlands have been labeled as 'kidneys of the landscape' (MEA, 2005a; McCartney, Rebelo, Senaratna & De Silva, 2010; Menbere & Menbere, 2018; Ramsar Convention on Wetlands, 2018). Wetlands are also among the world's richest life-supporting ecosystems – referred to as 'biological supermarket'- with a wide variety of distinctive biodiversity (McCartney, Rebelo, *et al.*, 2010). Furthermore, in the world of global climate change, wetlands have a significant role in climate regulation, adaptation and mitigation through carbon storage and sequestration. They contain about 12% of the global carbon pool in the global carbon cycle (Erwin, 2009). The carbon sink and sequestration potential of peatlands and vegetated coastal wetlands is approximately as equal as the potential of the global forests (Ramsar Convention on Wetlands, 2018). Thus, peatlands are referred to as the only type of ecosystem with a long-term net carbon storage function (Verhoeven, Beltman, Whigham, & Bobbink, 2016).

Despite their multiple services and values, wetlands have been treated as 'wastelands', without value by many groups. This view has negatively impacted on proper management of wetlands and led to overexploitation and conversion thereby degradation and loss (Ajibola, 2012a; Amsalu & Addisu, 2014). Scientific estimates show that in the 20th and early 21st centuries there has been a much faster rate of loss with 64 to 71% decline in the global extent of natural wetlands since 1900, and this is a cause for estimated loss of US$ 20 trillion of services from ecosystem each year (Davidson, 2014; Gardner *et al.*, 2015). The degradation and loss of wetlands has been highly pronounced in most developing countries where the survival strategies of many people largely depend on agriculture and thus clearing and draining of wetlands for agricultural expansion is highly practiced (McCartney, Rebelo,

et al., 2010; Marti, 2011; Ogato, 2013; IWMI, 2014). This is more evident in many parts of Africa where population growth is very high, thereby many people have been forced to seek livelihood from these resources. Reports indicated that 66% of Ramsar-designated wetlands in Africa are used for agriculture (McCartney, Rebelo, *et al.*, 2010; Wood *et al.*, 2013).

Various studies (Turner *et al.*, 2000; MEA, 2005b; Abebe *et al.*, 2014; Davidson, 2014; Chaikumbung *et al.*, 2016; Nhamo *et al.*, 2017) have shown that degradation and loss of wetlands has continued as the ecosystems lack proper management and are subjected to a host of stress-inducing threats. Wetlands face threats from natural factors, such as subsidence, sea-level rise, drought, erosion, hurricane and storms, yet the drastic changes of wetlands are highly related to multiple human actions including conversions of the land to agricultural, industrial, infrastructural and residential uses; drainage for irrigation; water withdrawals for industries; and pollution due to nutrient runoff from industries and agricultural production (Newcome *et al.*, 2005; Gebresllassie *et al.*, 2014; IWMI, 2014). Moreover, their management has proved to be inadequate to the task of maintaining wetland ecosystems and their resources. It has been emphasized that over the next few decades due to absence of appropriate management, conversion of wetlands for agriculture and other uses will intensify and continue in many parts of the world as the demand for more water and food rises rapidly owing to population growth (NBI, 2013; IWMI, 2014). Among countries of such concern Ethiopia is one, which has an agriculture dependent economy and a growing population of which the majority are agrarian and mostly natural resource dependent.

Ethiopia has diverse landforms and climatic conditions, creating a wide range of wetlands that cover approximately 20,000 km^2 (nearly 2% of the total area of the county) (Abunie, 2003; Hailu, 2007; Kebede & Hailu, 2011). Ethiopia hosts different types of wetlands including freshwater (riverine, lacustrine and plustrine), saltwater and human made wetlands that are distributed in almost all ecological zones mainly around the twelve major river basins and eight major lakes (Menbere & Menbere, 2018). Having such diversity Ethiopian wetlands, like many other wetlands of the world, provide multiple ecological and socio-economic values. Despite their enormous ecosystem services, most wetlands of Ethiopia are facing the challenge of sustainability owing to lack of proper management thereby

overexploitation and conversion. The ever-increasing demand for resources due to the large population size of the country and numerous economic activities has put unbearable pressure on wetland resources,[4] and threaten their overall resilience (NBI, 2013; Abebe *et al.*, 2014; Babu & Teferi, 2015). Moreover, the economic policies of the nation that prioritize short-term economic benefits over environmental consideration have been threatening wetlands (Abunie, 2003; Tekalegn, 2009; Hengsdijk *et al.*, 2010). Hence, in many parts of the country wetlands seems to lack proper management and thus, degradation of these ecosystems and their resources is prevalent; and some are even on the verge of annihilation as they lost their regenerating capacity (Amsalu & Addisu, 2014; Worku, 2014; Menbere & Menbere, 2018).

On account of the severe degradation of wetlands the need for proper management has increasingly been recognized to ensure their sustainable utilization[5] (Turner *et al.*, 2004; Dixon & Wood, 2007; Khan, 2011). Dixon (2005) noted that, in many parts of the developing countries, including Ethiopia, wetlands have been managed by local communities for generations. However, what often remains ambiguous is why some wetland management systems ensure sustainability of wetlands, whilst most others are characterized by mismanagement. According to NBI (2013) in Ethiopia and in other Nile Basin riparian countries the management of wetlands constitutes a challenge. The degradation state of the wetland ecosystems and the multiple threats and pressures that the ecosystems face, imply the difficult circumstances. This could be because, the management of wetlands is not an easy task owing to the complex environmental, socio-economic and institutional processes determining their existence and management (Turner *et al.*, 2000); Marambanyika & Beckedahl, 2016). Hence, effective management of wetlands entails understanding the factors that are interlinked in the management of wetlands in every site.

The Central Rift Valley (CRV) Lakes region of Ethiopia is an area where there is a mounting problem of wetland degradation. Despite the degrading status competition for the use of wetland resources in CRV is intensifying among different sectors -mainly agriculture,

[4] Wetland resources herein refer to open water of lakes, the land surrounding the lakes that is temporarily or permanently saturated or covered with water; and the biodiversity -floras and faunas- found there.

[5] Sustainable utilization of wetlands is "human use of wetlands so that it may yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations" (Ramsar Convention Secretariat, 2006).

industries, fishing, urbanization, tourism, domestic water use, hydropower and dams (Hengsdijk *et al.*, 2010; NBI, 2013; Elias *et al.*, 2019). If the ongoing trend of degradation of these wetlands is not checked, it can considerably affect the sustainability of these ecosystems. The need for effective management response to the degradation of wetland resources is therefore unquestionable. For effective response measures of wetland degradation it is imperative to understand the existing wetland management system as this highly matter for sustainability. As Dixon (2005) noted, it helps to examine weakness or gaps, if any, in the management of wetland resources and evaluate the need for management measures that need to be taken in the future. In view of this, the present study was aimed to examine the current management of wetland resources in CRV of Ethiopia. This will provide empirically supported information that can inform potential and feasible measures to respond to the current degradation of wetlands in order to maintain their ecosystem services.

The study is framed in the lens of a blend of theories to conceptualize the different issues that are at interplay of wetland management. Accordingly, the Theory of Planned Behavior (TPB) is useful to understand household wetland management behavior. The theory is an influential behavioral model to explain behavior and its determinant factors. However, in Ethiopia it is less widely used and has not been sufficiently grounded in dealing with issues related to environmental or resource management. The study has also employed the Theory of Rational Choice (TRC) and the probabilistic choice theory named Random Utility Theory (RUT) for modeling households' preference to management of wetland resources and wetland attributes. The TRC assumes that an individual is best able to make choices that affect his or her welfare. Hence, an individual is willing to pay for management and improvement of environmental services if he or she believes that the change in environmental services will bring improvement in his or her welfare. The RUT assumes that individual's utilities depend on choices made; and the choices for goods (herein wetlands) are based on attributes of the goods (wetlands). To understand stakeholders' action, interest, roles, responsibilities and challenges (for collective action) in wetland resources management, the study adopted the Institutional Analysis and Development (IAD) framework, a widely used framework to deal with management of Common Property/Pool/ Resources (CPRs). Further discussion of the theoretical frameworks is given in section 2.2.

1.2. Problem Statement

The CRV of Ethiopia is an area with diverse ecosystem services of socio-economic and ecological values. The ecosystems in the area are means of livelihood and income for many people via, for example, small-scale and large-scale irrigation farms, fishing and sources of fodder for livestock (Hengsdijk *et al.*, 2010; Elias *et al.*, 2019). The area is also the home of a wide variety of terrestrial and aquatic biodiversity including edible fish and varieties of bird species (Abera, 2016; Girmay *et al.*, 2017). Despite the enormous values, most of these resources are falling under threats and pressures. Hence, in the CRV area there have been continual decreases in water resources; lakes levels have lowered and wetlands have deteriorated (Jansen *et al.*, 2007; Temesgen *et al.*, 2013; Abera, 2016; Gebretsadik & Mereke, 2017). A study by Elias *et al.* (2019) revealed that the water bodies especially lakes and associated wetlands of the CRV area have decreased by 11.57% between the years 1985-2015; the highest turn down, which is 8.89%, was recorded in the years 1995-2015. The danger is highlighted for the wetlands of Lakes Ziway and Abijata[6] where resource extraction related to human activities are being maximized beyond the resources' rejuvenating capacity (Pascual-Ferrer *et al.*, 2014; Bezabih & Mosissa, 2017).

Over the last decade the size and depth of Lake Abijata has shown a dramatic reduction which brings a great fear in the minds of people that it may dry up within a few years (Ewnetu *et al.*, 2013; Temesgen *et al.*, 2013). Lake Abijata area has decreased in size by 5.6% between 1973 and 1986; and a significant reduction of 46.5% has been recorded between 2000 and 2006 (Temesgen *et al.*, 2013). The increase in the salinity of the lake, which is often attributed to water abstraction for soda ash extraction[7], has also resulted in significant reduction in the number of various species particularly fishes (Legesse, 2005; Jansen *et al.*, 2007; Temesgen *et al.*, 2013). According to Girmay *et al.* (2017), the fish stock of Lake Abijata has almost totally collapsed. The danger also refers to Lake Ziway and associated wetlands. The water level of the Lake has shown reduction of 0.5 meters since 2002 because of serious pressure from various human-induced factors (Temesgen *et al.*,

[6] Different spellings can be found in literature: Lake Abijata, Lake Abyata, Lake Abjata, Lake Abiyata

[7] Commercial exploitation of soda ash by evaporation of brine in an artificial basin by diverting the water of Lake Abiyata via a canal started in January 1988 (Legesse et al., 2004)

2013). Human's impacts in the lake littoral are most severe in Lake Ziway than other lakes of the rift valley (Beneberu & Mengistou, 2009). Open irrigated agriculture in Ziway basin has increased by about 8.8 fold, with an average increase of 26.14% per year between 1984 and 2014 (Abera, Kibret and Beyene (2019). Because of agricultural and commercial activities, the salinity, nutrient and sediment loads of the lake and associated wetlands have increased with consequent impacts on biodiversity, above all fisheries and wetland birds (Jansen *et al.*, 2007; Beneberu & Mengistou, 2009; Hengsdijk *et al.*, 2009).

Apparently, with the existing pressures in Lakes Ziway and Abijata and associated wetlands further degradation is inevitable that significantly jeopardize their sustainability and ecosystem services. The struggle is between economic gain obtained from the use of wetland resources on one side and the consequences on the other side. This situation calls for a long-term balance between conservation and development. However, according to IWMI (2014), there is no blueprint to balance use and conservation in all wetlands, so establishing the trade-off between use and conservation largely depends on site specific analysis of the way wetlands are currently used and managed. Moreover, because each situation is unique, there is no common response to the degradation of wetlands, and so there is a need to understand local conditions and realities and design appropriate conservation and management interventions to specific needs and conditions.

Wetlands in the CRV of Ethiopia including Lakes Ziway and Abijata have been the subject of different studies inter alia are Dagne (2010), Gibtan and Abera (2011), Kumssa and Bekele (2014), Tamire and Mengistu (2014) and Mengesha *et al.* (2015) that focused on the ecology, biological diversity and species abundance of the lakes and associated wetlands. Some other studies (Ayenew, 2002; Legesse *et al.*, 2004; Abraham *et al.*, 2007; Mengesha *et al.*, 2014; Abraham *et al.*, 2018) have looked into the impacts of land use/land cover (LULC) change and climate variability and change on the lakes and associated wetlands. However, given the existing severe degradation and potential future threat to the wetlands of the CRV lakes, particularly Lakes Ziway and Abijata, the sustainability of these resources requires an understanding of the existing management system. This has hardly been addressed in previous studies. So, the argument of this study is that before culminating with

disastrous effects it is imperative and timely to examine the current management of wetland resources. In what follows are the arguments that backed the central thesis of the study.

Firstly, wetland resources management is usually influenced by local communities owing to the fact that the communities are among the immediate beneficiaries of these resources (Chandool, 2007; Zhu *et al.*, 2016). Hence, analysis of the existing management of wetland resources of the CRV lakes area presupposes understanding of local community's wetland resources management behavior and the factors that determine it; as well as the community's Knowledge, Attitude and Intention (KAI) to the resources and their management. It is indicative that introduction or adoption of any conservation and management activity at the local scale cannot be effective unless these dimensions of human behavior are well understood (Gebrelibanos & Assen, 2013). Secondly, since most planning and development decisions are made on economic ground, wetland goods and services need to be valued if their conservation and management is to be chosen over alternative uses of the land and/or water (Schuyt, 2005). Due to the public nature of most goods and services of wetlands and the resultant market failure and the absence of market price, the values of wetlands are often poorly understood or neglected in development decisions and policy initiatives. Consequently, protection and management of wetlands is not prioritized (Turner *et al.*, 2000; Schuyt, 2005; Ajibola, 2012b; Chaikumbung *et al.*, 2016; De Groot *et al.*, 2016). As Abebe *et al.* (2014) asserts that decision-makers cannot take wetland management actions based on intuition and they do not give warranty to protect wetlands unless their values are defined in economic terms. Hence, empirical information on economic values of wetland resources of the CRV lakes is imperative to guide management of these resources.

Thirdly, the management of wetland resources often deals with varied and usually conflicting interests and views of numerous stakeholders that use the resources for different purposes. Hence, decision-makers face complex trade-offs and often fail to recognize and pay adequate attention to stakeholders and their particular interest and influence. This in turn leads to a failure in resource management efforts and thereby degradation and loss (Grimble *et al.*, 1995; Reed *et al.*, 2009; Schuyt, 2005). Cognizant of this, the prevailing degradation of wetlands of Ethiopia in general and the CRV lakes in particular also suggest the need for

analysis of stakeholders' actions in the management of wetland resources. Moreover, studying stakeholders' perspective on institutional arrangements that guide the management of wetland resources is indispensable. This is because studies elsewhere (Khan, 2011; Chaikumbung *et al.*, 2016; Ramsar Convention on Wetlands, 2018) reveal that wetlands in different parts of the world remain ignored or under-emphasized in conservation and management planning, policies and practices. Thus, degradation and loss are likely to be partly attributed to lack of institutional arrangements, institutional laxity; policy intervention failures and inconsistency among policies in different areas (Turner *et al.*, 2000; Marambanyika & Beckedahl, 2016). In Ethiopia, hitherto there is a policy vacuum of wetlands, and the need for a stand-alone national wetland policy has been contentious. Some scholars, for example, Mesfin (2003), argue that the need for a wetland specific national policy is limited since wetlands are represented, directly or indirectly, in different policies. Whereas, others (Fisseha, 2003, Wondafrash, 2003 and Amsalu & Addisu, 2014) argue that because wetlands have a critical role for Ethiopia's water resource and livelihood of local community, it makes sense to consider an independent wetland policy. Owing to such divergent views, a look at stakeholders' perspectives on existing institutional frameworks is helpful to unearth the capacity, functionality and limitations of these frameworks in serving for wetland management, thereby justify the need for wetland policy.

In Ethiopia there are only a few studies that assess communities' KAI and behavior to the environment at large (Bantider *et al.*, 2013; Adem, 2017) or specific environmental issue such as land degradation (Gebrelibanos & Assen, 2013; Birhanu, 2014). However, to the best of the researcher's knowledge, local community's KAI and behavior to wetlands and their management have hardly been studied. There are also scant studies (Ali, 2007; Abebe *et al.*, 2014; Yimenu & Rao, 2015) that have undertaken economic value estimation of some wetlands of Ethiopia and there are virtually no studies on the wetland resources of the CRV lakes. Since the estimated economic values of wetlands vary enormously across wetlands with different biophysical characteristics as well as people's socio-economic and cultural setting that differ from place to place (Federal Environmental Protection Authority, 2007; Abebe *et al.*, 2014; De Groot *et al.*, 2016), extensive site-specific wetland valuation studies remain important. Hitherto, stakeholders analysis in the management of wetlands has rarely

been made in Ethiopia, Gebre *et al.* (2008) being a notable exception, and in the CRV areas in particular. More importantly, previous studies did not address stakeholder views on wetland institutional arrangements. As Cohen-Shacham *et al.* (2014) and Marambanyika and Beckedahl (2016) noted, stakeholder views regarding wetland institutions is very important for better understanding and considering factors underlying the management of wetlands, thereby putting in place the appropriate measures to improve institutional arrangements of wetland management. This dissertation, therefore, aims at filling the paucity of empirical information regarding the identified gaps, thereby provides empirical information that informs possible ways to design future conservation and management measures to reverse degradation and maintain wetland resources in CRV in particular and in Ethiopia in general.

1.3. Objectives

1.3.1. General Objectives

The overall objective of this study is to examine the current management practices of wetland resources in the CRV lakes of Ethiopia, mainly of Lakes Ziway and Abijata.

1.3.2. Specific Objectives

Specifically, the research intends to address the following objectives:

1) To assess household knowledge, attitude and participation intention of wetlands management in the study area.
2) To examine household wetland resources management behavior and its determinants.
3) To assess economic value and welfare impact of the improvement of wetland attributes and the factors that determine household preferences for wetlands management plans.
4) To examine stakeholders' action and involvement in the management of wetland resources of the study area.

1.4. Research Questions

The research questions that guide this dissertation are:

1) In the study areas, what is the existing households' knowledge of wetlands and their ecosystem services and the existing households' attitude and participation intention to management of wetlands?
2) What factors determine household wetland management behavior in the area?

3) How much value do households ascribe to wetland resources in the study areas?
4) What are the determinants of household preference for wetland management plans?
5) How is stakeholder action and involvement reflected in the management of wetland resources?
6) How do stakeholders perceive the capacity and functionality of existing institutional arrangements in regulating the management of wetland resources?

1.5. Significance of the Study

This study provides empirical information that is useful to academia, policy makers and other communities. The study attempts to capture and explain the existing management of wetland resources from different dimensions mainly household behavior and ascribed values to these resources as well as stakeholder involvement. Thus, academic communities who have interest in working on human-environment interaction can benefit from this study because it can inform how to approach and examine managements of resources from multiple dimensions. The study's use of different theoretical underpinnings may be beneficial in comprehending the multi-dimensionality of the management of wetland resources. Moreover, owing to the limited application of the TPB in Ethiopia's wetland literature, the use of this theory in the present study provides a good opportunity to provide theoretical grounding for future studies seeking to frame different issues with this theory.

Regarding policy relevance, the researcher has the conviction that the study offers empirical information that can help resource managers and policy makers to come up with relevant policies and make sound and informed decisions for the management of wetland resources. The findings on household KAI and behavior can be good entry points for designing mechanisms to involve local communities in wetland resource management programs that can contribute to sustainability of the resources. This is because effective involvement of local communities in resource management programs is partly influenced by the communities' knowledge (about the ecosystem services of the resources) as well as the communities' attitude and participation intention to resource management. Likewise, the findings on valuation of wetlands have great significance in justifying spending on conservation and management of wetlands. This is because valuation enables direct

comparison of wetland goods and services with the monetary value of alternative sectors of the economy when activities are planned, policies are formulated and decisions are made to appraise alternative public investments. The study offers relevant information for resource planners and decision-makers to undertake cost-benefit analyses for different scenarios of wetlands conservation thereby select the one that can best improve the ecosystems and maximizes social welfare. Empirical information on stakeholders' analysis can also benefit resource planners, conservation experts and decision-makers on how to consider stakeholders' views while activities are planned and decisions are made. The study provides an essential basis for initiating feasible policies on wetland management undertakings that suit local contexts. The research provides key recommendations that would provide indication for response actions to the prevailing degradation of wetland resources. The finding of this study can also help the local communities in realizing the existing condition of wetland resources thereby enable them to engage in conservation and management of these resources.

1.6. Scope of the study

The scope of the study is delimited based on three parameters: (i) the issues or themes addressed (ii) temporal and geographic delimitation and (iii) the units of observation[8] of the study. The thematic delimitation of the research refers to the issues that the dissertation addressed. There could be several issues that matter in the management of wetland resources. Because each and every issue cannot be addressed in a single study, there was a need to delimit the scope of the present study. Accordingly, this study attempts to analyze the management of wetlands focusing on local communities' knowledge (about wetlands and their ecosystem services), attitude, intention and behavior of wetland resources management, the value that local communities ascribe to these resources and stakeholder action and involvement in the management of wetland resources.

The temporal and geographic delimitation of the study entails the framing of the study in terms of the time frame of data collection and its geographic coverage. From the time perspective, this dissertation extensively generated and utilized data that tell the existing

[8] Herein units of observation refer to participants of the research from which primary data were collected.

management of wetland resources. Hence, the study used a cross-sectional design[9] and collected cross-sectional survey and qualitative (interview) data. Moreover, data were generated through Participatory Rural Appraisals (PRAs) tools (*see* section 3.4, for details). Here, the researcher would like to underscore that the fact that some of the data generated though PRAs inform past conditions should not mean that there is discrepancy with the study design being cross-sectional. The data generated through PRAs is just to substantiate the data collected using survey questionnaire. Spatially, the study was delimited to the wetland resources of the CRV lakes of Ethiopia, mainly Lakes Ziway and Abijata. Although the study was delimited to these areas, for the stakeholder analysis pertinent data was generated from different tiers[10] of the government, viz. federal levels[11], region[12], Zones[13], *Woredas*[14], and *Kebeles*[15].

The dissertation was also delimited by units of observation- the source of primary data. Accordingly, to generate the household level survey data the study targeted on households of six sample *Kebeles*. Data were also generated from the local communities using different PRAs tools. Whereas for stakeholder analysis the data was generated from governmental, non-governmental, business (private and public) enterprises as well as academic and research institutions (*see* section 3.4 and Appendix XI, for details).

1.7. Limitation of the study

The limitation of the study can be briefed from different dimensions. First, issues related to wetland management may potentially vary according to local contexts. Hence, objection to the generalizability of the findings of the present study may arise as the study focused on wetland resources of the CRV lakes of Ethiopia, specifically on Lake Ziway and Abijata. If not for time and budget constraints, the study could have assessed the wetlands associated

[9] "A *cross-sectional design* is often used in survey research and involves the collection of quantitative data at one point in time and from a number of cases" (Somekh and Lewin, 2005: 216)
[10] Information in support of wetland management needs to be acquired at multiple scales from regional, national and local assessments to guide policymaking and prioritization of responses (NBI, 2013).
[11] The current governance structure of Ethiopia follows Federal system. The country has nine national regional states under which there are jurisdictional administrative boundaries called Zones.
[12] The region considered in this study is the Oromia National Regional State
[13] Zone in Ethiopia refers to an administrative unit next to *woreda*
[14] *Woreda,* which is equivalent to a district, is an administrative unit in Ethiopia next to *kebele.*
[15] *Kebele* is the smallest or lowest administrative unit in Ethiopia.

with the other two lakes of the CRV, i.e. Lake Shalla and Lake Langano. However, some recommended response measures of the research can be tailored to other wetland contexts, at least to wetlands that are akin to the wetlands of study areas. In fact, the researcher is not claiming that the findings of this study suffice to address the degradation of wetlands in different areas and socio-economic contexts, and thus recognizes the importance of undertaking various studies in different wetland contexts. This can help to design sound and robust institutional frameworks that have context specific response measures for the degradation of wetlands of the country.

Second, as the survey data was generated from rural households, the study merely captures rural communities' values and practices in the management of wetland resources. Considering urban communities in studying wetland management might provide better insights to capture the practices and views of urban communities particularly in the valuation of wetland resources. The researcher decided to target rural local communities owing to the constraints of time and financial resources. It is also based on the conviction that rural local communities are relatively nearer to the wetland areas, and so are more likely the foremost ones in the management of wetland resources. Further research could address the urban communities' value and practice and may even comparatively assess the rural communities' and urban communities' practices. Third, the present study is cross-sectional while the issue of knowledge, attitude, intention and behavior (KAIB) are dynamic that changes overtime with change in societies. Hence, the present study only tells the existing KAIB of the local communities and could not capture the dynamics overtime.

Fourth although institutional arrangements merit an analysis in their own right, the study did not give detailed analysis and discussion on the institutional arrangements of wetland management. Rather, the discussion is based on stakeholders' perspective on the capacity and functionality of existing institutional arrangements in regulating the management of wetland resources. In fact, the study attempted to complement and substantiate the finding by reviewing available policies, strategies, legislations and regulations, despite the challenge posed by inaccessibility or absence of pertinent documents from the responsible government bureaus and office. Fifth, the dearth of theories and models that exclusively or particularly

deal with wetlands is the other limiting factor. It was unwieldy to have a model that captures the themes of this research. This demanded the researcher to labor in search of relevant theories and models. Part of the challenge is attributed to scantiness of related empirical research on wetlands that utilize theories that are pertinent to this study. Hence, the researcher consulted and adopted pertinent theories and models that can best help to capture and have good insight into the issues that are addressed in this dissertation.

1.8. Structure of the Dissertation

This thesis is organized in five chapters. The first is an introductory chapter that comprises the background of the study, description of the research problem, research questions and objectives, significance, scope and limitation of the study. Chapter two presents a review of the theoretical and empirical literature and conceptual frameworks. Chapter three is devoted to the study's methodology that includes a description of the study areas, research design and approaches, sampling and methods of data collection and analysis. Results of data analysis and research findings are presented in chapter four. This chapter has four sections that present the findings for the major themes of the study. Accordingly, the first section addresses household KAI on wetlands and their management. Section two provides analysis of the determinants of household wetland resources management behavior. Section three presents the findings on the economic value of wetlands and socio-economic factors that determine household preferences for wetlands management plans. The fourth section deals with the typology of stakeholders of wetland management their roles, responsibilities, interest and influence in wetland management, their perspective regarding the status of wetlands; their synergy in management of wetland resources, as well as their perspectives on the capacity and functionality of the institutional arrangements that could guide the management of wetland resources. Finally, chapter five synthesizes the main findings and provides conclusions, recommendations of the study for sound and sustainable management of wetlands and forward future research areas.

CHAPTER 2: REVIEW OF LITERATURE

This chapter presents review of empirical and theoretical literature, as well as the conceptual framework of the study which has got underpinning from the literature reviewed. The chapter starts by providing working definition for the key terms and concepts. The second section is devoted to theoretical literature where it presents perspectives on Pro-environmental behavior, approaches and theories of environmental valuation, theoretical insight on property rights and management of environmental resources and framework for stakeholders' analysis. The reviews on empirical literature on each theme of the study are presented under the third section. Owing to the scanty theoretical and empirical literature that deal with the themes of this research, in wetland context, there is a wide use of literature written on different environmental issues or resources, yet have much relevance to the present study. Lastly the conceptual framework of the study discusses the interplay among the different issues addressed in this study.

2.1. Terms and Concepts

As a point of concern a number of terms and concepts may have equivocal and multiple definition or meaning. Hence, explanation and conceptualization of pertinent terms and concepts is useful in order to enlighten the way they are used in this dissertation.

I. Wetland Management

According to Ramsar Convention Secretary (2020c) wetland management is an activity that is most successfully addressed through integrated management at the river (or lake or aquifer) basin scale that is integrated to coastal zone management for coastal and near-shore wetlands and that considers allocations of water for the ecosystems. It emphasizes on maintaining the ecological character of wetlands through wise use of wetlands and their surrounding environment. Wise use of wetlands is the utilization of wetlands in a sustainable way for the benefit of humans in a way that consider the maintenance of their inherent natural or ecological properties (Ramsar Convention Secretariat, 2010a). Likewise, in the Nile Basin Initiative Wetland Management Strategy wetland management refers to an activity to guide sustainable utilization of wetlands and enhance their greatest possible contribution towards the common benefit (NBI, 2013). The study at hand conceptualize wetland management as an activity that involves wise use of wetlands as well as any activity

that can be conducted within and around wetlands to restore, protect and sustain wetland resources and their ecosystem services.

II. Knowledge

According to Tarrant (1995) knowledge refers to (i) the state or fact of knowing, (ii) awareness or understanding gained through experience or study, (iii) the sum or range of what has been perceived, discovered, or learned, or (iv), specific information about something. Knowledge in this study is conceptualized as a state of having awareness or specific information about the different attributes and the ecosystem service of wetlands.

III. Attitude

Attitude towards a behavior offers indication of people's evaluation of the behavior and reflects the extent to which an individual appraise that given behavior as favorable or unfavorable (Obeng, Oduro & Obiri, 2019). It is individual's positive or negative evaluation of performing a particular behavior of interest or individual's opinion about whether a behavior is positive or negative (Ajzen, 2005). In this study it is operationalized as people's state of mind or feeling towards conservation and management of wetland ecosystems and the resources there.

IV. Intention and Behavior/Action

According to Ajzen (2005), intention reflects primarily an individual's willingness to try enacting a given behavior and it remains a behavioral disposition until, at the appropriate time and opportunity, the intention is translated into action. Intention to participate in resource management can happen in different forms, such as motivation and willingness to engage in or provide support in resource conservation and restoration activities, to reduce negative impact activities and to partake in training (Zhang & Lei, 2011). For this research purpose this definition is adapted, so intention refers to individual's willingness and readiness to participate in wetland management activities; whereas behavior (or action) is individual's actual or observed participation in wetland management activities.

V. Pro-environmental Behaviors (PEB)

According to Eilam and Trop (2012) and Lee *et al.* (2013), any active participation or responsiveness to preservation or conservation of environmental resources is considered as a

pro-environmental behavior (PEB); and so people with PEB are those who have concern towards environmental problem, protect their surrounding environment and show responsible actions that do not disturb the environment. According to Kollmuss & Agyeman (2002: 240) PEB is "a behavior that consciously seeks to minimize the negative impacts of one's actions to the natural and built world". Such negative impacts activities include reduce consumption of resource and energy, use of non-toxic substances and reduces waste production. In this study PEB is conceptualized as a behavior which reveal actions towards conservation and management of wetland resources, such as contribution to resource conservation (for example through money or labor); adherence to rules on resource use and conservation, and refrain from resource damaging activities.

VI. Stakeholders and Stakeholders Analysis

The concept *stakeholder* is formally introduced in 1963; and since then it has appeared in many scholarly works (Freeman, 1984). In relatively broader terms Freeman (1984:46) defined stakeholder as "…any group or individual who can affect or is affected by the achievement of the organization's objectives." Chevalier and Buckles (2008:165) also defined stakeholders as "actors that can influence or be affected by a certain problem or action." For Grimble and Wellard (1997:175) 'stakeholders' mean "any group of organized or unorganized people, , who share a common interest or stake in a particular issue or system; they can be at any level or position in society, from global, national and regional concerns down to the level of household or intra-household, and be groups of any size or aggregation." Grimble, Chan, Aglionby, and Quan (1998:3) explained stakeholders as "all those who affect, or affected by, the policies, decisions, and actions of the system; they can be individuals, communities, social groups or institutions of any size, aggregation or level in society". In the works of De Groot *et al.* (2006:9) stakeholder refers to "a person, organization or group with interests in an issue or particular natural resource."

Many definitions of stakeholders have also been forwarded with respect to wetland resources management. Stakeholders, according to Darradi, Grelot & Morardet, (2006) are people who either (i) will be potentially affected by the management of wetlands; (ii) will be involved by one way or another in the implementation of management activities; or (iii) who are likely to support or oppose the research or development project or the policy at stake. In

the definition of the Ramsar Convention Secretariat (2010: 28) stakeholders include "those agencies, institutions, and groups who have an interest in, or are affected by, the National Wetland Policy. It includes government departments, non-governmental organizations, local governments and many others." In this study the term stakeholders is contextualized as individuals, groups or organizations /institutions/ that have a *stake* (interest, share or concern); and are directly or indirectly affecting or being affected by decisions or actions of wetland resources management.

Similarly different definitions have been forwarded to stakeholder analysis (SA). For Grimble and Wellard (1997:175) SA is "a holistic approach or procedure for gaining an understanding of a system, and assessing the impact of changes to that system, by means of identifying the key actors or stakeholders and assessing their respective interests in the system." They used that the term 'interests' in an economic sense to represent stakeholders' perception of the level of utility or welfare and change in welfare which can be measures by any gain or loss in the utility. In wetland context, Koopmanschap and Gevers (2012) conceptualize SA as the identification and analysis of the action of individuals, groups or organizations that have a specific interest in the wetland and are likely to affect or be affected by proposed intervention activities in the wetland. The results of stakeholder analysis, therefore, show the way stakeholders interact, the different activities they perform, the different challenges they face in performing their activities, their impacts on wetland resources and their potential roles and responsibilities in wetland conservation and management of wetland resources.

VII. Institutional arrangements/institutions/

Worldwide, spatial variations were observed in institutional arrangements/institutions that resulted in differences in their interpretation by different groups depending on what they want to address (Maconachie *et al.*, 2008; Marambanyika & Beckedahl, 2016). In most popular usage the term "institution" is associated with and regarded only as "organization", with a neglect of the importance of rules and laws that are necessary for effective organizational performance (Bandaragoda, 2000). According to Ostrom (2010), in the analysis of institutional arrangements the concept of rules is central yet it refers to many concepts with diverse meanings. In the context water resource institutions Hailu (2018:17)

defined institution as "rules, regulations, bylaws, policies, and customs that govern water users and uses from basin to household level and *vice versa*." In view of this, in this dissertation institutional arrangements are conceptualized as rules-in-use[16] i.e. the sets of formal rules (policies, strategies, legislations, regulations and directives) as well as informal rules (norms, practices or codes of conducts) that societies establish to define, guide or govern stakeholders' action in the management of wetland resources.

2.2. Theoretical Frameworks

In studying an issue, it is of paramount importance to have a theoretical underpinning in guiding a research because it influences the various activities and stages of the research (Tolossa, 2005). Accordingly, the present research is underpinned and guided by a blend of different theories and explanations. This sub-section presents pertinent theories that would enable to have insight into the different thematic issues of this research.

2.2.1. Perspectives on Pro-environmental Behavior

Studying behavior and its determinants has long been a topic of interest for range of disciplines, such as psychology, economics, sociology, anthropology and environment, so the philosophical and methodological foundations differ much across disciplines and that it is often difficult to find a common ground to develop an integrated understanding of behavior (Turuga *et al.*, 2010). To describe behaviors that protect the environment, environmental scholars have put forwarded various terminologies, such as 'responsible environmental behaviors'[17], 'environmentally-concerned behaviors'[18], 'environmentally significant behaviors'[19] and 'pro-environmental behaviors' (PEB). Like most environmental studies this study adopt the term PEB.

With the degradation of the world's environmental resources, environmentalists and various professionals gave attention to society's perspective and behavior towards protection and

[16] They are the dos and don'ts that someone learns on the ground that may not exist in written formal documents (Ostrom, 2010).
[17] Also "environmentally responsible behavior" defined as "any action of individual or group, towards the remediation of environmental issues/problems" (Sivek & Hungerford, 1990)
[18] "Actions which contribute towards environmental preservation and/or conservation" (Axelrod, & Lehman, 1993)
[19] "Behavior that is undertaken with the intention to change (normally, to benefit) the environment" (Stern, 2000)

sustaining the environment. Correspondingly, development in theories has also given way to such human behavior. The present study focuses on wetland resources which are increasingly being threatened and their sustainability necessitates PEB of every individual who are involved in the use and management of the resources. However, it is a complex undertaking to try to fully understand what shapes the PEB of different groups of people since it is influenced by several factors, which can prevent or strengthen the emerging of such behavior (Kollmuss & Agyeman, 2002; Bantider *et al.*, 2013).

While attempting to describe PEB scholars have examined the different factors that result in such behavior. In so doing, they visualize PEB at macro scale by considering non-psychological factors such as geo-physical conditions, natural forces, technological innovation, government institutions or political influences (Gifford & Nilsson, 2014). At meso-scale scholars have also long sought to understand human's PEB by examining issues such as knowledge, attitude, intention, values, belief as well as demographic and socio-economic factors. In the course of understanding PEB and examining the factors that shape such behavior scholars have proposed different theoretical frameworks of PEB although the frameworks yield markedly different predictions and policy recommendations about the determinants of PEB (Turuga *et al.*, 2010).

The linear model of PEB: These are the oldest and simplest models of PEB, of the early 1970s. The models have an assumption of a linear progression that environmental knowledge leads to environmental concern (or environmental attitudes) which in turn is thought to lead to PEB (Kollmuss & Agyeman, 2002). This model assumed that educating people about environmental issues would automatically result in more pro-environmental behavior (Latif, Omar, Bidin & Awang, 2013). There are discrepancies of empirical findings, most controverting whereas some lending support to these theories of linear assumption. As Kollmuss and Agyeman (2002) opine the main limitation of this model is that it has a rational assumption that knowledge result in PEB although in reality only small fraction of PEB can be directly related to environmental knowledge and hence environmental knowledge *per se* is not a prerequisite for PEB.

Moral theories: Further review of theoretical frameworks which look at PEB reveals "moral theories" which originate in the field of Environmental Social Psychology. These theories focus on environmental values as the main drivers of PEB and assume that moral reasons are the cause of such behavior (Turuga *et al.*, 2010). Among the prominent theories in this field are the New Environmental Paradigm (NEP) and the Norm-Activation Theory (NAT). The NEP assume that environmental concern is the key to PEB, on the other hand the NAT argues personal norm that is created by awareness of consequences and ascription of responsibility is an antecedent of environmentally friendly behavior. Later, these two theories were integrated in to what is called the Value-Belief-Norm Theory (VBNT) (Stern, 2000). Initially VBNT had a strong support of the contention of NAT theory that personal moral norms are the main basis for an individual's general predispositions to environmental behavior. However, it later claimed that the bases for such behavior are not just morals but biospheic (i.e. focus on the welfare of the environment and biosphere) and egoistic belief along with our ecological worldview (McDonald, 2014; Stern, 2000). The main limitation of these theories is that they highly focus on and claimed that moral reasons and/or personal norms are the main causes of variation in human behavior. In reality, however, human behavior varies not only due to these factors but also but also socio-economic, demographic and environmental factors.

Although these are among the prominent theoretical frameworks and have some validity in certain circumstances, no conclusive explanation has yet been found about the factors that shape PEB. In fact, as Kollmuss and Agyeman (2002) point out, developing a model that tries to incorporate all factors might neither be feasible nor useful. Despite the absence of definitive model to explain the PEB and the factors operating behind it, the most influential behavioral model which has got good support of several empirical works in a range of environmental issues is the Theory of Planned Behavior (TPB) proposed by Icek Ajzen in 1985 through his article "From intention to action".

The Theory of Planned Behavior: The TPB is an extension or a developed version of the theory of reasoned action (TRA) by its inclusion of the influence socio-cultural constraints on behavior which the TRA does not consider. Here the assumption of TPB is that the

predicted environmental behavior is, at least partially, beyond one's control since it is susceptible to a wide range of (socio-cultural) influences (Ajzen, 2005). Thus, in predicting environmental behavior TPB is especially useful because it includes socio-cultural constraints which the TRA does not consider. TPB also asserts that an individual's behavior is shaped by the impact of attitude towards behavior (Ajzen, 2005). This attitude is seen as a closely related variable to factual knowledge or salient information on the argument that the attitude an individual holds towards an issue involves evaluation of a certain outcome and estimation of the likelihood of this outcome both of which entail knowledge or understanding about the issue (Kaiser *et al.*, 1999; Katz, 1960). TPB also assumes that human beings are essentially rational in that they usually behave by considering available information rather than in ways that can be described as capricious (Ajzen, 2005). Gifford & Nilsson (2014) opine that it is unlikely for an individual to knowingly be concerned about the environment or intentionally act in pro-environmental manner if the individual knows nothing about the problem or potential positive actions. So, knowledge provides a cause for people to base on their PEB.

Although the TPB assumes that individual's behavior is shaped by the impact of attitude towards behavior, it recognizes that the influence of knowledge and attitude on specific behavior is mediated (attenuated) by the presence of other more immediate factor: intention towards performing the behavior. The theory postulates that intention to perform a behavior is the most important immediate determinant of that action. Intention is believed to capture the motivational factors that influence a behavior; and it indicates how hard people are willing to try in order to perform the behavior. If individual's intention is high and the person is able to act on it, then the behavior will be demonstrated. So, if the intention to engage in a behavior is stronger, there is high probability for the behavior to be performed (Ajzen, 1991, 2005; Ajzen & Fishbein, 2005).

TPB has been applied in different contexts and has got substantiation from many research works elsewhere (Fielding, McDonald & Louis, 2008; López-Mosquera & Sánchez, 2012; Kitzmuller 2009; Latif *et al.*, 2013; Mutyasira, Hoag, & Pendell, 2018; Obeng *et al.*, 2019). In Ethiopia, however, there are limited research works that used the theory, of which most of

them are in the field of health and education or social psychology. The TPB has hardly been applied by studies on the issues of natural resources, with a mentionable exception of Tesfaye, Roos, & Bohlin, (2012) that investigated local people's collective action to forest management. To the researcher's knowledge, hitherto, virtually no study of wetland issues in Ethiopia has applied the theory. Since the TPB accentuate the mediation /indirect/ effect of intention on PEB, the present study has got good opportunity to assess not only the direct effect of knowledge and attitude on PEB to wetland resources management but also the mediation effects that is attributable to intention.

2.2.2. Theories of Environmental Valuation

It is assumed that resources with a relatively high economic value are more encouraging to resource management (Ostrom, 1990). However, since all resources may not necessarily have market value, as in the case in wetland resources, it could be difficult to identify resources with relatively high economic value. Hence, translating these values into monetary terms- resource valuation, which is grounded in environmental economics, is of primary importance. The fundamental perception of environmental economics is that ecosystem services have economic value despite often not having market value, and so environmentalists question the need to always put a price tag on nature or ecosystems if we are to convince of their importance as life-supporting systems and conserving them for long-term uses (Lambert, 2003). However, this has two problems: how to conceptualize such values theoretically and estimate them empirically (Hanley *et al.*, 2007).

Environmental economists' valuation of non-market goods and services is usually based on the theory of rational choice (TRC): the preference set, utility function and consumer surplus) (Alberini & Kahn, 2006). The basic assumption of this theory is that, an individual has a set of preferences over goods and services; and these preferences can be ordered in logical and consistent manner. The utility function is an ordinal representation of preferences that allow expression of the most preferred consumption bundles by the highest level of utility. Utility is unobservable continuous index of preferences. If a policy is imposed that changes the consumption bundle such that utility increases, then this change is measured as consumer surplus- the money metric of the unobservable utility function. Therefore, there are preferences that are indexed by a utility, and changes in utility are

captured by consumer surplus measures - either willingness to pay (WTP) or willingness to accept (WTA). WTP for a good or service is the amount (of money) to be taken away from an individual enjoying benefit from improvement in environmental quality while keeping his or her utility constant, whereas WTA is the amount (of money) to be given, as compensation, to an individual experiencing deterioration in environmental quality to keep utility constant (Carson *et al.*, 2001; Schuyt, 2005). Estimation of the value of ecosystem services is usually based on the ideas of rationality and consumer sovereignty: an individual always knows what he or she needs (rationality) and is able to make choices that affect his or her welfare (consumer sovereignty). If an individual believes he or she will be better off in some way due to a change in an environmental service, he or she may be willing to pay (money) to secure this improvement. This WTP, therefore, reflects his or her view of economic value for improved environmental services. Whereas, if the individual believes the change makes him or her worse off, he or she might be willing to accept compensation to allow this deterioration. Hence, WTP and WTA estimates represent the two general measures of economic value for an environmental or ecosystem services. Although consumer surplus can be either of the WTP or WTA measures, in a strict sense an individual's WTP is based on the TRC (Hanley *et al.*, 2007).

According to Lambert (2003), WTP is a more reliable and so most preferred and widely used measure of economic value of ecosystem services over WTA. This is because compared to WTP value WTA is subject to inflated value for a given environmental changes. In theory, when WTP is small, WTP and WTA should be approximately equal. However, WTA is typically much larger than WTP for the same commodity. One possible explanation for this is the theory of prospects which states: individuals value losses more heavily than gains, and so need to accept more for environmental deterioration than paying for environmental improvement. As Hanemann (1991) noted, it could also possibly be related to individuals' reaction to their perception of who has the property rights over the commodity in question. If the proposed program or policy contradicts their perception of the existing property rights, individuals might express their rejection of the scenario through high WTA values even when the individual might incur benefits from the proposed program or policy. In view of the above assertions, and given that we asked households to reflect

their view of economic value for improvement of the goods and services of wetlands, in this study WTP is used as a measure to elicit the monetary values of wetland goods and services.

Valuation methods of non-market environmental goods and services are commonly classified into two broad categories: revealed preference (RP) and stated preference (SP) methods. RP methods infer economic value indirectly by observing individuals' behavior in actual markets, rather than their conjectured behavior in hypothetical markets. These methods are sometimes known as indirect methods since the analyst has to infer the value people place on non-market good indirectly from individuals' behavior in actual market somehow related to that good. The two widely used techniques of RP are the hedonic pricing method and the travel cost method. The hedonic pricing method estimates the value of environmental benefits through the prices of related market transactions where the change in the environmental amenity is reflected in the value attached to the amenity, while the travel cost method is mostly used to capture the value of environmental resources in recreational sites, such as national parks and sanctuaries, approximated by the cost that the visitors incurred in order to enjoy the service offered by the resources. However, since all environmental goods and services may not be traded, it is not always possible to ascribe people's measures of values to these resources by their behavior in actual market. In such cases SP approaches which estimate peoples' measures of environmental values in hypothetical market could be used. SP methods use direct approach to elicit people's environmental values, based on hypothetical markets, by asking them directly to state their preferences for a given ecosystem service (Hanley *et al.*, 2007; Freeman *et al.*, 2014).

Although there are concerns on the method of deriving the measures of environmental values from either RP or SP, these seem to have been resolved. Accordingly, if the purpose is to estimate use values RP methods are used, whereas to estimate total economic values (TEV) SP methods are used (Bateman *et al.*, 2002). TEV is the total amount (of money) that individuals would be willing to forego for increased amount of goods and services (Lambert, 2003). According to the type of use the economic values of (wetland) ecosystems can be categorized into distinct components: use and non-use values of the TEV (De Groot *et al.*, 2016). Use values encompass: direct use, indirect use, and option values. Direct use values

also known as extractive, consumptive or structural use values are mainly derived from goods which can be extracted and consumed directly; for example, fish, irrigation, fuelwood, recreation, transport, wildlife harvesting, peat/energy. Indirect use values, which are also known as functional values or non-extractive use values, are mainly derived from the services that wetlands provide. These values maintain and protect natural and human systems; such as, nutrient retention, storm protection, groundwater recharge, flood control, micro-climatic stabilization, shoreline stabilization and external ecosystem support. Option value is the value in which an individual derives benefits ensuring that a resource will be available for future use or the premium placed on maintaining resources for future possible uses such as pharmaceutical applications. Non-use values, on the other hand, are derived from the benefits the environment may provide which do not involve using it in any way, whether directly or indirectly. The most important of such benefit are their intrinsic values, such as, biodiversity, cultural heritage, aesthetic, religious and bequest despite their current or future use possibilities (Emerton, 1998; Lambert, 2003; De Groot *et al.*, 2016).

According to Emerton (1998), when valuing goods and services of wetlands, it is necessary to take account of TEV, both use and non-use values, associated with them, for which SP methods are the appropriate one. In using SP methods the choice is between contingent valuation (CV) and multi-attribute valuation (MAV) methods (Freeman *et al.*, 2014). Although both methods are used to elicit measures of TEV of almost any kind of environmental goods and services irrespective of their being traded or not, each of these methods have their own strength and weakness. CV is a useful method which has been widely used to estimate TEV based on asking people to directly state their WTP or WTA contingent on a specific hypothetical scenario that describe environmental goods and services (Emerton, 1998). CV method has theoretical foundation in welfare economics, viz. the neo-classical concept of economic value which is based on individual utility maximization. It assumes that the amounts of WTP are related to people's underlying preferences in a consistent manner (Hanley *et al.*, 2007). However, in using CV survey, there are various sources of possible biases to the outcome of CV study. The major problem is largely to do with specification of the "scenario". The concern is that the hypothetical situation in CV survey may pose problems since people are not accustomed to pay for non-

market goods and services or may have little incentive to provide valid response on their true WTP or WTA, giving way to hypothetical bias (Teshome & Bogale, 2014). Moreover, people may have preference for one alternative over the other but may not know their maximum WTP for a good. The quality of information given in the scenario is the other concern. If inadequate or improper information is given on the goods and services to be valued, it creates information bias that could affect the quality of the CV study (Adamowicz *et al.*, 1998; Alberini & Kahn, 2006). Strategic biases may also arise, especially in open-ended CV method, when people try to influence their WTP value either by understating or overstating so as to serve their own interest. Moreover, in CV method that involves a bidding game the suggestion of an initial starting point can influence the final bid, leading to a so-called starting point bias (Teshome & Bogale, 2014).

Besides the above limitations CV method is criticized for its inefficiency to estimate resource's value if multiple attributes are involved and if we are interested in the values attached to each and trade-offs between or among them. In response to this problem, valuation practitioners developed MAV techniques which include: (i) preference-based approaches: the contingent ranking which require the individual to rank or contingent rating which require the individual to rate each alternative product (paired comparison methods) and (ii) choice-based or choice experiment (CE) method which make the consumer to choose one among several alternative products. One of the main differences between them is in their modeling. Due to stronger ordering of alternatives the modeling of ranking and rating data differs from choice experiment data. Models used for ranking and rating data include ordered logit and ordered probit. Regarding their applicability, however, there are potential practical obstacles in the use of ranking and especially rating techniques. Above all concerns is individuals might face difficulty in ranking or rating all the alternatives; and particularly the rating tasks involve difficulty in making interpersonal comparisons that consumers usually face in the real world (Bennett & Blamey, 2001). The other difference between preference- and choice-based approaches is the form of the utility function. Preference-based approaches, labeled as conjoint analysis, use a deterministic utility function, whereas choice-based approaches, labeled as choice modeling, use the random

utility function which composes both the deterministic and the stochastic components (Bateman *et al.*, 2002).

CE methods is more preferred to conjoint analysis as it is based on a more realistic task that people perform on everyday life, the task of choosing a good, and thus a better method to capture actual decision processes. Moreover, having their origin in the economics discipline choice-based approaches have been widely used for valuing wide range of goods and services, whereas preference-based approaches originate in the marketing discipline and are mainly focused on gaining insights into preferences of consumers rather than estimating economic values. CE method also gives welfare consistent estimates in that; having the freedom to choose the status quo, households are required to trade-off changes in attribute levels against the cost of making these changes. Moreover, the econometric technique can be represented in a way which is parallel to the TRC (Louviere, 1988; Hanley *et al.*, 2007).

Choice Experiment Method- the State of the art in resource valuation

The CE method, which is a subset of SP methods, is a versatile and useful choice-based method which can be applied to economic valuation of almost any kinds of environmental goods and services irrespective of being marketed or not. It is more efficient and appropriate value estimation and preferences modeling method for multi-attribute goods and environmental resources such as wetlands (Merino-Castello, 2003; Dahmardeh & Shahraki, 2014). The method provides a wide data as it involves a broader attribute based perspective. Hence, it allows estimation of not only the value of the resource (herein wetlands) as a whole, but also of the implicit value of each attribute separately and compare the relative significance of each attribute. It works on a series of simulated or hypothetical scenarios with combinations of levels of various attributes of the resource, including the price which varies systematically among the scenarios. Accordingly the households are presented with a series of alternative scenarios (assembled in choice sets that consist of the status quo and other proposed improvement scenarios); and are required to tradeoffs over several attributes and choose their most preferred alternative (with the highest expected utility) (Adamowicz *et al.*, 1998; Merino-Castello, 2003; Birol *et al.*, 2006).

CE method is based on probabilistic choice theory named random utility theory (RUT) and utility maximization (Adamowicz *et al.*, 1998). RUT is basically consistent with Lancaster's characteristics theory of value that states consumers' utilities for goods are assumed to rank collections of goods indirectly through the characteristics/attributes/ that the goods possess. This implies that it is not from the good (herein wetlands) themselves that consumers derive satisfaction rather from the characteristics they possess (Lancaster, 1966). If there is a change in one of the characteristics of the good, it may result in a discrete shift in choice from one good to another and will affect the probability of choosing that good on the margin (Yimenu & Rao, 2015). Hence, RUT assumes that utilities depend on choices made; and the choices of an individual are based on attributes of the alternatives.

The RUT leads to families of discrete choice models (DCMs) that describe the nature of individual choice probabilities in response to changes in the characteristics or attributes that measure differences across individuals (Merino-Castello, 2003). Hence, it provides the basis for integrating choice behavior with economic valuation in CE method (Birol *et al.*, 2006). However, individuals' choices cannot be perfectly predicted because there are some uncertainties surrounding the choices. Hence, instead of identifying one alternative as the chosen option, each alternative is assigned with a probability to be chosen (Kjaer, 2005). RUT states that although an individual's utility from the choice made is not directly observable; an indirect determination of preference is possible (McFadden, 1974). Hence, for any sampled individual i (i=1…I) the indirect utility/benefit/ (U_{ij}) derived from any alternative j (j =1… J) (herein wetland management alternative) from a choice set C_i is a function of the attributes of the (wetland management) scenario (Z_j) and the socio-economic characteristics of the individual (S_i):

$$U_{ij=}\ V(Z_j, S_i) + e \qquad (2.1)$$

The indirect utility (U_{ij}) is the sum of deterministic/systematic component (V) of utility that can be estimated by the researcher and a stochastic/random aspect (e) of utility which is independent of the deterministic part and it follows a predetermined distribution. The models that can be derived in such a way are called random utility models (RUMs). The models become "random" since not all attributes that affect utility can be observed by the

researcher. The stochastic (*e*) portion, which is unknown to the researcher implies that predictions cannot be made with certainty, and so captures the difference between U_{ij} which is the true utility and *V* refers to the observed or representative utility, which is part of utility that the researcher captures (Kjaer, 2005; Train, 2009).

In view of the above theoretical explanation, in the present study it was presupposed that people value or derive satisfaction not from the wetlands themselves rather from the attributes that the wetlands possess. The wetland attributes that were selected for this research purpose are biodiversity, water and recreation (detail description of the selection of these attributes is give in section 3.5.2.1.). The attributes of the wetlands have different levels (*see* Table 3.4) and so the alternatives include different combinations of the levels of the attributes. Sets of alternatives are assembled in choice sets from which individuals choose their preferred alternative, with the highest expected utility. Since individuals' differences in selecting the alternatives are expected, a few number of hypothesized demographic, socio-economic and physical factors were captured in the CE analysis in predicting households' preference for wetland management alternatives (*see* section 3.5.2.3 and Table 3.5).

2.2.3. Theoretical Insight on Property Rights and Management of Environmental Resources

Despite extensive literatures theorizing the distribution of property rights and management of wide range of environmental resources, there have been common property resources (CPRs) versus open access resources (OARs) debates on the characterization of the access, use, ownership and management of resources. According to Ostrom *et al.* (1999), OARs refers to resources with the absence of well-defined property rights, where access to the resource is open to everyone, whereas CPRs are held by identifiable community with interdependent users who regulate use by members of the local community while excluding outsiders. Swallow (1999) usefully summarized the differences of the two in that, in the case of CPRs regime: (i) resources are accessed and controlled by a group of users recognized as owners; (ii) group members have secure expectations that they can gain access to future use of the resource; (iii) there are functioning membership criteria; (iv) there are communally-defined guidelines for resource use; and (v) there is an enforcement mechanism for

punishing deviant behavior. While in contrast, in OARs regime: (i) there are no social authorities that define and enforce the rights of individuals or groups to use of the resource and (ii) each resource user ignores the consequences of his behavior on others. For Baland and Platteau (2000) a resource is open access, when a “right of inclusion” is granted to anyone who wants to use the resource, whereas in common property although there is difficulty of exclusion of beneficiaries via physical and institutional means, the “right of inclusion” is assigned to a well-defined user group. In view of this, though there could be wetlands that satisfy the features of CPRs, it is difficult to connote CPRs for wetlands of all situations unless site specific study uncovers the property regime of a particular wetland.

For a long time, extensive literatures was built on common property theories the most important being the “tragedy of the commons” by Garrett Hardin (1968), the “the prisoners’ dilemma” and “logic of collective action” by Mancur Olson; all having a central thesis of the ‘free-riders’ problem which states that as long as individuals cannot be excluded from the benefits that others provide, each person is motivated not to contribute to the joint use and management efforts, but to free-ride on the efforts of others, so the collective benefit will not be produced (Wade, 1987; Ostrom, 1990). Influenced by these theories mainly by Hardin’s “tragedy of the commons” paradigm, for many years in the past literature on resource ownership, use and management has been summarized by the maxim "everybody's property is nobody's property"; meaning when a given natural resource is physically and legally accessible to more than one resource user, the result is said to be a ‘free-for-all’, where users competing each another for a better share of the resource at the expense of the resource as well as to the detriment of themselves and society as a whole (Ciriacy-Wantrup & Bishop, 1975). At different time this idea has been applied for range of resources, such as fisheries, forests, pastures or grazing lands and wildlife, and that the common property condition is largely thought to lead inevitably to resource depletion in a “tragedy of the commons” scenario. However, Hardin’s model as well as explanations by his advocates has been increasingly challenged by different writers. Ciriacy-Wantrup and Bishop (1975) and Wade (1987) among others, emphasized that such proposition is just naïve and a flaw as it failed to distinguish between open access and common property modalities. Ciriacy-Wantrup and Bishop (1975) clearly stated the difference between *open access* property regimes, where no

one has the legal right to exclude anyone from using a resource, and *common property*, where the members of a clearly identified group have the legal right to exclude those who are nonmembers from using a resource. They further assert that, 'Common property' is not 'everybody's property'; rather it refers to the distribution of property rights in resources in which a number of owners are coequal in their rights to use the resource. Hence, the "tragedy of the commons" as a general theory to explain the situation of CPRs is criticized for its neglect of the existence of some form of communal use, ownership and management of resources; and for its neglect of the existence of different rules that constrain individuals' interest (Berkes *et al.,* 1989).

The fundamental logical flaw that occurs in the Hardin's argument of "the tragedy of the commons" has given way for the development of collective action approach which elaborated on the potential of collective/community-based/ management of natural resource and the importance of institutions and their role in resource management. This approach is different from "open access" situations in that the rules or institutions regulate the ways in which individuals gain access to and use of resources (Ostrom *et al.,* 1999). Critics therefore argue that the "tragedy of the commons" results from institutional failure to control access to resources and enforce decisions to collective use and management which is very common to OARs than CPRs; and so the resource degradation more accurately refers to a *tragedy of open access* than to a tragedy of common property regimes (Bromley & Cernea, 1989). In fact, institutional failure could also happen to CPRs due to either external reasons such as, exploitation by outsiders or internal reasons: the inability of local resource users to manage resources by themselves. Particularly, if formal institutions including the central authority pay little or no attention, it is difficult for local resource users to establish enforceable rules in common management; which could in turn lead to overuse of resources and discourage users to invest in resource conservation and management (Berkes & Folke, 1998). Hence, the presence of active and strong institutional arrangements increases the likelihood of success in management and sustainability of resources. This is because in the absence of rules which limit access and define rights and duties of resource users, overuse of resources may result that negatively impact on improvement and maintenance of the resources. In this regard, Khan (2011) asserted that, institutional arrangements are central in natural resource

management (NRM) as they provide appropriate process and structures that shape and define the relationship of stakeholders to resources and stakeholders' participation in decision-making process, which have bearing in wise use and management of commonly used resources such as wetlands. Involving local institutions in particular enhance the efficiency of management in commons as they have the potential in mobilization for collective action.

In response to this concern, institutional analysis and development (IAD) framework has been forwarded and widely used in diverse issues such as, management of forests, fisheries, wetlands and local irrigation to understand the roles of institutions in influencing outcomes in the context of collective action (Dorward & Omamo, 2009). IAD is a multi-tier conceptual map that has a conceptual unit called an 'action arena', which in the present study's context is wetland management, through which the human-environment interaction is conceptualized. The action arena consists of two major components: the actors and the action situation. Actors are the participants or group of stakeholders in an action arena who hold specific positions, perform different activities and make decisions on various actions. The action situation is a social space where the various stakeholders with diverse preference engage in different activities; operate and interact. In the framework, the structure of the action situation and the interaction of the stakeholders in the action arena are governed and affected by exogenous variables, among others are the rules-in-use. These rules order or govern the stakeholders' action; thereby produce environmental outcomes (sustainability or unsustainability of resources) that in turn feedback to modify the rules-in-use, the stakeholders and their action situation (Ostrom, 2005, 2010; Dorward & Omamo, 2009).

2.3. Empirical Literature

2.3.1. Environmental Behavior and Resource Management

For long in mankind's history impact on the environment has to a great extent been a consequence of human wants for physical solace, versatility, help from work, satisfaction, power, status, individual security, upkeep of custom and family, etc, and of the associations and innovations humankind has made to meet these wants (Stern, 2000). Human's impact on the surrounding environment became more and more noticeable as the population

expanded and as new capacity and skill to manipulate natural processes increased (Tedla & Lemma, 1998). The prevailing population growth and economic development and the resultant exorbitant rate of resource consumption have greatly affected the healthy and sustainable functioning of the natural environment (Davidson, 2014; Chaikumbung *et al.*, 2016; Nhamo *et al.*, 2017). The impossibility of separating human activities from the natural resources makes resource management an important strategy in achieving a sustainable balance between socio-economic development and environmental conservation (Cobbinah, 2015).

Review of different earlier and contemporary scholarly works have shown that individual's resource management behavior is related to his or her knowledge about the resource, in question, the attitude and behavioral intention to management of the resources, providing good support of TPB. However, empirical works show inconsistent result on the degree of association among these variable some studies finding weak relation and others finding no relation. Owing to the dearth of empirical works most studies discussed herein may not be directly linked to the resources under consideration in this study, that is wetlands, yet they remain important for their finding consider analysis of the relationship of these variables in the study of different environmental resources/issues. In their analysis of environmental behavior most of the research works considered environmental knowledge and attitude. However, it seems that they gave less emphasis to examine the role of intention in determining participatory behavior.

Knowledge is regarded as a necessary but not sufficient condition for useful decision-making, however correct knowledge has been shown to predict behavior (Levine & Strube, 2012). In their meta-analysis of 315 studies on environmental behavior, Hines *et al.* (1997) found out that PEB is most strongly influence by, among other factors, knowledge about environment (and the right action to solve environmental problem) and attitude towards it. Those individuals with greater knowledge of environmental issues and/or knowledge of how to take action on those issues are more likely to have reported engagement in responsible environmental behavior. Hines *et al.* further stated that, for an individual to act on a particular environmental issue, that individual must be cognizant of the existence of the

issue and also possess knowledge of the courses of action. Knowledge is a necessary predictor of behavior, and so making an informed pro-environmental choice is difficult if one has incorrect or lacks knowledge about it (Gifford & Nilsson, 2014). Hence, local knowledge about environment or a given resource is a drive for a community to participate in environmental management. In line with this Durant *et al.* (1989) noted that, the more people know about their environment, the more they will be interested in, concerned about and engage in conservation and management.

The study result of Kasier, *et al.* (1999) on environmental attitude and ecological behavior (focusing on pollution control) of two Swiss transportation associations indicate a significant positive correlation between environmental knowledge and environmental behavior intention as well as between environmental intention and PEB. They used factor analysis and structural equation model to confirm that environmental knowledge is precondition for environmental behavior intentions, explaining 40% of the variance, which in turn predict 75% of the variance of PEB. Thus, they strongly argue that people need to have a basic environmental knowledge in order to act in a pro-environmental way. Their study substantiated the predictive validity of behavioral intentions which account for a great proportion of variances in actual behavior. It therefore supports the TPB that posited the mediation/indirect/ effect of intention (Ajzen, 2005).

Suwarto (2013) in a study of the effect of environmental knowledge on PEB in peasant community in Surakarta, came to a similar conclusion. Using quantitative approach and path analysis moderation model the study found that environmental knowledge significantly affect attitude as well as PEB, and conclude that those individuals with greater knowledge of environmental issues and/or knowledge of how to take action on those issues were more likely to have positive attitude and so engaging in responsible environmental behaviors than were those who did not possess this knowledge. Latif, *et al.* (2013) studied the role of environmental knowledge in creating Pro-environmental residents in Malaysia. From their structural model analysis they found out a significant direct effect of environmental knowledge on PEB. However, with the introduction of environmental value in the model, as the mediator linking the relationship between environmental knowledge and PEB, the effect

of environmental knowledge on PEB in no longer significant. This shows that environmental value is a full mediator for environmental knowledge and pro-environmental behavior. It means that environmental value intervene the relationship between environmental knowledge and PEB.

Conversely, other studies which investigate the relationship between environmental knowledge and PEB have found different results. For example, Bantider *et al.* (2013) conducted a qualitative study on the environmental knowledge and behavior of rural youths in southern Ethiopia and have found that although youth have knowledge about environment; their behavior did not reflect their good knowledge of the environment. This could be because; as they point out in their study, national and global environmental knowledge did not seem to be grounded in the youths' knowledge system, which might have been due to the absence of proper environmental education at school. Kollmuss and Agyeman (2002) also argued that there is no apparent correlation between knowledge and PEB and further explained that "The longer the education the more extensive is the knowledge about environmental issues. Yet more education does not necessarily mean increased PEB." (p:248). However, according to Kasier *et al.* (1999) it is not surprising that different studies found either weak or no relations between environmental knowledge and environmental behavior. This is because, given that factual environmental knowledge is a precondition of one's environmental attitude, this knowledge should not be strongly related with ecological behavior since its influence is mediated both by environmental attitude and participation intention. Moreover, as Kollmuss and Agyeman (2002) assert it might be fruitful to distinguish between different levels of knowledge. In view of this, Jensen (2002) noted that the fact that knowledge *per se* does not lead to behavioral change is due to many factors among others are (i) traditional knowledge about the environment as it is taught in school is not in practically action oriented; (ii) environmental education at school has traditionally focused on passing on knowledge to people, who have not been given the possibility of actively taking and internalizing that knowledge.

With regard to attitude-behavior linkage research findings indicate strong relationship. Bagherian *et al.* (2011) use factor analysis and Pearson's product moment correlation in their

study of analysis of relationship between attitude toward watershed management programs and level of participation in the programs in Iran. The study revealed that attitudes correlate well with behavior. They found out a significant positive relationship between the level of participation and attitude toward the water management programs. Hines *et al.* (1997) in their meta-analysis of studies (done in different areas), and found that those individuals with more positive attitudes were more likely to have reported engaging in responsible environmental behavior. In their further examination of the data to determine the nature of attitudes they found that there were essentially two types of attitude studied: attitude towards the natural environment itself or some aspect of it and attitude towards taking environmental action (for example, attitude towards conservation, management, recycling). Accordingly, they detected a slightly stronger relation between attitude towards environmental action and environmental behavior (meta-analysis of forty-two studies) than was observed between attitude towards the environment in general and environmental behavior (analysis of nine studies). In their analysis however, they also revealed that the mode of behavior assessment attenuated the attitude-behavior relationship; higher attitude-behavior correlations were obtained in conditions where actual behaviors were assessed than were obtained in conditions where behavior were determined via self-reported means.

In general, although most empirical literature provides good supports for many of the individual hypothesized relationships among the variables in the TPB theory, there are also study findings that counter some of the hypotheses. This, therefore, suggest the need for site and resource specific analysis of PEB and the factors that shape it.

2.3.2. Valuation of Wetland Resources

As natural and economic resources, wetland ecosystems have high local and global values ranging from basic life-supporting tangible uses and direct benefits to intangible ecosystem services (MEA, 2005b; Gebresllassie *et al.*, 2014) (Table 2.1). They are among of the key productive ecosystems that support community livelihood in most areas of the world particularly in developing countries. In human history they had significant roles in many great civilizations of the ancient times, for instance, the Maya, Inca and Aztec in Latin America, the Khmer in Asia, the Marsh Arabs of Tigris and Euphrates Rivers in Mesopotamia including the Nile and Niger in Africa (McCartney, Rebelo, *et al.*, 2010;

IWMI, 2014). Moreover, they are sources of substantial biodiversity and support numerous plants (hydrophytes) and animal species for all of the major groups of organisms. Wetlands are also instrumental in providing a wide set of hydrological functions and uses such as, water storage, storm protection and flood mitigation, shoreline stabilization and erosion control, groundwater recharge and discharge, continued stream and river flow, water purification through retention of nutrients, sediments and pollutants and stabilization of local climate conditions particularly rainfall and temperature and water supply for people, livestock and wildlife (Fisseha, 2003; Heide, 2012).

Moreover, through the various functions and uses wetlands strongly support local and national economies (Fisseha, 2003). In developing countries in particular wetlands are increasingly recognized as important resources as they produce a number of products that are beneficial to local communities in particular and national economy at large (Dixon & Wood, 2007). In rural communities of developing countries (of Africa and South East Asia) the poor heavily depend on wetlands and floodplain resources for their livelihood and daily sustenance (Tekalegn, 2009; Khan, 2011). The case of Niger and Nile deltas' agriculture could best exemplify the values of wetlands in the life of local communities. In Mali, approximately 1 million people live within the Inner Niger Delta with livelihoods largely supported by fishing, livestock breeding and cultivation. Specifically, the livelihoods of approximately 300,000 people are dependent on the fisheries of the Inner Niger Delta (a floodplain wetland) which also supports around 2 million cattle and 3 million sheep; some of the highest livestock densities in Africa (McCartney, Rebelo, *et al.*, 2010). The role of wetlands to national economy is also paramount. In Zambia, for example, wetlands are estimated to contribute around 5% of the gross domestic product (GDP) (Wood *et al.*, 2013). In the Nile Basin also wetlands provide huge benefits. For example, around 63% of Egypt's people live in the boundaries of Nile delta which produce about two third of national output (NBI, 2013). Globally, the economic value of wetlands' ecosystem services has been estimated at US$14 trillion annually (MEA, 2005c).

Table 2.1 Ecosystem services provided by wetlands

Provisioning Services	
Food	Production of fish, invertebrates, fruits, grains and algae
Fresh water	Storage and retention of water for domestic, industrial and agricultural/irrigation uses
Fibers, fuel and other raw materials	Production of timber or logs, fuelwood, peat, fodder
Biochemical products and medicinal resources	Extraction of medicines and other materials from biota
Genetic Materials	Genes used for resistance to plant pathogens,
Ornamental species	e.g., aquarium fish and plants
Regulating Services	
Water regulation (Hydrological flows)	Ground water recharge/discharge
Purification of water and treatment of waste	Water retention, recovery and removal of excess nutrients and pollutants
Pollution control, detoxification	Retention, removal of excess nutrients or pollutants
Erosion control	Retention of soils and sediments and prevent landslide
Flood regulation	Store, retain and regulate the flow of water to prevent flooding
(Micro) climate regulation	Sink for greenhouse gases; influence local and regional temperature, precipitation and other climatic processes
Biological Regulation	e.g., control of pest species and pollination, habitat for pollinators
Cultural Services	
Spiritual and inspirational	Religious attachement, spiritual and religious values to different aspects of wetland ecosystems
Recreational	Opportunities for recreational activities
Aesthetic	Many people find beauty or aesthetic value in aspects of wetlands
Educational	Provision of formal and informal education opportunities and training
Supportive Services	
Biodiversity & nursery:	Habitats for resident or transient species; provide breeding, feeding or resting habitat to resident or migratory specie
Soil formation	Retention of sediment and accumulation of organic matter
Nutrient cycling	Nutrients storage, recycling, processing and acquisition

Source: MEA (2005); De Groot *et al.* (2006)

Like elsewhere, wetlands in Ethiopia provide a number of ecosystem services. Some of the important uses of Ethiopian wetlands are those which are derived from the large variety of habitats. For example, out of a total of 73 important bird areas identified in the country about 30 (41%) are wetlands, which support a variety of endemics as well as worldwide

endangered bird species such as the White Winged Flufftail. Best cases are the Rift Valley Lakes and associated wetlands of Ethiopia which support thousands of birds and serve as stop-over sites for migratory bird species including those worldwide endangered ones, which add their value in economic term, in attracting tourists. The area also supports diverse phytoplankton, zooplankton, macro-invertebrates, amphibians, reptiles, fish, mammals, and terrestrial macrophytes (Abunie, 2003; Wondafrash, 2003; Hailu, 2007). Lake Abijata, for example, was previously named as the Ethiopian Lake Nakuru and "the paradise of Bird watchers" which gave a spectacular scene for one to watch huge number of flamingos and various species of other water birds (Ewnetu et al., 2013). However, nowadays these ecosystems meagerly support the once rich bird and fish life because the human influences are significantly disrupting and irreversibly changing the major ecological systems that severely degraded the productivity of the lake and associated wetland habitats (Gebeyehu et al., 2015). Lake Tana, Ethiopia's largest fresh water lake and associated floodplains also support huge biodiversity and are listed in the top 250 lake regions of global importance for biodiversity (McCartney, Alemayehu, Shiferaw & Awulachew, 2010). Economically, most of the wetlands of Ethiopia are used for crop cultivation, fish harvesting, forest resource extraction and dry season grazing (Gebresllassie et al., 2014). For example, the Fogera flood plain in the eastern shore of Lake Tana support extensive rice cultivation, huge livestock populations and is also home of unique cattle breed locally known as Fogera cattle breed (Molla et al., 2011).

Despite all such ecological and socio-economic values, partly because of lack of facts and figures that explain the economic value of wetland ecosystems and the resultant low priority in the decision-making process, management and wise use of many wetland ecosystems is not promising (De Groot *et al.*, 2006). In fact, wetland ecosystem are particularly difficult to value due to the wide, variable and often unclear ecological, economic and management boundaries of wetlands, and because many wetlands goods and services are not fully captured in the market-market failure (as they are never bought or sold) (Emerton, 1998; De Groot *et al.*, 2006). Because of unclear ownership of wetlands resulting from absence of clear natural boundaries of these ecosystems, their values are not immediately apparent for decision-makers. Hence, wetland values are often not taken into

account fully or properly in decision-making, or are only partially valued, leading to degradation or total destruction of these ecosystems (De Groot *et al.*, 2006). To justify public spending on conservation and management activities of wetlands, environmentalists, therefore, emphasis the need to put a price tag on different natural resources, including wetlands. Thus, at different time many wetland valuation studies have been done in different parts of the world. They used different research methods, and so varied result. Oduor, Raburu and Mwakubo (2015) analyze the economic value of Nyando wetlands of Kenya. In their study they used a market price method (to value marketable wetland goods with direct good values) and CV method (to value wetland services for which people have some knowledge about and estimate their WTP in hypothetical market) through Trust Fund as the payment vehicle and iterative bidding game as an elicitation mechanism for WTP. The result for their study revealed that the wetlands yield a flow of economic benefits of consumptive goods and services estimated about US$15 Billion with an infinite present value of US$75.5 Billion at 2% discount rate. They conclude that the conversion of the wetlands would imply high economic costs to the government and local communities and so suggested to reduce the pressure of educational campaigns on the importance of wetlands to be carried out.

In their study of valuing the provisioning services of wetlands: contrasting rural wetland in Lesotho with a per-urban wetlands in South Africa, Lannas and Turpie (2009) estimate the gross incomes from agriculture and natural resources, the level of dependence on the wetlands in terms of the percentage of overall household incomes derived from them, and the overall annual value of the wetlands aggregated from the income that the households derive from the wetlands. They found out that households around peri-urban wetland derived more of their income (82%) from wetlands than those in rural wetlands (6%) indicating more specialized livelihood strategies in per-urban areas. They also estimated an annual income of U.S. $220/ha and U.S.$1765/ha annually derived from wetland provisioning services in rural and per-urban wetlands respectively. Based on their findings they concluded that the loss of the wetlands would potentially affect the economy of many people. Kong *et al.* (2014) examine determinants of farmers' WTP and their payment level for ecological compensation of Poyang Lake wetland in China. They employed CV method

and the Heckman's two-step model and found out that 46.58% of farmers are willing to pay for ecological compensation, with an average price of $64.39/ household per year. In their analysis they found household income, residential location, emphasis on improvement of wetland resources, arable land area, and contracted water area as significant predictors of farmers' WTP, whereas household income, residential location, arable land area, and contracted water area are significant predictors of their payment levels.

The study by Berhanu (2012) measures the TEV of Choke mountain range wetland ecosystem to the welfare of the society. The study applied CE valuation method using four identified attributes i.e. biodiversity, water availability, recreational facilities and the monetary payment attribute. Data collected was collected from a sample of 250 respondents (farmers); and for data analysis multinomial and random parameter logit models were used. All the attributes were significant and positive in affecting the probability of choosing an alternative scenario except negative effect of biodiversity. The conclusion drawn by the research for the negative effect of biodiversity is that perhaps because of farmers' expectations about the negative effects of future policy change on their current consumption of the mountain resources and perhaps limited awareness about the use and non-use values derived from biodiversity. The study also found that the marginal WTP for availability of water was the highest (Birr[20] 155 annually) which was followed by availability of recreational facilities (Birr 36 per year). Moreover, the estimated compensating surpluses for high, medium and low impact improvement scenarios were Birr 444, 490 and 143 respectively. With these the study concluded that the wetland ecosystem of the area is indispensable and so the government needs to take measure for improvement of the ecosystem. Although this particular study and others revealed the enormous values of wetlands, the degradation and loss of wetlands is still prevalent in different parts of the country including the CRV suggesting that the required conservation measures are not appropriately in place.

[20] Ethiopian unit of currency

2.3.3. Stakeholders' Arena in Wetland Resources Management

In the past three decades global recognition for the ecosystem services and values of wetlands has developed whereby their conservation has been emphasized (Babu & Teferi, 2015; Ramsar Convention on Wetlands, 2018). As a means to call worldwide attention for protection of wetlands, management and sustainable use of wetlands gained impetus through an intergovernmental treaty- the Ramsar Convention. The convention provides framework for international cooperation and national action for conservation and wise use of wetlands (Ramsar Convention Secretariat, 2010b; Brooks *et al.*, 2011). Following this many countries took measures towards protection and management of wetlands; including formulation of national wetland policy and legal frameworks (Turner *et al.*, 2000). Despite this, degradation and loss of wetlands has persisted in many parts of the world, thereby wetlands continued to face pressing challenges of sustainability (Chaikumbung *et al.*, 2016; Marambanyika & Beckedahl, 2016).

The degradation and loss of wetlands seems to partly attribute to governance of wetlands. Various studies (Adger & Luttrell, 2000; Schuyt, 2005; Gebre *et al.*, 2008; IWMI, 2014; Villamor *et al.*, 2014) have shown that wetland governance involves numerous stakeholders including local users, conservation groups, businesses, regional and national governmental organizations (GOs) and nongovernmental organizations (NGOs). Most often these stakeholders lay competing claims and have varied interests, views and objectives on the management of wetlands. In many contexts due to user externalities imposed on other stakeholders and the overlapping and opposing interests at local level as well as between local and national interests, potential for conflict over natural resource is high, which impede management and wise use of the resources (Adger & Luttrell, 2000; Gebre *et al.*, 2008). Nowhere is this more evident than in the case of wetland resources where the management of these resources deal with diverse interests of multiple stakeholders, and so wetland owners or communities and decision-makers usually face challenges when deciding on how to use and manage the resources. According to Whitten and Bennett (1999) the benefits and costs of alternative wetland management measures are not restricted to individual wetland owners and managers; they may spill over to other members of the community. Hence, decisions made by private owners and managers change the benefits and costs of wetlands to

society as a whole which could lead to a conflict of interest. Possibly conflict may arise at the farm management level between the desire for monetary and non-monetary benefits from wetlands and the costs of various options for wetland management. At community level, the potential conflict is between net benefits to the community and private benefit; the conflict increasing with increase in wetland scarcity. So, failure to consider their interest and view could lead to unregulated and unwise use of wetlands impeding their sustainability. Herein, Grimble *et al.* (1995) noted that many resource management efforts often fail because they failed to recognize and pay attention to stakeholders involved and their interest and influence.

In response to this conflict of interest, which has increased with increasing wetland scarcity, in recent years, there has been scholarly and applied interest in "stakeholders' participation" in management of wetland resource. The key concept of this approach is to involve resource users effectively in management and decision-making processes. Because stakeholders share risk and responsibility in wetland resources management, the participation of all relevant stakeholders in decision-making have greater significance as it leads to desirable outcomes (Khan, 2011). Stakeholders' participation is also often seen as a key in mediating conflicts and relationships between government agencies, civil societies and the private sector (Ostrom, 1990). The research conducted by Gebre *et al.* (2008) on 'stakeholder analysis of the Chara Chara Weir, Lake Tana" has highlighted the divergence in values, needs and interests of individuals and different stakeholder groups. It has shown that the construction of the weir gave little or no consideration to those who have been adversely affected by the weir. Thus, management planning requires a dialogue between all involved stakeholders in wetland the community. Through such process diverse groups of people, and individuals with different interests, values and perspectives come together for a shared vision (Federal Environmental Protection Authority, 2007).

Moreover absence of strong and dedicated institution for management of ecosystems or environmental resources could lead to loss of the assets of the ecosystem (Nune *et al.*, 2016), such as wetlands. A large body of literature, particularly in developing countries, (Dixon & wood, 2007; Mahonge, 2010; McCartney, Rebelo, *et al.*, 2010; Durigon *et al.*,

2012; Were *et al.*, 2013; IWMI, 2014; Marambanyika & Beckedahl, 2016; Menbere & Menbere, 2018) revealed that wetland policies and legal frameworks are unable to abate degradation and loss of wetlands, especially where other policies and local governments tend to promote and reinforce drainage and conversion of wetlands to other land uses, mainly for agriculture, to expedite economic development. Khan (2011), in his research-Participatory wetland resource governance in Bangladesh, found that the involvement of diverse institutions without having any coordination among them often creates complexities and conflicts in the management system. This is because, national level institutions (ministries, departments and directorates) frame policy objectives within their highly structured 'allocation of business'[21], having nominal or no communication and/or feedback from the implementing agencies working at the field level. Local level institutions maintain routine communications with higher levels as part of their official obligation while policy development processes do not consider local level needs and demands to establish effective linkages among stakeholders to address critical issues at the field level.

Some countries have policies for wetland management; however they are often influenced by the policies of several different sectors. Agricultural policies in particular have been a key driver of changes to wetlands (IWMI, 2014). Accordingly, in different parts of the world policies which promote clearing and draining of wetlands for agricultural expansion have been key drivers of unsustainable wetland use leading to degradation and loss (McCartney, Rebelo, *et al.*, 2010). In China, for example, after the Communist Revolution (1946–1950), to drive economic growth and enhance food security, government policies led to an increase in agricultural production. In Heilongjiang province, this resulted in the decline of the Sanjiang wetland from 5.36 to 1.04 Million hectare by 2000 (IWMI, 2014). Likewise, due to poor policy support and management practices, rapid population growth and urbanization wetlands of Nile Basin are under great pressure and rapid degradation (Dixon & Wood, 2007; NBI, 2013). For example, in West and Southwest of Uganda many wetlands have been converted into agriculture and livestock farms stimulated by government policy of the 1950s and 1960s as a means to deal with the high population pressure in surrounding steep hills (Bakema & Mafabi, 2003). Hence, to ensure sound management and wise use of

[21] The allocation of Business- the very specific job distributions among government agencies

wetlands and enhance their capability as environmental, economic and social resources, a sound policy framework is vital and is highly recognized among many conservationists. In this regard, the Ramsar Convention Secretariat (2010) has placed an emphasis on the national wetland policy for management and wise use of wetlands, along with the technical tools that can be used to support the implementation of policies and management actions. In justifying the need for a national wetland policy the convention noted that, "A unique wetland policy provides a clear opportunity to recognize wetlands as ecosystems requiring different approaches to their management and conservation, and not being masked under other sectorial management objectives" (Ramsar Convention Secretariat, 2010b:17). The convention emphasized that since wetland ecosystems have unique character, they require different approaches and a unique policy to their management and conservation.

In Ethiopia, despite the lack of wetland policy, the need for a policy is contentious. The question that was raised by Amsalu and Addisu (2014:4) seems critical to be investigated: "are our wetlands degrading because of policy gaps or due to our negligence and ignorance? or the lack of legal frameworks on wetland tenure?" Policies and legal frameworks in different sectors (such as, water, land, forest, fishing and agriculture) may have some provisions on wetlands, yet the question is to what extent do these provisions are adequate to guide the management of wetland resources? And how much they are congruent? According to Mesfin (2003), at the macro-level wetland concerns are adequately represented in existing sectorial policies and strategies of the nation; what is left and in fact the difficulty is translating the federal level policies into locally relevant regulations on wetlands exploitation and management. On the other hand, Amsalu and Addisu (2014) contend that for wetlands in Ethiopia to get attention and serve their intended purposes their management needs to be supported by a standalone National Wetland Policy. In view of these controversial findings it is good to capture the stakeholders' perspectives on the capacity and functionality of existing institutional arrangement in guiding wetland management.

2.4. Conceptual Framework

A study build conceptual framework which serves as an abridgment of the theoretical and empirical literature reviewed on the key components/themes/ of the study, thereby integrates

the themes to guide the study (Zeleke, 2015). Accordingly, the conceptualization of the core components of this dissertation is underpinned by the foregoing concepts and theoretical frameworks. The study predominantly employed the perspectives and tenets of the theory of planned behavior (TPB), the theory of rational choice (TRC) and institutional analysis and development (IAD) framework. It was also substantiated with empirical evidences of scholarly works in order to holistically capture the study objectives. The conceptual framework attempted to capture the possible connection of management of wetlands to the households' PEB and KAI, the values households ascribe to these resources, the stakeholders' action and involvement; as well as the interplay among these components (*see* Figure 2.1). Although multiple factors might be considered in the theories or frameworks as well as different empirical works, this study limits itself to those discussed hereunder.

In the task of dealing with wetland resources management, understanding local communities' behavior is fundamental since the management activity at local scale necessitate their engagement. Equally important is to understand the factors that shape this behavior. This study contends that different factors operate in shaping the PEB of individuals because it is claimed that PEB is complex in its nature as well as in many of its causal factors (Blankenberg & Alhusen, 2019). To capture the factors that determine PEB the study adapted the TPB. However, it did not entirely confine within the TPB framework. This is because as Gifford and Nilsson (2014) noted it is difficult to fully account, in this model, for variation in PEB; and so they recommend extension of the model to include other factors that are not considered in the theory. Ajzen (2005) also affirmed that for better understanding of the determinants of a behavior TPB can be complemented by identifying relevant background factors in the behavior domain of interest.

Accordingly, household's behavior to management of wetland resources was presumed to be linked with the household's knowledge about wetland resources and their ecosystem services as well as attitude and participation intention to management of these resources, which Blankenberg and Alhusen (2019) refer them as 'psychological factors'. The premise was that people's practices of wetland resources management become more pro-environmental if they have good know-how about wetlands and their ecosystem services, if

they have more favorable/positive/ attitude towards their management and have the willingness to engage in management of these resources (Lawson, 2014; Adem, 2017). According to Durant *et al.* (1989), the more people know about their environment, the more they become concerned about and engage in conservation and management. It was also presumed that a behavior is strongest when it is evaluated positively hence, a positive attitude to the management of wetland resources results in higher level of PEB. However, the TPB posits that the influence of knowledge and attitude on behavior is mediated by intention. This mediating effect assumption of the TPB seems to confound with empirical works (Bagherian *et al.*, 2011; Suwarto 2013) that evidenced strong direct influences of knowledge and attitude on behavior. Given these seemingly conflicting premises this study tried to examine both the direct effect of knowledge and attitude on behavior as well as the mediation/indirect/ effect attributed to intention (the mediation effect is represented in orange arrows in Figure 2.1).

In addition to the measures of the aforementioned 'psychological factor' (i.e. KAI), household's PEB was assumed to be a function of different background factors. The potential importance of such factors is recognized by Ajzen's TPB. Ajzen (2005) asserted that different background factors influence the way people perform a behavior. However, in light of the presence of vast number of potentially relevant factors, it is difficult to know which should be considered. Hence, selection of relevant factors in the behavior of interest can be guided by empirical findings. Getacher and Tafere (2013), in their study, have tried to categorize background factors into three: demographic, economic and biophysical. In this dissertation the background factors that were hypothesized to predict household's behavior to management of wetland resources can also be summarized as (i) demographic and socio-economic factors and (ii) physical factors. In the demographic and socio-economic factors the variables considered are age, sex, educational level of the household head, household size, gross annual income of the household, households' benefit gain from wetlands, participation in off-farm job, total livestock owned by the households, farmland size, attending training on wetland and contact with agricultural extension workers. On the other hand, the variables considered as physical factors are distance (in minutes to walk) from home to the nearest edge of the lake or associated wetlands and location (whether the area

borders Lake Ziway or Lake Abijata) (*see* section 3.5.1.2 and Table 3.3 for detail description of the variables). These background factors were also presumed to bring variation in the psychological variables (KAI).

Another key component of the study was economic valuation of wetland resources. As depicted in the framework (Figure 2.1) the economic values the local communities ascribe to these resources has linkage with management of wetland resources. Because wetlands are mostly threatened due to ignorance and lack of understanding of their role, an important step for effective management and conservation of wetlands is informing policy and decision-makers as well as the general public about the values of wetlands (Smrekar, Horvat & Ribeiro, 2020). The values the local communities hold to wetland resources can suggest how important these ecosystems are, and thus is an impetus to take actions for conservation and management of wetland resources. The assertion is that, the WTP value implies how much value (in economic or monetary term) the communities assign for improved ecosystem services and their willingness for conservation and management of the resources.

Accordingly, the dissertation adapted the TRC to conceptualize households' preference for wetland management plans and capture the values ascribed, by the households, to wetland resources. The TRC assumes that if an individual believes that a change in the environment or environmental service will make him (or her) in better off condition, he (or she) will be willing to pay for the improvement of the environment (Hanley *et al.*, 2007). Hence, the WTP values are related to people's underlying preference for the improvement or management of the environment or a resources (herein wetland resources). However, people's preference and WTP value is expected to be influenced by demographic, socio-economic and physical factors. The demographic and socio-economic variables that were considered in this study are age, sex, educational level of the household head, household size and gross annual income of the household. Whereas the physical factors considered were distance (in minutes to walk) from the nearest edge of lake or associated wetlands and location (whether the area borders Lake Ziway or Lake Abijata) (*see* section 3.5.2.3 and Table 3.5 for details about the type, measurement and hypothesized relationship of the variables). Psychological factors (KAI) could in some way influence individual's preference

for wetland management. However, to the best of the researcher's knowledge, previous empirical works hardly documented the influence of these factors on individual's preference. This study couldn't, therefore, get empirical backing to hypothesize the relationship between these psychological factors and individual's preference and WTP, and so were not considered (represented in blue broken arrow in Figure 2.1). Although it is not in the scope of this study, it is also expected that some sort of linkage might exist between the valuation of wetlands and the stakeholders' action. This is because, as Grimble and Wellard (1997) noted, valuation of utility has a strong cultural component that can influence the objective involvement of different stakeholders and their perception of how they could be affected by policies. This aspect can be addressed by future research works (the green broken arrows in Figure 2.1).

The other component of the study that was presumed to intervene in the management of wetland resources is the action and involvement of varied stakeholders. Proper management of wetland resources is futile in the absence of the involvement of stakeholders. Effective collaboration of stakeholders increases the chance of success in achieving effective management of wetlands (Dickens *et al.*, 2003) that can lead to a sustainable resource outcome. According to Menbere and Menbere (2018), the sustainability of wetland resources of a given area stems from the way in which the resources are managed among multiple stakeholders and policymakers. The assumption in this study is that stakeholders have varied roles, responsibilities and involvements in the management of wetlands that need to be assessed and considered as these highly determine the management of wetland resources, thereby by the sustainability of the resources.

The study adapted the IAD framework which was found to be useful to capture stakeholders' action and involvement in the management of wetland resources. It states that stakeholders that have their own specific roles and responsibilities, and interact and engage in different activities within the action arena (herein management of wetlands). However, stakeholders' action is partly subjected to institutional arrangements. As Kosal (2004) opines, the action and involvement of stakeholders in the management of wetlands follows institutional arrangements specific to their mandate. If institutional arrangements are

inclusive, functional and supportive of stakeholders' involvement in decisions related to management of wetland resources, and if there are rules which define their rights and responsibilities, stakeholders will effectively engage in conservation and management of wetland resources. In view of this, in this dissertation the capacity and functionality of existing institutional arrangements (rules-in-use) in the management of wetland resources is assessed from the perspective of the stakeholders. According to Dorward and Omamo (2009), strong and functional institutional arrangement can effectively guide stakeholders' action, which will in turn lead to a sustainable environmental outcome. The issue of sustainable or unsustainable resource outcome which emanates from the management activity is slackly addressed in this study since it is beyond the scope of the study (the brown broken arrows in Figure 2.1). So, future research works can also address this part.

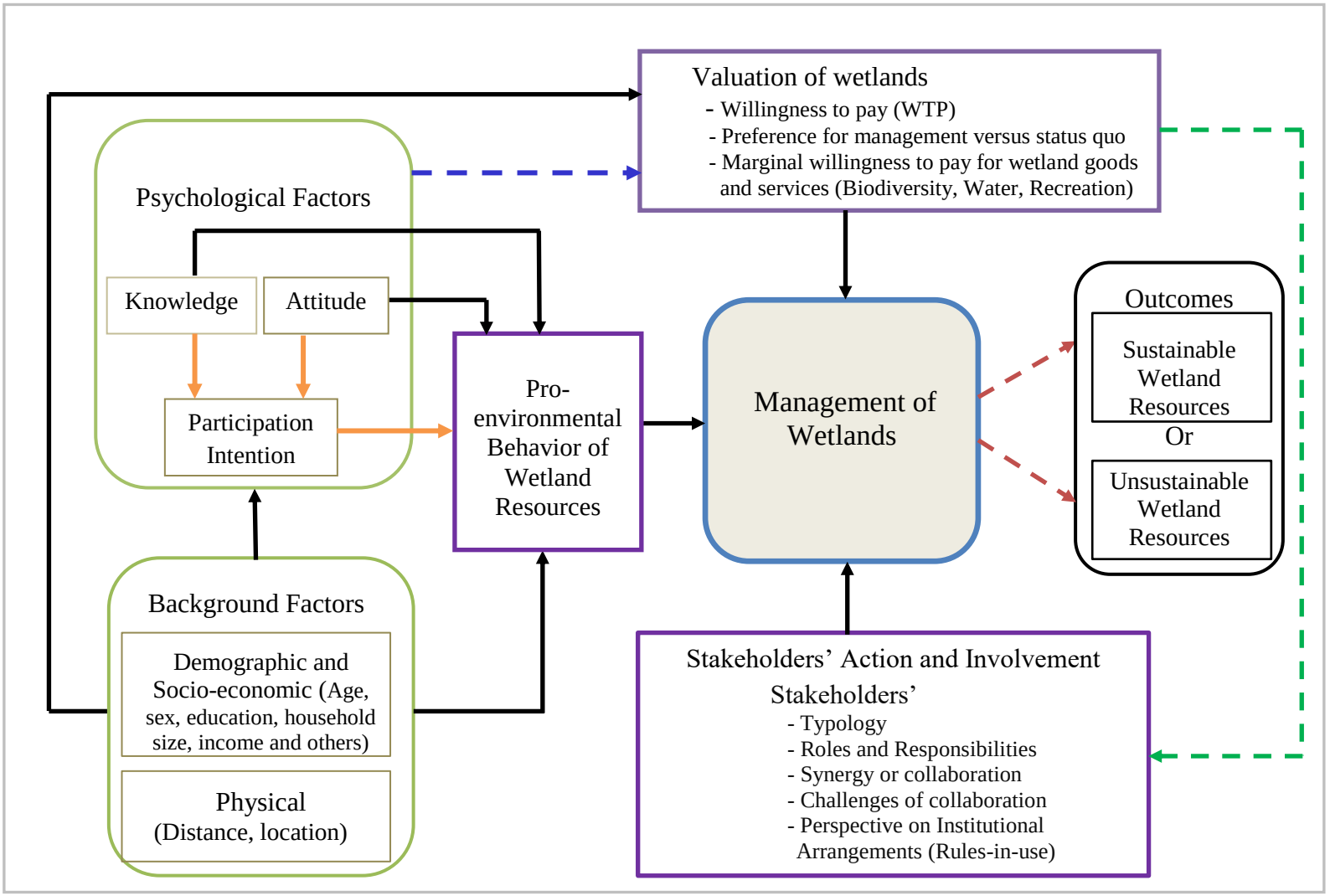

Figure 2.1 Conceptual Framework of the study; *Source*: Researcher's own construction based on Ajzen (2005); Getacher and Tafere (2013)*: Note: the relationships represented in broken arrows are not addressed in this study.*

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Description of study area

3.1.1. Biophysical and socio-economic settings of the Central Rift Valley of Ethiopia

Location: With an area coverage of about 1 million ha, CRV lies between $7^0$10' to $8^0$30'N and $38^0$15' to $39^0$25'E, about 200 Km south of Addis Ababa, the capital city of Ethiopia. It lies in the administrative regions of Oromia National Regional State (ONRS) and the Southern Nations Nationalities and Peoples Region (SNNPR) of Ethiopia (Hengsdijk *et al.*, 2009; Pascual-Ferrer & Candela, 2015).

***Geology, relief and hydrology*:** The CRV is a sub-basin of the Ethiopian Rift Valley[22] system which is part of the Great African Rift Valley system or the Afro-Arabian rift system, bounded by the Arabian plate in the north and the African plate in the west and east. The CRV has three physiographic regions: the rift, escarpment and highland. The lithology of the area is dominated by basalt, ignimbrite, lava, gneiss, lapilli tuff, volcanic ash and pumice as well as riverine and lacustrine alluvium (Temesgen *et al.*, 2013; Billi, 2015). The geological setting of the CRV involves volcanism, rifting, fluctuation of Quaternary lake levels, and deposition of fluvial and volcano-lacustrine sediments (Ayenew & GebreEgziabher, 2015). Bordered by high altitude plateau to the east and west, the altitude of the CRV area ranging from 1500 m.a.s.l. in the lowest part of the rift to about 4245 m.a.s.l. in the largest volcanic peaks (Mount kaka) on the eastern side of the Ziway-Shala lake basin (Ayenew, 2002; Ayenew, 2004; Pascual-Ferrer *et al.*, 2014).

With unique hydrology and ecological characteristics CRV consists of a chain of lakes, rivers and associated wetlands. Being a closed basin it consists of four lakes namely Ziway, Abijata, Langano and Shalla; and four rivers: Meki, Katar, Bulbula and Horakelo. Lake Ziway has two major sources of inflow, the Ketar River from east and the Meki River from west. Lake Langano receives its inflow merely from the eastern escarpment through the

[22] The floor of Ethiopian Rift valley encompasses three major sections from South West to North East: (i) the southern portion from the border with Kenya to the hydrological divide between Lake Abaya and Lake Awasa, (ii) the main portion (commonly referred as the Great Lakes Region of Ethiopia) stretching up to the Awash River and (iii) the northern portion from the Awash to the apex of the Afar Triangle and its northeastern branch, the Danakil depression (Alemayehu et al., 2006; Billi, 2015).

Teji-Gedemso streams. Lake Ziway, Lake Langano and Lake Abijata are hydrologically connected by rivers, i.e. Lake Abijata is connected to Lake Ziway and Lake Langano via Bulbula and Horakello Rivers respectively, whereas Lake Shalla has a closed catchment with no surface water connection to other lakes (Ayenew, 2002; Legesse *et al.*, 2004; Hengsdijk *et al.*, 2009; Pascual-Ferrer & Candela, 2015). Lake Shalla receives its water from River Dijo. It is the deepest lake in Ethiopia (with a depth of 266m); and there is unconfirmed hypothesis that the position and depth of the lake allows the infiltration of water from Lake Abijata (Muzein, 2006).

Climate: The climate of CRV area varies significantly along an altitudinal gradient, but generally arid and semi-arid climate characterizes the sub-basin with mean annual rainfall of 900 mm (Mengesha *et al.*, 2012). The area mostly experiences bimodal rainfall: with most of the rain (about 70%) occurring during the three summer months (June to August and sometimes up to September), while very short and unreliable rain occurs during the months of April to May. The temperature of the area is relatively high with mean monthly maximum and monthly minimum of 28^0C and 13.8^0C (Temesgen *et al.*, 2013). In general, the temperature ranges from 11.9^0C to 29.5^0C in the lower part to 4.3^0C to 26^0C in areas above 2500m (Mengesha *et al.*, 2012; Pascual-Ferrer *et al.*, 2014).

Soils: Apparently, the soil types of an area are closely related to the underlying rock or parent material. In most parts of the CRV area the soils observed are commonly derived from volcanic ash. Mostly the ash has been reworked and occurs as lacustrine sediment (Temesgen *et al.*, 2013). In the Central and Southern Rift including the Ziway-Hawassa basin Eutrci vertisol is the dominant type of soil while in the ASLNP area Virtic Andosols covers more than 1/3 of the park and its 10km radius. In fact, in the park area more than half of the terrestrial land is covered by Andosols, and it is usually associated with virtisols forming Virtic andisols (Muzein, 2006). Andosols are coarse textured (loamy sand to fine sand), highly alkaline (PH of 7.6 -8.2) soils (Temesgen *et al.*, 2013). Generally, soils in the lakes areas tend to have high PH. High PH mean more nitrification, and thus it is expensive to maintain these soils, through fertilization, for agriculture. Generally the soils have low fertility and organic matter with moderate nutrient retention capacity. Their low bulk density and hence weaker structure exposed the soils to wind and water erosion. Loss of soil through

erosion, particularly via wind, is an increasing problem, which prevent regeneration and rehabilitation, as the vegetation around the lake is removed or degraded (Muzein, 2006; Temesgen *et al.*, 2013; Mesfin, 2018).

Biodiversity (fauna and flora): The CRV particularly the lakes support important biodiversity that have global significance. This sub-basin contains unique fauna and flora species of which a significant number are endemic. It is an important breeding and feeding area for some rare species of resident and migratory birds. A good example is Lakes Abijata and Shalla that together form the Abijata Shalla Lakes National Park (ASLNP), which has been recommended as a candidate site by the Ethiopian Government to the Ramsar convention on wetlands (Elias *et al.*, 2019). ASLNP supports the highest bird life form among the six protected areas[23] designated for conservation of wildlife in the Ethiopian Rift Valley (Muzein, 2006).

The phytogeography (distribution of plants) of the CRV is highly influenced by elevation, which also dictates the rainfall amount and pattern. In general, the climate of the area, particularly in the floor permits semi-climax perennials that are adapted to dry conditions or wet season vegetation that perish during dry spell (Muzein, 2006). Umbrella-shaped woodland, classified as *Acacia-Balanites* woodland and savannas usually dominate the natural vegetation of the CRV and most often deciduous forest occupy the ridges and slopes (Temesgen *et al.*, 2013). Along the rift floor the most common tree species belong to the deciduous *Acacia,* whereas the cooler escarpments on both sides support a wide diversity of both broadleaves and conifers. The low altitudinal deciduous vegetation type is dominated by Tedecha Dere (*Acacia tortilis*), Kessele (*Acacia etbaica*), Wacho (*Acacia seyal*) and Jemo (*Balanites aegyptiaca*) with sparsely scattered Kbkib (*Maytenus senegalensis*) bushes. The escarpments on both sides of the low-lying rift floor are rich in broad-leaved species like the pioneer species Bisana (*Croton macrostachyus*) as well as the climax species like Warka (*Ficus vasta*) and Wanza (*Cordia Africana*) are common. In relatively protected areas through fencing, like the head quarter of the ASLNP Administration and the

[23] These six protected area, in the Ethiopian Rift Valley, from north to south are: part of the Awash National Park, Abijjata-Shala Lakes National Park, Senkelle Swayne's Hartebeest Sanctuary, Nechsar National Park, Chelbi Wildlife Reserve and tiny part of the Yabelo Wildlife Sanctuary (Muzein, 2006).

Abernossa Cattle Ranch, the natural dominance tends towards juvenile specimen of acacia species (Muzein, 2006). Due to human interference in most part of the CRV, the stocking and species diversity of the woodland appears to be severely affected (Mesfin, 2018).

Livelihood and farming: The CRV area is predominantly occupied by pastoral Oromo people who came from the surrounding highlands. The mainstay of the population is agriculture. Formerly, livestock centered semi-pastoralism is the main livelihood system of many rural households particularly along the rift floor. These days, the livelihoods of the local community highly depend on mixed farming system- that integrates crop production, livestock rearing (mostly cattle), fisheries, and charcoal and fuelwood extraction. Most farmers depend, for their livelihood, on horizontally expanding rain fed crop production. Grazing is mostly free roaming on the vast communal grazing lands of lake retreat area, particularly Lake Abijata (Muzein, 2006; Temesgen *et al.*, 2013; Mesfin, 2018). Farming practice is mainly dominated by rain-fed complemented with irrigation for long-cycle crops. Maize (*Zea mays*) is the dominant staple food crop of the area, whilst haricot bean (*Phaseolus vulgaris*), *tef* (*Eragrostis tef*) and sorghum (*Sorghum vulgare)* are grown for cash (Pascual-Ferrer *et al.*, 2014; Mesfin, 2018). Due to the low and unreliable rainfall, there is low productivity of rain fed farming, which is the predominant livelihood for the local population. A major part of the irrigated agriculture is located along the shoreline of Lake Ziway and Bulbula River, where vegetables are produced and also a livestock farm extracts the Lake's and River's water (Van Halsema *et al.*, 2011). Cutting acacia trees for charcoal production has also been a common phenomenon, as it is an easy cash source for some farmers. The Main road that connects Addis Ababa to the Southern Regions has provided an opportunity for roadside charcoal and wood sellers (Muzein, 2006).

3.1.2. An overview of the Study Lakes

The study is carried out in the CRV of Ethiopia with specific interest to the wetlands of Lakes Ziway and Abijata.

Lake Ziway: is located between $7^0 51'$ N to $8^0 57'$ N and $38^0 43'$ E to $38^0 57'$ E; about 175 km from Addis Ababa and at an altitude of about 1636 m.a.s.l (Figure 3.1). It is the largest of the CRV cluster of lakes and the third largest of the Ethiopian Rift Valley Lakes with a water surface of 440 km^2, shoreline length of 137 km and average depth of 4 meters

(Hengsdijk & Jansen, 2006). The total catchment area of the lake is 6991 Km^2 (Abraham *et al.*, 2018). It is the shallowest of the Ethiopian Rift Valley lakes (Beneberu & Mengistou, 2009). Lake Ziway contains fresh water and is an open lake which is fed by Ketar and Meki rivers that drain from the Southeastern and Northwestern highlands respectively; and drains into Lake Abijata through the Bulbula River in the south. The catchments of these two rivers, Ketar and Meki, cover 5610 km^2. The long-term average annual inflow from Ketar and Meki rivers is 392 and 265 mcm (million cubic meter), respectively, while the contribution from the ungauged catchment is about 48 mcm. The annual direct precipitation over the lake is 323 mcm. The annual evaporation of the lake and the Bulbula River outflow are 890 and 184 mcm, respectively (Billi, 2015).

The lake is known as one of the most intensively fished lakes in Ethiopia (Hengsdijk & Jansen, 2006; Jansen *et al.*, 2007). The estimated potential yield of all species of fish that is the fisheries 'resource rent' which can be trapped without damaging the parent stocks from Lake Ziway ranges between 2500 to 6680 tons per year (Spliethoff *et al.*, 2009). The Lake catchment area supports huge agricultural development, particularly irrigation farming. However, the irrigation farming is blamed for creating stress on the lakes' ecosystem. The volume of water of the inflowing rivers - Meki and Ketar- and other surface and subsurface water sources is considerably reduced due to the irrigation practices in the upper catchment area of the lake (Beneberu and Mengistou, 2009; Spliethoff *et al.*, 2009). Irrigation farms, perennial plantations and orchards are also distributed along the Bulbula River (main fresh water feeder of Lake Abijata) between Ziway and Abijjata. These farms abstract a considerable volume of water that would otherwise flow to Lake Abijjata (Muzein, 2006). The abstraction from the lake and Feeder Rivers is expected to be over 50 mcm (Billi, 2015). The decrease in the water inflow to Lake Ziway has its own impact on the volume of Lake Abijata and River Bulbula. In this regard, Spliethoff *et al.* (2009:9) noted that, "over the past few years the reduced water flow caused water shortage along the spill regime between Ziway and Abijata where the 30 km long Bulbula River represents the only source of fresh water for a large number of rural communities." In describing the implication of this on the livelihood of the local community Spliethoff *et al.* (2009:10) further noted that

"When no water is flowing to Lake Abijata, people living downstream of Lake Ziway and their livestock have to travel long distance to get water."

The irrigation practice in the upper catchment of Lake Ziway not only has effect on the volume of water, it has also implication on the quality of the lake's water. The farmlands located near the shore of Lake Ziway use agrochemicals and fertilizers which are rich in nutrients such as phosphates and nitrates. This has impacted on water and soil chemistry of the nearby area (Ayenew, 2004; Beneberu and Mengistou, 2009; Spliethoff *et al.*, 2009). Excess irrigation results in evaporation of water in the top soil and precipitation of salts on the soil surface. The dissolved salt left behind on the surface severely affect the growth of crops and impact the quality of the lakes and associated wetlands (Spliethoff *et al.*, 2009).

Lake Abijata: is found at a geographic location of $7^0$33' to $7^0$43'N and $38^0$27' to $38^0$40'E; about 190 km from Addis Ababa at an altitude of about 1578 m.a.s.l. It is an exceptionally saline lake, rich in sodium carbonate and bicarbonates. The lake receives its inflow from Lakes Ziway and Langano via the Bulbula and Horakelo rivers respectively. However, a major part of the water inflow of the lake (on average two-third) is discharged from Lake Ziway through the Bulbula River (Alemayehu *et al.*, 2006; Legesse *et al.*, 2004). The long-term average annual inflows from Rivers Bulbula and Horakelo are 184 and 46 mcm, respectively; and 15 mcm of water is contributed by the surface runoff from the remaining ungauged catchments. The annual precipitation on the lake accounts to 112 mcm (Billi, 2015). Lake Abijata and associated wetlands are known for a great number of lesser and greater Flamingos, White Pelicans and other water fowl. Such nature of the lake, thus, makes it an ideal site for bird watching. The Lake's water is mainly used for commercial exploitation of soda ash by diverting it via canal and evaporation of brine in artificial basin (Hengsdijk & Jansen, 2006; Legesse *et al.*, 2004). Although the recent pumping rate is not exactly known, in 1998 the total annual water pumping rate from the lake, for soda ash extraction was estimated at 13 mcm (Billi, 2015).

The study covers mainly three *woreda*[24]*s*, namely Adami Tulu Jido Kombolcha (ATJK), Arsi Negelle and Ziway Dugda that are found in the catchments of the two lakes- Lakes Ziway and Abijata – and that border the two lakes (Figure 3.1). ATJK *woreda* is one of the *woredas* in East Shewa Zone of ONRS of Ethiopia. It is located at a geographic location of $7^0$37' to $8^0$04'N and $38^0$32' to $39^0$04'E with an area coverage of 1403 km^2. The *woreda* borders Lakes Ziway and Abijata to the West and the South respectively. The altitude of the *woreda* ranges from about 1500 to 2300 m.a.s.l., and agro-ecologically, it is generally termed as lowland (OESPO, 2003). According to the national population projection of the year 2014, the population of the *woreda* is 172,649 of whom 50.2% were men and 49.8% were women (CSA, 2013). Ziway Dugda is located between $8^0$05' to $8^0$25'N and $39^0$09' to $39^0$45'E. It is one of the *woredas* in Arsi Zone of ONRS and borders Lake Ziway to the East. The great portion of Lake Ziway is in this *woreda*. The total area of the *woreda* is 1043km^2; with altitudinal ranges of 1400 to 1600 m.a.s.l. (Moges & Reddy, 2013). The population of the *woreda* is 144,748 of whom 49.8% were men and 50.2% were women (CSA, 2013). The other study *woreda*, Arsi Negelle is located $7^0$09'-$7^0$41'N and $38^0$25'-$38^0$54'E; and lies within the altitude range of 500 to 2000 m.a.s.l. It is one of the *woredas* of West Arsi Zone of ONRS. It borders the shore of Lake Abijata on the North (ICRA, 2002; ONRS, 2004). The population of the *woreda* is 320,364 of whom 51.3% were men and 48.7% were women (CSA, 2013). Arid and semi-arid agro-climate dominates the study *woredas*. The livelihoods of the local community depend mainly on mixed farming of livestock rearing and crop production, which is rain-fed with limited irrigation for long-cycle crops (ONRS, 2004).

[24] However, data pertinent for stakeholders' analysis is also collected at the federal, regional and zonal levels.

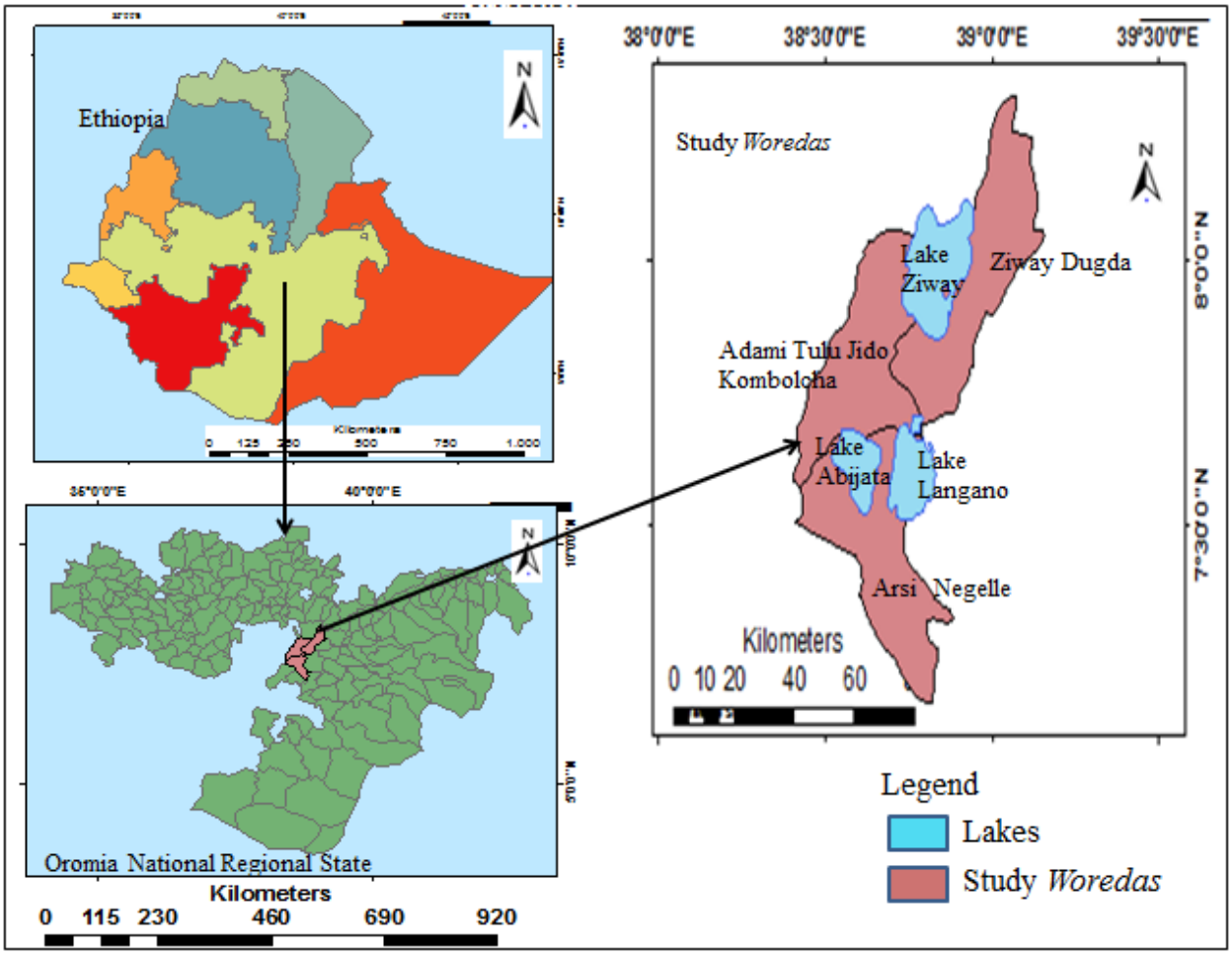

Figure 3.1 Location map of the study area

3.2. Research Approach and Design

3.2.1. Debate on research philosophy and approaches- Quantitative versus Qualitative

Research as an inquiry for knowledge is based on assumption(s) about what exists or how the world is perceived and how we can best know and understand it. There have been methodological debates centered on the question of which research approach- quantitative versus qualitative- is more 'scientific' and best help in understanding contexts and social realities. According to Creswell (2009), research methodology involves the intersection of philosophy, strategies of inquiry, and specific methods. It is therefore, important to brief the major philosophical concepts: ontology and epistemology, their theory on how inquiry should proceed, and see how these play out in shaping research approaches (quantitative versus qualitative).

Ontology as the largest branch of metaphysics in philosophy, deals with questions of existence, or what exists (Gomez & Jones, 2010). It has two basic distinctions: realism and phenomenology. According to Kalof et al. (2008:19), "realism argues that there is a real world, independent of our observation and interpretation of it. The opposite view, often called phenomenology, suggests that it is not meaningful to speak of a 'real' world; our interpretations of it are all that matter". So, for realists there is a single reality whereas for phenomenologist there are multiple realities, based on our mental construction/perception/ and interpretation.

On the other hand, epistemology, as a branch of philosophy, studies the nature of knowledge, our understanding of knowledge and the process by which knowledge is acquired (Gomez & Jones, 2010). There are two positions: positivism and constructivism. According to Kalof et al. (2008:19) positivism is "the belief that we can conduct objective, unbiased observations and through them come to understand the world accurately". It, therefore, bases knowledge solely on what we can observe and measure; and so researchers should be objective. An antecedent to positivism is post-positivism. Post-positivism recognize that we cannot be "positive" about our claims of knowledge when studying the behavior and actions of humans. Post-positivists argue that there are laws or theories that govern the world, and these need to be tested, verified and refined to best understand the world. Thus, for post-positivists our understanding of the world is constructed and research is a social process that is influenced by the value judgments of an investigator (Creswell, 2009). A more radical view that shares some ideas of post-positivism is constructivism. Constructivism is "the view that all observations of the world are our own social constructions rather than images of an objective, external world" (Kalof et al., 2008:19). As opposed to positivism, constructivism emphasizes the social construction of knowledge about the world. It holds the assumption that researchers seek understanding of the world in which they live and work by developing subjective meanings of their experience (Creswell, 2009). Relating the ontological and epistemological stands, Kalof et al (2008:19) noted that:

> *Needless to say, the positivists' view that we can understand the world objectively aligns with the realist notion that there is a world independent of our observations of it, whereas the view that all we can know is our social constructions aligns well with the phenomenological approach to ontology*.

As far as considering approaches to be employed in conducting research, there is a tendency to divide into quantitative and qualitative; and the above discussion brings to light the fact that a realist ontology and positivist epistemology is more closely aligned with quantitative method while the phenomenological ontology and constructionist epistemology is closely aligned with qualitative method. According to Kothari (2004), the process of measurement is central to quantitative research and with this approach it is likely that the researcher will take an objective position. So, proponents claim that quantitative research is undertaken in a value free framework. Qualitative approach, on the other hand, is concerned with subjective assessment of attitudes, opinions and behavior. Accordingly, research in such an approach is value-bound because inquiry is inevitably a function of researcher's insights.

For many years in the past there was no consensus about how to conceptualize the actual undertaking of research. Until recently, most researchers were trained to use one approach but not the other; and at least since the 1970s, there has been some tension between 'quants' and 'quals' in their research in which 'quals' denied the validity of quantitative research, and 'quants' denied the utility of qualitative research (Kalof et al., 2008). Despite the debate, there are scholars who argue that the distinction between the 'quant' and the 'qual' seems fuzzy and these approaches lie on a continuum ranging from one approach to the other. Newman and Benz (1998), for example, contend that qualitative and quantitative approaches should not be viewed as polar opposites or dichotomies; instead, they represent different ends on a continuum. The use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (Creswell and Clark, 2017). Moreover, advocates of mixed approach said that those who argued for the incompatibility created a false dichotomy between 'quant' and 'qual'. This is because, although there is an "objective" reality, under close inspection there is also a "subjective" reality (Creswell, 2012). However, mixed methods research is neither a simple collection and analysis of two distinct "strands" of data nor a mere incorporation of elements of both quantitative and qualitative approaches, rather a systematized integration or merging or embedding of both approaches in a study; and so enable researchers to validate results through triangulation. Therefore, the overall strength of a mixed method research in providing a richer understanding of research problem particularly social realities is greater

than either method by itself. It enables triangulation of data theories and results to get a more complete understanding of a research issue. (Creswell and Clark, 2017). In general, the above discussion on the methodological debate between quantitative and qualitative research approaches was aimed at providing the keystone for the mixed method approach that was employed in this research as it is discussed hereunder.

This dissertation draws its methodological framework from a mixed method approach that looks to different methods and approaches for generating and analyzing data. The philosophical underpinning for mixed methods approach is *pragmatism. Pragmatism* applies to mixed methods research in that it believes in an external world independent of the mind as well as that lodged in the mind. It does not see the world as an absolute unity, and truth is what works at the time, for a particular research problem under study. In a similar way, mixed methods researchers look to different methods for generating and analyzing data rather than fixing to only one way (either quantitative or qualitative). So, in such an approach researchers choose the methods, techniques, and procedures of research that best meet their needs and purposes, thereby inquiries are drawn liberally from both quantitative and qualitative approaches, which could help researchers to overcome limitations of anyone research approach (Kalof *et al.*, 2008; Creswell, 2009).

In the present study given that some of the research questions call for quantitative data while others for qualitative, the mixed methods approach is found to be useful to better understand the research problem and best meet in addressing the research questions and specific objectives. The study employs concurrent mixed method strategy. In this strategy the researcher integrates quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. So, it involves collection of quantitative and qualitative data simultaneously, comparison of the results from the analysis of both datasets and lastly integration of the result to make the required interpretation and draw conclusion. In this approach the researcher may also embed one smaller form of data within another larger data collection in order to analyze different types of questions (Creswell, 2009) (Figure 3.2). In this dissertation, the researcher seeks to address the research questions and objectives by integrating data collected through quantitative and qualitative methods. This is based on the

researcher's strong conviction that some of the quantitative data need substantiation from the qualitative data, which can give better insight on a given issue.

The research makes use of cross-sectional survey, based on data collected at a particular point in time. Because usually the final decisions on management and utilization of resources are made by household heads, this research used households as a unit of analysis to examine KAI and PEB as well as wetland valuation. However, for issues related to stakeholders and institutional analyses the analyses were made by considering more a larger scale; at community, *kebele*, *woreda*, zone, region and federal level. The specific methods and materials that were used in the study are presented in the coming sections. First description is given about sampling design and sample size; subsequently type and source of data, methods of data collection and data analysis for each theme of the research.

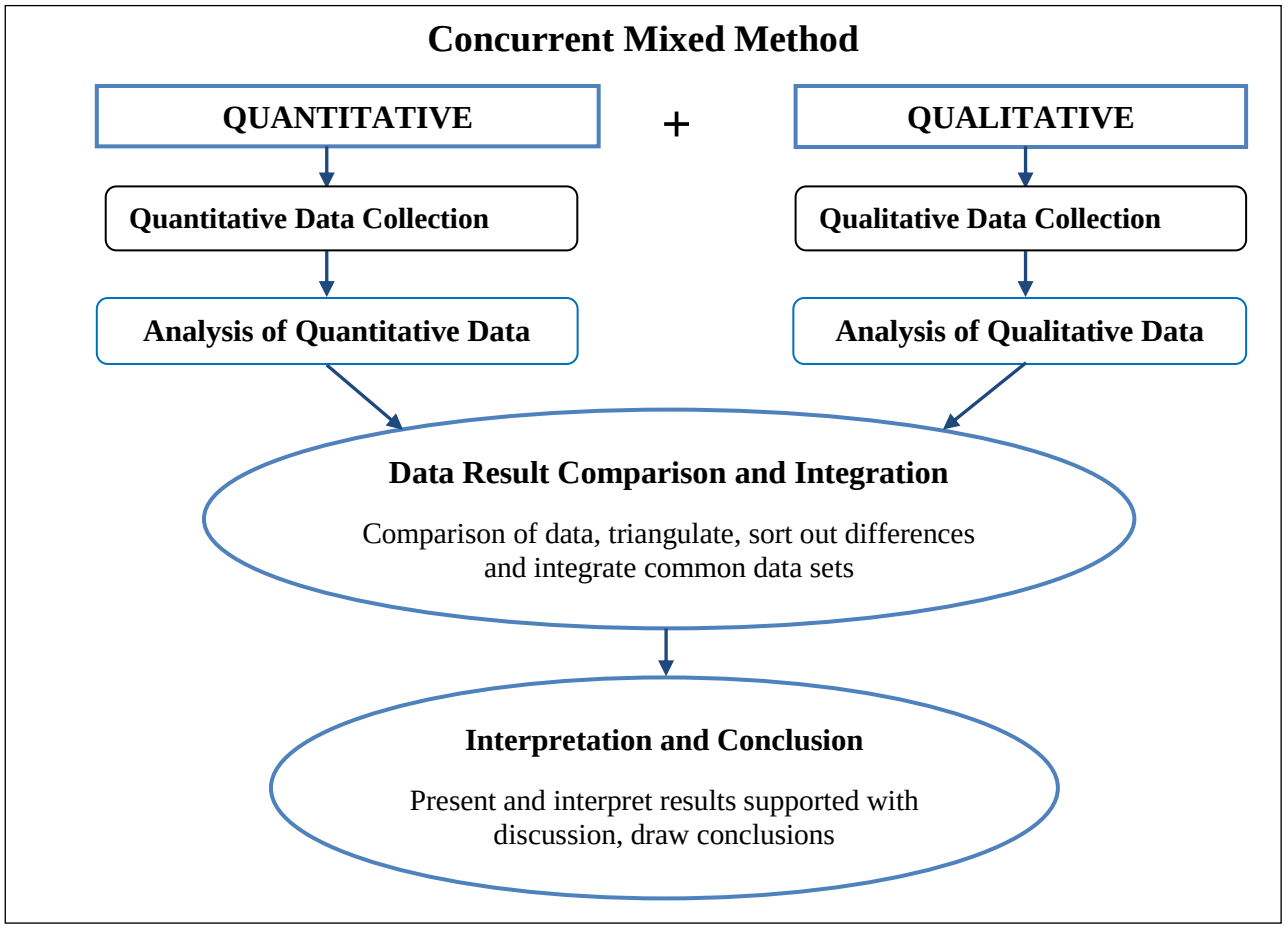

Figure 3.2 Concurrent mixed method design; *Source*: Adapted from Creswell (2012)

3.2.2. Sampling Techniques and Sample Size

Sampling strategy for quantitative data set

To select sample households for the survey data, the researcher employed a multi-stage sampling procedure combining purposive and random sampling techniques (Figure 3.3). First the study *woredas* (Arsi Negelle, ATJK and Ziway Dugda) were selected purposively since they border the two lakes (Ziway and Abijata). Hence, the study populations are the local communities living in the three study *woredas*, and households in these *woredas* were considered as the survey population. In the second stage of the sampling procedure *kebeles* that are found in the three study *woredas* and which border[25] the two Lakes were identified, in consultation with development agents (DAs)[26]. A total of 30 *Kebeles* (i.e. 9 Lake Abijata bordering and 21 Lake Ziway bordering) were identified, as primary sampling unit. In the third stage, six *kebeles*, three from Lake Ziway bordering *kebeles* (Abine Germama, Senbero, Burqa Lemefo) and three from Lake Abijata bordering *kebeles* (Daka Dellu Harengema, Galle fi Qello, and Desta Abijata) were randomly selected as sample study *kebeles*. Following this, households were stratified into male-headed and female-headed. Lastly, 422 sample households, which were proportionally allocated to the household size of the six *kebeles* on the basis of a probability proportional to size sampling technique (Kothari 2004), were selected using simple random sampling technique, from male-headed and female-headed households. Selection of proportionate samples from male and female-headed household strata is to make representative and sound analyses for which consideration of sex as a key variable is a requisite.

The total number of households of *kebeles* of the three study *woredas*, for the year 2007EC (2014/15), was collected from the respective *woreda's* rural land administration and environmental protection bureaus and *woreda's* agriculture and rural development offices. Accordingly, the total household in ATJK is 26,982, in Arsi Negelle 37,623 and in Ziway Dugda 27,970 which add up to 92,575. Using this source data, the total sample household

[25] We need to target on bordering *kebeles* because communities who live in these *kebeles*, as compared to those who live in non-bordering *kebeles*, are more likely to access wetland resources and so can best help to examine issues that this research aimed to address.

[26] Government Officials who are working with and supporting farmers on NRM, agricultural extension services and other related activities

size, which is selected from the six sample *kebeles*, for household survey is calculated using the following formula (Kothari, 2004).

$$n = \frac{z^2 * p * q * N}{e^2(N-1) + z^2 * p * q} \quad (3.1)$$

Where; N = total population size, n = sample size, e = level of precision, z= the value of the standard variate at a given confidence level, p = sample proportion, and q =1- p. Herein, to calculate the sample size a 95% confidence level where standard variate (z) = 1.96, sample proportion (p) = 0.5, and 5% level of precision (e) are assumed. Accordingly, the formula yields a minimum sample size of 384 and adding 10% as a contingency to compensate for non-response and/or non-availability, sample size of 422 was obtained which was proportionally allocated to the household size of the sample *kebeles* (Table 3.1).

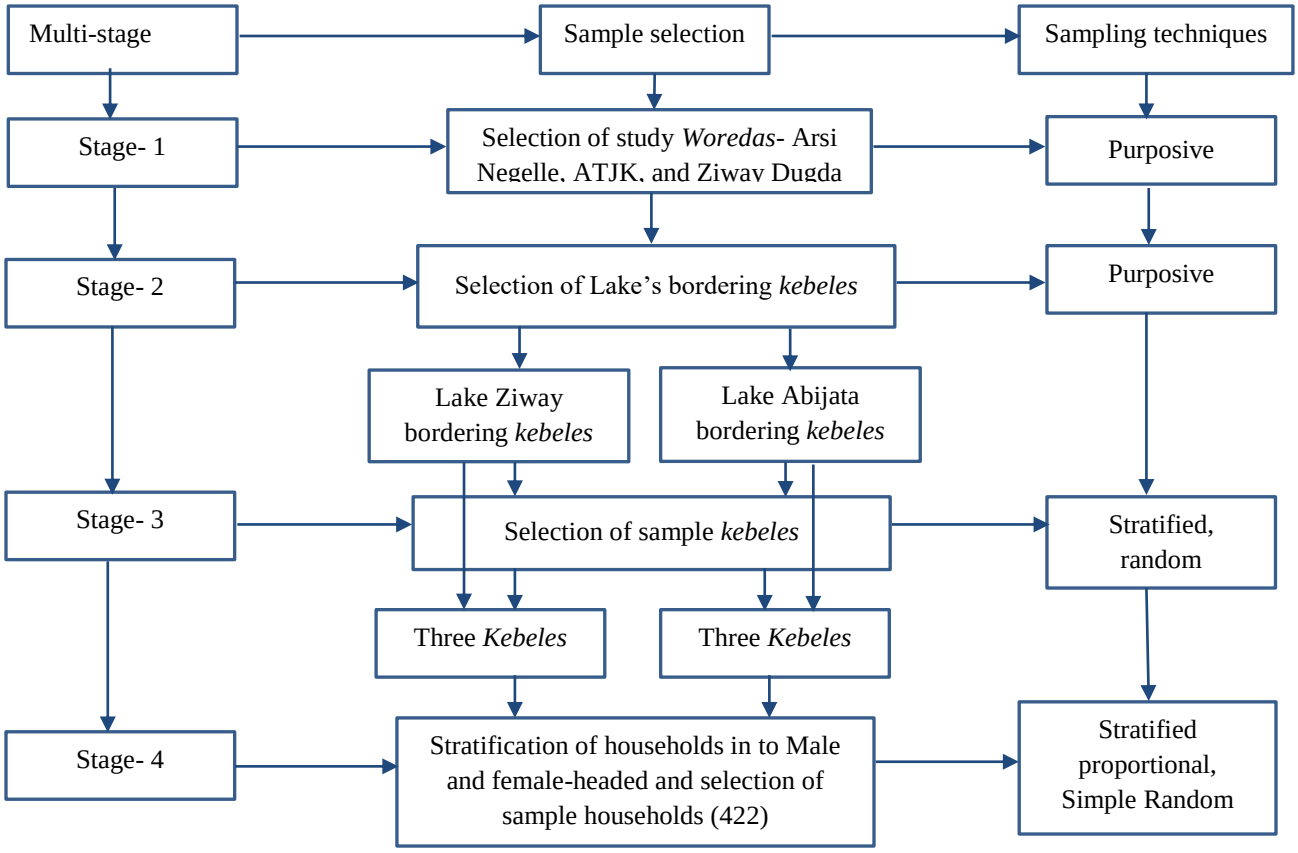

Figure 3.3 Sampling strategy: Stages and techniques of sampling

Table 3.1 Distribution of household survey sample size

Woreda	Lake	*Kebeles*	Total household size (Sample frame N)			Sample household size		
			Male-headed	Female-headed	Total	Male-headed	Female-headed	Total
Arsi Negelle	Abijata	Daka Dellu Harangema	308	277	584	29	26	55 (13%)
		Gallefi Qello	383	181	564	36	17	53 (13%)
ATJK	Abijata	Desta Abijata	574	340	914	54	32	86 (20%)
	Ziway	Abine Germama	670	234	904	63	22	85 (20%)
Ziway Dugda	Ziway	Senbero	638	244	882	60	23	83 (20%)
		Burqa Lemefo	415	223	638	39	21	60 (21%)
Total			2988	1499	4487	281	141	422(100%)

Sampling strategy for qualitative data set

Qualitative data that served stakeholders' analysis were collected from experts and professionals of different stakeholders. To this end the researcher first identified list of possible pertinent stakeholders. This was done through the researcher's own acquaintance of prior literature review and informal discussion with some experts during reconnaissance[27]. However, afterward the researcher recognized the inclusion of other stakeholders since the initially interviewed stakeholders were recommending some other stakeholders that have a stake and are responsible in the management of wetland resources. So, there was a need to employ snowball sampling[28] in selecting the interviewees whereby individuals from initial stakeholders were interviewed, and then asking the interviewees to refer to other relevant stakeholders (Chevalier & Buckles, 2008; Reed *et al.*, 2009). Accordingly, a total of 78 individuals were sampled, for interview, from different stakeholders (GOs, NGOs, business (private and public) enterprises, research institutions and universities) (the list is attached in Appendix XI). FGDs were not conducted with stakeholders for the reason that it was practically difficult to bring stakeholders together for discussion for two main reasons. Firstly, most of them are physically far from each other and so was tough for convening. Secondly, the sampled interviewees were experts and professionals who have regular duties

[27] Reconnaissance-preliminary investigation of the research area- was conducted prior to the main data collection in order to get good insight about the context of the research area particularly to identify wetland attributes that need to be considered in the valuation study. Aside from this it helped the researcher to identify pertinent stakeholders.

[28] Snowball sampling can be used when the researcher may not be aware, at the outset, of all the relevant informants involved (Somekh & Lewin, (2005).

of their own in their respective office. Hence, even some trials of arranging discussion programs were not successful because of clash in their program. In consultation with development agents (DAs) of the study areas the participants for Participatory Rural Appraisals were selected from the sample *Kebeles*. Nine PRAs (Table 3.2) were conducted using different PRA methods (*see* section 3.4).

Table 3.2 Participatory rural appraisal methods and respective participants

PRA tools used	**Participants (Number)**	**Location *Kebele*(*Woreda*)**
Impact Diagram	Farmers(8)	Abine Germama(ATJK)
	Women(7)	Daka Dellu Harangema (Arsi Negelle)
	Women(9)	Gallefi Dello(Arsi Negelle)
Pairwise ranking and Seasonal Diagram	Farmers(2), Fisher men(2) and DAs(2)	Abine Germama(ATJK)
	Youngsters(6)	Desta Abijata(ATJK)
Resource map and Trend Analysis	Elderly and local community leaders (5) and DA (1)	Desta Abijata(ATJK)
	Elderly(7)	Daka Dellu Harangema (Arsi Negelle)
Resource Map and Pairwise ranking	Farmers(7)	Galefi Qello(Arsi Negelle)
	Elderly(5), Fisher men (3) and DA(1)	Burqa Lemefo(Ziway Dugda)

3.2.3. Methods of Data Collection

The study used data, of both quantitative and qualitative nature, collected from primary and secondary sources. Data about local communities' KAI and behavior as well as the value the communities ascribe for wetland resources were generated from households of the sample *kebeles*. Stakeholders' analysis demand collection of data at multiple scales from primary and secondary sources. For stakeholders' analysis data were collected from key persons (officials or experts) of stakeholder sector organizations from five levels of government, viz. *kebeles*, *woredas* (the three study *woredas*), zones, region and federal level. Moreover, local community, research institutes and universities, NGOs and business enterprises that have stake; and so affect and/or affected by policies and decisions on the wetlands of the study areas were also consulted (*see* Appendix XI). In order to have holistic analysis of stakeholders' perspective on the capacity and functionality of existing institutional arrangements of wetland resources management, the researcher tried to review available sectorial and cross-sectorial policy documents. The data collection therefore demands employing varied, yet appropriate tools and methods/approaches/ to generate adequate and reliable data. Collection of data from different relevant sources enhances the reliability of

the data as it allows data triangulation whereby deeper meaning of the data will be uncovered and the research issues are viewed and analyze from different perspectives. Hereunder, is a brief description on the tools and methods that were used to generate primary and secondary data.

Primary data collection methods: The primary data were collected from December 2016 to February 2017 using the following methods and instruments:

1) Household Survey: Primary cross-sectional data were collected from households using a structured survey questionnaire. The questionnaire included open and close-ended question items and was organized in three sections. The first section included questions on households' demographic and socio-economic background characteristics (such as, sex, age, marital status, education level, income[29], household size, occupation, land holding, livestock holding). The second section had four sub-sections that include questions to assess households' knowledge about wetlands and their ecosystem services, attitude, participation intention and behavior to management of wetland resources. Because KAI and behavior are latent constructs that do not have direct, concrete and objective measurement (Latif *et al.*, 2013), each construct was assessed by multiple question items, each of which measures some more defined part of the construct.

The knowledge test constituted question items with response options of "yes", "no" or "don't know"; whereas Likert scale questions with five point (1 to 5) response categories were used to assess attitude and intention, and Likert scale question items with four point (1 to 4) response categories to assess behavior. Herein, we used Likert scale question items (for attitude, intention and behavior) because in each of the items the constructs are reflected/represented/ as points along a continuum whereby individual evaluate a particular issue in a continuum level, in the Likert scale, that runs from extremely pro-issue/favored/ to extremely anti-issue/disfavored/ (Javaras, 2004). In the Likert scale question items of behavior the middle value, 'neutral', was excluded since the questions ask something that

[29] Because income data was suspected of being under reported if it is asked in aggregate, it was assessed by asking households' income from the sales of each farm product, livestock production and from other income source and then summed.

the households have to report on whether or not they have actually practiced/participated in/ the activities mentioned in the items. To make items in the Likert scale of behavior assessment practical detailed discussions were held with local people and DAs, during reconnaissance survey, regarding indicators of communities' participation in management of wetlands. Accordingly, contribution (money or labor) to resource conservation; adherence to laws or rules on resource use; refrain from resource damaging activities were among the mentioned indicators considered in developing the questions. The third section of the questionnaire elicited data about households' ascribed value to wetland resources using CE design; detail description of it is given in section 3.6.2. The questionnaire was administered in the form of face-to-face interview, by well-trained data collectors under close supervision of the researcher. Eighteen data collectors, who are diploma and degree holders and most of them DAs of the study *Kebeles*, were recruited and adequately trained on the content of the questionnaire and methods of data collection.

2) Key Informant Interviews (KIIs): To generate data for stakeholder analysis interviews were held with officials, experts and/or professionals from stakeholders (GOs, NGOs, business (private and public) enterprises, research institutions and universities) that have rich experiences and in-depth knowledge on issues related to management of wetland resources (*see* Appendix XI, for the list of stakeholders). The interviews were managed using semi-structured interview schedule that allowed expanding discussion on relevant aspects (*see* Appendix VIII). Where there was permission of the interviewees the interviews' talks were audio-recorded otherwise notes were taken. Interview's questions were mainly focused on stakeholders' views about the status of wetlands of the CRV lakes, particularly Lakes Ziway and Abijata; stakeholders' mandate, rights and responsibilities; capacity, involvement and collaboration with other stakeholders; interest and influence; opportunities and challenges for collective actions in the management of wetland resources; as well as their views on the capacity and functionality of existing institutional arrangements that currently regulate the management of wetland resources. To assess stakeholders' level of interest and influence the stakeholders were asked to rate their responses for statements that were forwarded. In this dissertation the researcher adapted the criteria used in previous related research works (Hailu *et al.*, 2017; Vogler *et al.*, 2017). Accordingly, the criteria

used are: (1) collecting and/or pay resource use fees, (2) controlling management of wetland resources, (3) protection of wetland resources, (4) capacity building or funding for management of wetland resources, (5) formulating rules for the management of wetland resources, (6) resolve conflict(s) related to the management of wetland resources, (7) coordinating resource management and (8) conducting studies. A four point Likert scale with weighting of 1 to 4 ("Very low", "slightly low", "slightly high" and "very high") was used to rate the scores of the stakeholders' responses (*see* the items at the end of the interview schedule).

3) Participatory Rural Appraisals (PRAs): While the household survey generated the relevant information for the research purpose, some data might not be fully captured. Hence, to complement and substantiate the survey data qualitative data were also collected from the local communities (including farmers, fishermen, women, local community leaders, elderlies and DAs) using PRAs. This helped to triangulate the data as well as get full understanding of their perception about the status and change in wetland resources; and their rights, responsibilities and involvement on the management of the wetland resources of the study area. It also helped to crosscheck evidence and arrive at accurate findings. For this purpose PRAs were conducted using different methods (Table 3.2): resource map, trend analysis, impact diagram, pairwise ranking and seasonal diagram. Resource map served the purpose of depicting the existing wetland management and to get idea about resources generated from the wetland ecosystems, while trend analysis was used to get historical perspective of change in wetlands, dynamics in wetland resources management. Impact diagram was used to gather information about local communities' view on wetland management scenarios (such as area closure, restricted use of resources) and possible effects of these scenarios; any identifiable arrangement among the local communities in terms of management of wetland resources. We have also used pairwise ranking and seasonal diagram to depict the values of wetlands; resource use conflicts; causes and consequences of conflicts. The PRA discussions were managed using semi-structured schedule (*see* Appendix IX).

4) Field Observation

Observation during the field work was an important approach to capture or document realities and some of the observable evidences of the study areas that could not be captures through other techniques. It enabled to have first-hand information regarding local community's behavior/actual practice/ in management of wetland resources as well as the existing condition of the wetland resources thereby gain a more complete understanding. Observations were carried out by walking around the wetland areas of the study *Kebeles* and having informal talk with people in the area mainly DAs. It was managed by observation guide (*see* Appendix X). Observation results were documented in note books and in the form of photos and videos, some of which are used in discussing the finding of the study and some others are annexed (*see* Appendix XIII and Appendix XIIII). Hence, it helped to corroborate data collected using other tools and avoid unnecessary speculations and generalizations.

Secondary data collection methods

To generate data from secondary sources the researcher has conducted review of documents mainly government sectorial and cross-sectorial policies, strategies, proclamations, legislations, regulations, plans and programs pertinent with respect to management of wetland resources, reports on local level enforcement practices, archives, project documents and other gray literatures. The document review aimed to address mainly two strands of information: (i) the provisions that wetland related sectorial policy documents and legal frameworks have for management of wetland resources, and (ii) conceptual (in)consistencies that exist within and among these documents related to management of these resources, and their endeavor to respond to the ongoing degradation of wetlands. The reviewed data were corroborated with data collected from stakeholders on their perspective about capacity and functionality of wetland related policy documents and legal frameworks. To assure the reliability and authenticity of the data collected from secondary sources we have carefully scrutinized and triangulated the documents for their validity as well as internal and external consistency.

Reliability analysis of the survey questionnaire

Before the main data collection the questionnaire was piloted using 30 individuals to check the internal consistency of the items. At that stage reliability was tested using Cronbach's alpha, which describes how well a set of items measures a single latent construct in an internally consistent way (Presser *et al.*, 2004). Alpha value of 0.70 (the lowest desirable value) was used as a threshold to measure the internal consistency of the questions in each of the scales of KAI and behavior; and based on the analysis of the pilot data we found good internal consistency with alpha coefficients of 0.78, 0.84, 0.78 and 0.74 for the items in the respective scales. Because all these values are acceptable, with minor revision the questionnaire was administered for the main data collection. After the data collection inter-item correlation analysis was done for multi-collinearity check of the items in all the four scales; and all items revealed desirable coefficients less than 0.8 (the highest desirable value) (Reported in tables of Appendix I-IV). The internal consistency of the individual item to the respective construct in each scale was also assessed through an item-total correlation analysis, using 0.20 as the lowest desirable value (Everitt, 2002; Field, 2005). All 19 items in the attitude, 18 items in the intention and 12 items in the behavior scales revealed acceptable item-total correlation values more than 0.20 with respective Cronbach's alpha values of 0.93, 0.92 and 0.90. Conversely, two items (K13 and K14) from 19 knowledge test items revealed item-total correlation values of 0.01 and 0.12, which fell below 0.20. Because this shows the inconsistency of the two items with the scale overall, these items were dropped and 17 items were retained for analyses with the scale's alpha value of 0.91.

3.2.4. Data Analysis

This section presents the data organization and analysis methods employed in the present study. Prior to the commencement of analysis of the survey data editing and cleaning was made to vet wrong entries either in the field or during data coding and entry. The data entry was accomplished using Statistical Package for Social Science (SPSS) version 24. A codebook was developed, for data entry; and the negatively worded items in the knowledge test as well as in the Likert scales of attitude, intention and behavior were reverse coded. Although a total of 422 household heads participated in the study, during data cleaning 17 questionnaires were found incomplete and/or incorrectly responded, yielding response rate

of 96%. After eliminating the incomplete ones 405 questionnaires were retained for further analyses. LIMDEP 8.0 or NLOGIT 3.0 software was used to estimate random parameter logit models (RPLM) or mixed logit model and Multinomial logit models (MNLMs) in the analysis of wetland valuation. Regarding interview data, prior to analysis the data were translated (from Amharic to English) and transcribed; then transcripts were imported into NVivo 8, a qualitative data organization and analysis software, through which the analysis of qualitative data was conducted. The processes and the methods employed for data analysis are briefly discussed in the coming sub-sections.

3.2.4.1. Analysis of Knowledge, Attitude, Intention and Pro-environmental Behavior

Descriptive statistics: frequency, percentage, total scores (TS), mean score (MS) and standard deviation (SD) were used to characterize households' KAI and PEB to wetlands and their management. For the knowledge test items each correct response was given a score of 1, otherwise 0. Then TS for every household was calculated by adding household's score for the responses to the 17 knowledge test questions; accordingly, the minimum and maximum possible TS are 0 (0×17) and 17 (1×17) respectively. In the Likert scales of attitude and intention the response options for each question were given numeric value of 1 to 5 points, so a household's possible minimum and maximum TS for attitude scale are 19 (1×19) and 95 (5×19); and for intention scale are18 (1×18) and 90 (5×18). On the other hand, on the Likert scales of behavior response options for each question were given numeric value of 1 to 4, hence household's possible minimum and maximum TS for behavior measurement scale are 12 (1×12) and 48 (4×12) respectively. Higher TS in the respective scale indicates a better knowledge, a more favorable attitude, a stronger participation intention and a better PEB to management of wetland resources. In this dissertation measures developed in previous related studies elsewhere (Birhanu 2014; Evangelista *et al.* 2016; Adem 2017) were adapted to characterize households' levels of KAI and PEB using TS and MS. TS was used to assign low ($0 \leq TS \leq 5$), medium ($6 \leq TS \leq 11$) and high ($12 \leq TS \leq 17$) for households' level of knowledge. MS was used to categorize households' attitude and intention into three: unfavorable/negative/ ($MS < 3$), apathetic ($MS = 3$) and favorable/positive/ ($MS > 3$), whereas using TS we assign low ($12 \leq TS \leq 24$) and high ($25 \leq TS \leq 48$) for household's level of PEB. Independent samples t-test and one-way

ANOVA were used to capture differences in households' level of KAI with respect to socio-economic, demographic and physical factors. Post-hoc (Scheffe's) multiple mean comparison analyses were used to examine differences between pairs of means. Chi-square test was used to examine association between variables of categorical data. On the other hand, multiple linear regression (MLR) analysis was used to examine factors that determine household's behavior in management of wetland resources. The Sobel Mediator Test analysis was used to examine the indirect effect of knowledge and attitude on behavior. The model specifications on the PEB analysis and the Sobel Mediator Test analysis are explained hereunder, in section 3.5.1.1.

Model Specification of pro-environmental behavior

MLR requires the dependent variable to be at an interval or ratio scale (continuous variable). Hence, in the MLR model the response variable – household PEB of wetland resources management is a continuous variable measured by the TS of the Liker scale items in the behavior constructs. Explanatory variables, which were hypothesized to determine household's behavior, are described in section 3.5.1.2 (*see* also Table 3.3). In considering the variable knowledge, attitude and intention as explanatory variable, TS of each construct was used because the items under each constructs are many in number that item by item analysis is impractical. The following model specification was assumed for the PEB:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \varepsilon_i \qquad (3.2)$$

Where, Y_i = is the dependent variable (household's PEB) measured by TS in the behavior Likert scale for household *i*, β_0= the intercept of the model, $X_1 \ldots X_k$ = explanatory variables, $\beta_1 \ldots \beta_k$= coefficients of the explanatory variables and ε_i= residual term.

Prior to running MLR model the data was checked for basic assumptions. Shapiro-Wilk and Kolmogorov-Smirnov tests were used for assumption of the normality of the distribution of the scores of the dependent variable. The values of the two tests were not statistically significant ($P > 0.05$) so the dependent variable (PEB) was assumed a normally distributed. Assumption for Linearity was checked with Normal Probability Plot of the Regression Standardized Residual. Major deviation from normality was not found, suggesting the

linearity of the relationship between the independent variables and the level of PEB. The assumption for absence of outliers was checked using scatterplot of the Standardized residuals. A very few outliers were detected which fall outside $\pm$ 3 SD which did not necessitate further action. The absence of collinearity or multicollinearity among the independent variables was checked using variance inflated factor (VIF). The VIF values for all the variables were far less than 10 (the highest VIF value is for variable Age that is 2.126) (Reported in Appendix V). So, multicollinearity was not suspected to be a problem in the MLR analysis, thereby all the independent variables were retained in the model for the final analysis.

On the other hand, to examine indirect effect Sobel Mediator Test analysis was used. The indirect or mediation effect represents relationship between an independent variable and a dependent variable that is mediated by a mediator variable. So, in mediation/indirect/ effect, the independent variable (herein refers to knowledge or attitude) is hypothesized to have indirect effect on the dependent variable (behavior) due to the influence of the mediator (herein refers to intention). The Sobel Mediator test provides a method to examine whether there is significant reduction in the effect of the independent variable, after including the mediator in the model; and so whether the mediation effect is statistically significant. Hence, to test whether or not intention was significant mediator in explaining the relationship of both knowledge and attitude with behavior the Sobel test estimation was undertaken. The Test use unstandardized coefficients and standard errors obtained from two regression models (Sobel 1982), specified as follow:

Model 1: Simple linear regression model with independent variable predicting the mediator:

$$M_i = \beta_0 + \alpha X_i + \varepsilon_i \qquad (3.3)$$

Where, M_i = mediator variable (intention, measured by TS in the Likert scale of intention), for household i; β_0= the intercept of the model; X_i = the independent variable (knowledge or attitude), measured by TS for the household i; α = vector of coefficients of the independent variables and ε_i = residual term.

Model 2: MLR model with independent variable and mediator predicting the dependent variable:

$$Y_i = \beta_0 + \alpha X_i + bM_i + \varepsilon_i \quad (3.4)$$

Where, Y_i = the dependent variable (behavior) measured by TS in the behavior Likert scale for household *i*; β_0= the intercept of the model; *b*= coefficient of the mediator (M_i).

In the Sobel Mediator Test analysis we used the unstandardized coefficient (*a*) and standard error (S_a) values of the independent variable from model 1 and the mediator's unstandardized coefficient (*b*) and standard error (S_b) values from model 2 (Figure 3.4). The statistic was done using SPSS and an online program. The coefficients for the indirect effects represent the change in the TS of behavior for every unit change in the TS of knowledge or attitude that is mediated by intention.

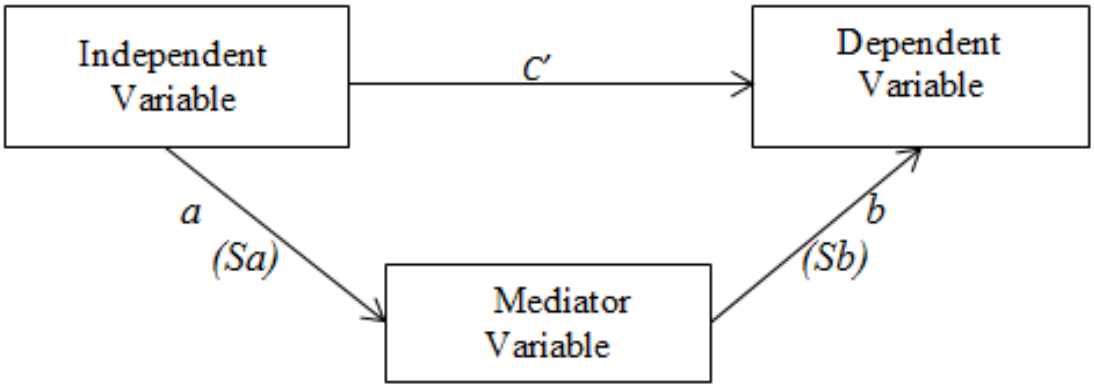

Figure 3.4 An illustration of mediation model

Description of variables and working hypotheses

The dependent variable in the MLR analysis is the household's PEB to wetland resources management. It is a continuous variable that is measured by TS from the items in Likert scale of the behavior construct. By adopting classification used in Getacher and Tafere (2013) and Blankenberg and Alhusen (2019), in this dissertation the potential explanatory variables that were hypothesized to influence household's PEB are broadly classified as psychological, demographic and socio-economic and physical factors (Figure 2.1). Hereunder is a brief discussion on each of the specific variables. Table 3.3 presents summary of the variables, their measurement and hypothesized relationship with PEB.

Age (AGE): is continuous variable defined as the age of the household head measured in years. In natural resource management (NRM) studies age is usually considered with the assumption that older people have more farming experience that helps them to adopt new techniques of resource management and conservation. On the other side, there is an argument that because of risk averting nature older age farmers are more conservative than the youngest one to adopt new techniques, and hence age was thought to have a negative relationship with resource management (Okuthe, Kioli & Abuom, 2013). The role of age in explaining participatory behavior to resources management is somewhat controversial that research found mixed results. Thacher *et al.,* (1996) have found that age had no influence on resource management behavior, while others (Badal *et al.,* 2006; Atmis *et al.,* 2007; Udo, 2014) found that participation in resource management is positively related with age. Whereas, Samuel (2017) in a study of determinants of sustainable land management practices in Jeldu District, West Shewa Zone of Ethiopia, found out a negative and significant coefficient for age that older farmers are less likely to engage in or adopt sustainable resource management practices. He argued that this could be because older farmers have a short planning horizon compared with younger farmers. Van Liere and Dunlap (1980) also noted that younger people are more concerned about the environment because they were less integrated in the existing social order; and it is logical to expect the support of youth to environmental reform and pro-environmental ideologies more willingly than the old people. In this study, with the assertion that concern about the environment increase with longer life experience, age is hypothesized to be positively related with wetland management behavior.

Sex (SEX): is the sex of the household head which is a dummy variable that takes the value of 1 for male headed household and 0 for female. There are controversial findings on the relationship of sex with resource management behavior and making definite hypothesis is difficult. In some studies, such as Getacher and Tafere (2013)-a study on determinants of community based forest management in Alamata, Ethiopia, being headed by female reduces the probability of high level of participation. This is because females' multiple roles (productive and reproductive tasks) hinder them to actively participate in conservation and management activities. Likewise, in the study of Damena (2012) and Okuthe *et al.* (2013) male farmers have been found to be more participant in resources management and

conservation practices. On the other hand, the study by Udo (2014), on the socio-economic factors influencing farmers' participation in community-based program in Abia and Cross River States of Nigeria, revealed a negative and significant coefficient for gender that female farmers were found to be more participant in community based natural resource management program. This is because women are traditionally real collectors of natural resource products like water, fuelwood, fodder and grass and thus play great role in natural resource management and conservation. In this research the hypothesis is that male- and female-headed households differ significantly in their participatory behavior to management of wetland resources but the relationship is indeterminate a priori.

Education (EDUC): represents household head's educational level in years spent in school. More years of schooling is generally expected to lead to greater awareness and so a better understanding of the importance of wetland resources and benefits of conservation and management of these resources. La peyre *et al.* (2011) in a study of determinants of wetland management programs stated that with the increase in education wetland protection also increases. Likewise, Damena (2012); Zhu, Guan and Xuan (2016); Okuma and Muchapondwa (2017), and Samuel (2017) found out that farmers with higher education attainment have strong positive impact on farmers' participation decision to environmental protection and sustainable resource management practices. In this research a positive relationship is expected between educational level of the household head and household's behavior to management of wetland resources.

Household Size (FAMSIZ): is a continuous variable measured in number of people living in a household. There is no agreement of research findings regarding the influence of household size on participation behavior. Bagherian *et al.* (2009) in a study that investigated determinants of local people's participation in watershed management in Iran found no relation between household size and the level of participation in resource management. Whereas Zidana *et al.* (2007); Getacher and Tafere (2013); Ranjit (2014) and Okuma and Muchapondwa (2017) found that the level of participation is positively influenced by the size of household members. In this study household size is expected to be positively related to household's behavior that respondent with large household size might not face time and labor constraint (lower work load) to engage in wetland management. Moreover, given that

the labor for almost all farm and off-farm activities in the study area is provided by the family rather than hired, lack of adequate family labor can seriously constraint participation in wetland resources management.

Gross household Income (GHI): is the household's gross annual income[30] measured as a continuous variable in Ethiopian Birr (ETB)[31]. Research findings on the influence of income on participation behavior are controversial. In the study of Bagherian *et al.* (2009) and Ranjit (2014), it was found out that income have a significant and positive effect in the level of participation in resource management. On the other hand, Zhu, *et al.* (2016), in a study that investigated determinants of farmers' willingness of participation in wetland restoration in China, reported that household income is negatively associated with farmers' participation in wetland restoration. This is on the premise that household income can be used as a proxy to assess the effect of poverty which, according to World Bank (2003), is the main cause of environmental degradation. In this study it is expected to be positively related with household's behavior to management of wetland resources on the assumption that with increase in household's income the household's capacity to contribute for conservation and management of wetland resources will also increase.

Benefits from wetlands (BENEF): represent getting any benefit (goods and services) from the Lake and associated wetlands. It is a dummy variable which takes value of 1 if the household get benefit of any kind and 0 otherwise. Agrawal and Chhatre (2006); Getacher and Tafere (2013) found the variable benefit positively related with participation behavior in that the more benefit households get from resources, the higher the level of participation behavior in the management of the resource. In this research getting benefit is expected to positively influence participation behavior in the management of wetland resources on the premise that households who gain benefit have encouraging return from the existence of wetlands thus participate more in resource management anticipating continued benefits.

Off-Farm Job (OFFJOB): represents household's engagement in off-farm job. It is a dummy variable which take value of 1 if the household engage in off-farm job and 0

[30] In this study the income of a household is a sum total of the income that the household get from the sales of farm produce, sales of livestock production and other income source that are reported by the household head.
[31 b] ETB is Ethiopian Birr - the unit of currency in Ethiopia

otherwise. Badal *et al.* (2006) found a negative relationship between participation and off-farm income sources as more time farmers spend on off-farm jobs, the lesser the time they get for management activities. Samuel (2017) has also found out that engagement in off-farm activities negatively influence resource management practices. According to Samuel's argument this is because farmers who are involved in off-farm activities may encounter time and labor constraints to participate in resource management practices. Okuma and Muchapondwa (2017), in their study on the determinants of successful collective management of natural resources, also found that household heads employed in off-farm jobs are less likely to be active in resource management activities which could be due to availability of exit options from farm work. In this research it was hypothesized to have a negative sign based on the premise that households who are engaged in off-farm activities could feel secured by the income they generate from these sources, and so less likely to engage in management of wetland resources. Moreover, if the opportunity costs of a household increase due to availability of Off-farm activities, the household's level of participation could also be low.

Livestock in Total Livestock Unit (in TLU): is a continuous variable measured in Tropical Livestock Unit (TLU) which represents total livestock owned by the household. In the study of Ranjit (2014) number of livestock was found to be a significant positive determinant of the level of participation. A study by Damena (2012) on determinants of farmers' land management practices in South West Shewa of Ethiopia also revealed that farmers with large livestock holding have a higher chance of using resource management techniques. Similarly, in the finding of Samuel (2017) the number of livestock owned positively affected sustainable resource management practices. In this study it was hypothesized to have a positive influence on respondent's behavior in wetland resources management. This is on the assumption that with increase in the number of livestock, the demand for food and water increase, and so household's PEB to wetland resources increase in order to sustain wetland resources and for greater availability of water and fodder.

Farmland Size (FARSIZ): this is a continuous variable which represents the size of total farmland in hectare[32] owned by the household at the survey time. Previous studies showed

[32] The communities used a local unit of measurement *keret* which refers to ¼ of a hectare (0.4 hectare)

mixed results. While the results of the study by Zhu *et al.* (2016) showed farm size does not affect farmers' participation in wetland restoration, Okuthe *et al.* (2013) and Ranjit (2014) found significant positive influence of land holding size on the level of participation in resource management. On the other hand, Udo (2014) has found a negatively signed and highly significant coefficient for farmland size in determining the participation of farmers in natural resource management program. In this study it was hypothesized to have a positive effect on household's behavior on the premise that households who hold large land size tend to expect more benefit by practicing different management and conservation practices.

Training (TRAIN): It is a dummy variable which takes a value of 1, if the household attend any training about conservation and management of wetlands in the past 3 years and 0 otherwise. Badal *et al.*, (2006) in their study on dimensions and determinants of peoples' participation in watershed development in Rajasthan, India, found that training rather than education had significant influence in motivating the farmers in taking action and contributing in the form of labor and/or money. Likewise, in a study by Damena (2012) farmers with training are found to participate more in resource management and conservation when compared to farmers with no training and the result is statistically significant. Training is among important institutional supports that are likely to significantly improve household's behavior in wetland resource management and conservation practices. Thus, in this study it was hypothesized to have positive influence on household's PEB.

Contact by Extension workers (EXTCON): It is a dummy variable which takes a value of 1, if the respondent had contact with agricultural extension workers or DA at least one time in the last three years and 0 otherwise. A study by Badal *et al.*, (2006) indicates that level of participation is higher when households get frequent visit of extension workers. The implication is that, controlling for the effect of other variables, household heads that have better pro-environmental behavior are those who have contact with extension workers than those who do not have. Visits made by the extension workers create mass awareness about the value of resources and their management and hence leads to greater participation (Badal *et al.*, 2006). Faham, Hosseini, & Darvish, (2008); Damena (2012) found similar result that contact with extension agents is a significant and positive determinant of the level of farmers' participation in sustainable management of land and water resources. Likewise,

Samuel (2017) found that frequent contact with extension workers has a significant positive effect on sustainable resource management practices. This is because the information gained from the DAs help farmers to initiate sustainable management practices. In this dissertation contact with extension workers was expected to influence household's wetland management behavior positively on the assumption that it helps to create awareness about the values of wetland resources.

Distance from home to wetland areas (DIST): it represents proximity of household's residence to the nearest edge of the Lake and/or associated wetlands. It is a continuous variable measured in average time in minutes to walk. Getacher and Tafere (2013); Ranjit (2014) found that distance has a significant negative impact on level of participation in resource management. Getacher and Tafere (2013) documented that households living far from a resource will have less impetus to participate because it would be more expensive for them to travel to the resource. In this study it was presumed to negatively influence household's behavior to wetland resource management. Using distance to proxy for resource scarcity, Okuma and Muchapondwa (2017) also found out that the further a household is from a resource, the lower the success of collective action**.**

Location (**LOCAT**): herein location refers to a site or a place, i.e whether the residence of the household is in Lake Ziway bordering *kebele* or Lake Abijata bordering *kebele*. It is a dummy variable which takes a value of 1 if the household lives in Lake Ziway bordering *kebele* and 0 if the household lives in Lake Abijata bordering *kebele*. In this dissertation it was just considered to examine whether or not location factor determine household's behavior in management of wetland resources. The relationship of this variable with the dependent variable is indeterminate in *a-priori* hypothesis but it was assumed that households who live around Lake Ziway and Lake Abijata differ significantly in their behavior to wetland resources management. With regard to location Getache and Tafere (2013) found that location with a higher forest stock induce participation in forest management.

Knowledge (KNOW): is household head's knowledge about wetlands and their ecosystem services. It is a continuous variable measured by total score (TS) in the knowledge test items. Bagherian *et al.* (2009); Suwarto (2013) found out that environmental knowledge has

a significant positive influence in PEB. Backed with these previous findings, in this study the influence of knowledge on PEB of households was hypothesized to be positive.

Attitude (ATTIT): refers to household head's attitude towards the management of wetland resources. It is a continuous variable measured by TS in the Likert scale items in attitude construct. TPB states that an individual's behavior is shaped by the impact of attitude towards behavior; and so individuals' behavior is strongest when he/she evaluates the behavior positively (Ajzen, 2005). Bagherian *et al.*, (2009) and Bagherian *et al.* (2011) have also found a significant positive influence of attitude on resource management behavior. In this study, it was presumed that attitude positively influence household's PEB to wetland resources management.

Intention (INTENS): household head's intention to engage in wetland resources management is a continuous variable measured by factor scores. According to TPB, people act in accordance with their intentions, so individual with better/stronger/ intentions to engage in a behavior are more likely to perform it (Ajzen, 1991, 2005). In view of this, intention was hypothesized have an effect on household's wetland management behavior.

Table 3.3 Description and measurement of variables used in Multiple Linear Regression model

Dependent Variable		**Description and measurement**			
Behavior		HH[a] PEB of wetland resources management (a continuous variable measured by TS of Likert scale items of the behavior construct)			
Independent Variables	**Description and measurement**	**Type**	**Hypothesized relationship**	**Identified relationship in studies**	
				Positive	**Negative**
AGE	Age of HH head (in years)	Continuous	(+)	Badal *et al.* (2006); Atmis *et al.* (2007); Udo (2014); Okuma and Muchapondwa (2017)	Samuel (2017)
SEX	Sex of HH head (male=1, otherwise=0)	Dummy	(Indeterminate)	Damena (2012); Getacher and Tafere (2013); Okuthe *et al.* (2013)	Udo (2014)
EDUC	Education level of HH head (in years spent in school)	Continuous	(+)	Dunlap (1980); La peyre *et al.* (2011); Van Liere and Zhu *et al.* (2016);Okuma and Muchapondwa (2017); Samuel (2017)	
HOUSIZ	Members in a household (in number)	Continuous	(+)	Zidan *et al.* (2007); Getacher and Tafere (2013); Okuthe *et al.* (2013); Ranjit (2014); Okuma and Muchapondwa (2017)	
GHI	Estimated gross annual income of HH (in ETB)	Continuous	(+)	Bagherian*et al.* (2009); Ranjit (2014)	Zhu *et al.* (2016)
BENEF	Whether HH derive any benefit from the lake/wetlands(HH derive benefit=1, otherwise= 0)	Dummy	(+)	Agrawal and Chatre (2006); Getacher and Tafere (2013)	

OFFJOB	Whether HH engaged in off-farm job (HH has off-farm job=1, otherwise= 0)	Dummy	(-)		Badal *et al.* (2006); Samuel (2017)
TLU[b]	Total Livestock owned by HH (in TLU)	Continuous	(+)	Damena (2012); Ranjit (2014); Samuel (2017)	
FARSIZ	Size farmland owned by HH (in hectare)	Continuous	(+)	Okuthe *et al.* (2013); Ranjit (2014)	Udo (2014)
TRAIN	Attend training on wetland (attend =1, otherwise= 0)	Dummy	(+)	Badal *et al.* (2006) Damena (2012)	
EXTCON	Contact with extension worker (Have contact=1, otherwise=0)	Dummy	(+)	Badal *et al.*, (2006); Faham *et al.* (2008); Damena (2012); Samuel (2017)	
DIST	Distance from home to the nearest edge of Lake or associated wetlands (in minutes to walk)	Continuous	(-)	Getacher and Tafere (2013); Ranjit (2014); Okuma and Muchapondwa (2017)	
LOCAT	Bordering Lake (Lake Ziway= 1 Lake Abijata= 0)	Dummy	(Indeterminate)		
KNOW	Knowledge about wetlands (in TS of knowledge test items)	Continuous	(+)	Ajzen (2005); Bagherian *et al.* (2009); Suwarto (2013)	
ATTIT	Attitude to management of wetlands (in TS of attitude items)	Continuous	(+)	Bagherian *et al.* (2009); Bagherian *et al.* (2011); Suwarto (2013)	
INTEN	Intention to management of wetland (in TS of intention items)	Continuous	(+)	Ajzen (1991, 2005)	

Note: [a] HH stands for household; [b] Conversion Factor is calculated based on Jahnke (1982) (see Appendix VI)

3.2.4.2. Choice Experiment Analysis for Economic Values of Wetland Resources

Descriptive statistics: frequency, percentage, mean and SD values were used to describe households' perception about status and problem faced by the wetlands of the study areas. The economic values of wetland resources were estimated by the RPLMs. MNLMs were also estimated for comparison. Each CE model has three indirect utility functions; one representing utility from the status quo, which was considered as a base category; and the other two utility derived from wetland improvement plan 1 and plan 2. The estimations of the models were based on 2430 observations that is the total number of choices elicited from 405 households who were presented with 6 choice sets and asked to choose one among the three alternatives per choice set (405 households * 6 choices). The coefficients are confounded by a different scale parameter μ, thus estimated parameter cannot be interpreted as the contribution made to utility by each attribute or variable in any absolute sense as they are (Yimenu & Rao, 2015). The coefficients, rather, revealed the significance and direction

of the impact on household's choice probability between the wetland improvement plans and the status quo; so neither represents the actual magnitude of change nor probabilities.

Choice Experiment Design for Valuation of Wetlands

Following common approaches and steps of CE method used in different literature (Adamowicz *et al.*, 1998; Kjaer, 2005; Birol *et al.*, 2006; Louviere, Flynn & Carson, 2010; Abebe *et al.*, 2014; Yimenu & Rao, 2015) the CE design for this study includes the following steps:

Step 1) Defining attributes and their levels:

The first step in CE design involves defining the attributes of interest and their levels. However, there is no accepted "standard" way and no consensus on how to identify attributes and set their levels (Louviere *et al.*, 2010). "While a number of ways exist to do this, no 'gold standard' has been identified" (Kjaer, 2005:76). As Louviere *et al.* (2010) noted, it is mostly done by using qualitative examination involving in-depth interviews and/or focus group discussions with the target population. However, it is worth to consider two issues in particular while deciding the attributes to be included in the study: (i), the attributes need to be relevant to the requirements of the policy makers; and (ii), the attributes should also be meaningful and important to the respondents of target communities (Bennett & Blamey 2001). To ensure that these requirements are fulfilled, it is important to gather information from different sources, which include literature reviews, group discussions and interviews with key persons such as policy makers and experts (Kjaer, 2005). In view of these, in this dissertation, to select attributes the researcher has consulted literature, conducted interview with professionals from Arsi University; Rift Valley Lakes Basin Authority (RVLBA) and rural land administration and environmental protection bureaus of the study *woredas*; and discussions with community leaders and DAs of three *kebeles*.

Accordingly, three attributes of wetlands, namely biodiversity, water availability and recreational service were selected. Advantageously, the selected attributes were also important to capture the total economic values (TEV) of wetlands – the use and non-use values. Emerton (1998) underscored that, when valuing goods and services of wetlands, it is useful to take account of TEV, both use and non-use values, associated with them. Turner,

Geogrgiou & Fisher (2008:143) have also noted that 'a typology of values based on the total economic value concept is an appropriate way to represent the long-run and multifaceted characteristics of the benefits associated with wetlands… the total economic value calculation is a practical and policy relevant method" Herein, biodiversity attribute represents non-use values, whereas water availability and recreational services represented use values (*see* section 2.2.2). Hereunder is the definition and discussion on selection of each attributes.

Biodiversity: herein refers to the abundance of both familiar and endangered species of fish, bird and other animals together with their habitat; and surrounding vegetation- trees, bushes and grasses. The wetlands of Lakes Ziway and Abijata have been highly recognized for their support of many species of both terrestrial and aquatic biodiversity. The biodiversity have multiple benefits, direct and indirect, such as, collection of wood and grass for construction and animal feeding, fuelwood consumption from Acacia trees, income from fishing, recreational value, flood control, pleasant local climate. Despite these benefits, habitat disturbance and degradation in the stock and species diversity is widely prevalent that jeopardize the benefits obtained from the biodiversity (group discussion finding; Pascual-Ferrer & Candela, 2015; Bezabih & Mosissa, 2017; Menbere & Menbere, 2018). Hence, management strategies which include three different levels of improvement were proposed (Table 3.4).

Water availability: is the second attribute that represents the number of seasons with adequate water supply for different purposes and the size of open water surface area of the lakes. The lakes' water and associated wetland ecosystems in the area are means of livelihood and income for many people through, for example, small-scale and large-scale irrigation farms, fishing and source of water and grazing ground for livestock (group discussion finding; Elias *et al.*, 2019). However, recent trends show significant decline and annual fluctuation in the water level and shrinkage of the water surface area have been observed in the two lakes and associated wetlands (Temesgen *et al.*, 2013; Gebeyehu *et al.*, 2015, Elias *et al.*, 2019). Moreover, currently it is only in the summer season that water is adequately available (group discussion finding). Cognizant of this, three levels of improvement were proposed.

Recreational service: is the third attribute which refer to the potentials of the areas to provide recreational value/satisfaction/ to the local community and be destination of many domestic and foreign tourists. The two lakes and associated wetland ecosystems are among Ethiopia's important places that have remarkable uses for recreation and tourism development because of the natural scenery beauty, variety of unique aquatic and terrestrial birds and other wildlife (Menbere & Menbere, 2018). In so doing, these ecosystems have benefit for the local community via provision of recreational value and job opportunity from tourism sector (group discussion finding). These benefits, however, are declining owing to inadequate provision of infrastructures, resting facilities and poor waste disposal, among others (Ali, 2007; Gebeyehu *et al.*, 2015). These problems are highly visible in Lake Abijata area (group discussion finding). Thus, two levels of improvement in recreational services have been proposed. Besides the wetland attributes, a monetary attribute was included to estimate the value of wetland attributes in terms of households' WTP. It is a one-off payment that each household contributes, in the form of environmental fund, for improvement of wetland resources.

Table 3.4 Description of attributes and their levels used in Choice Experiment

Attributes	Descriptions	Levels
Biodiversity	The number and abundance of both familiar and endangered plant and animal species, and their habitats	**i)** Status quo: biodiversity is deteriorating
		ii) Improvement at small level (a 25% improvement)
		iii) Improvement at medium level (a 50% improvement)
		iv) Improvement at high level (a 75% improvement)
Water availability	Size of open water surface area of the lake that remains being covered by water and seasons with adequate water supply for different purposes,	**i)** Status quo: a decrease in the size of open water surface area of the lake and one season of adequate water supply.
		ii) A 5,000ha increase in open water surface area and two seasons of adequate water supply
		iii) A 10,000ha increase in open water surface area and three seasons of adequate water supply.
		iv) A 15,000ha increase in open water surface area and four seasons of adequate water supply.
Recreation service	The services for recreational purpose in terms of infrastructural development, provision of resting facilities, and waste monitoring	**i)** Status quo: insufficient service provision and decline in recreational and tourism value
		ii) Infrastructural development only
		iii) Infrastructural development; provision of resting facilities and waste monitoring
Payment	A one-off payment for the proposed (improvement or management plan) in the form of an environmental fund	**i**) Status quo: no payment
		ii) 20 ETB
		iii) 40 ETB
		iv) 60 ETB

Step 2) Experimental design and choice set determination*:* This involved combining the levels of the attributes to obtain optimal alternative scenarios; then assembling the alternatives in to choice sets. The alternative scenarios generated using full factorial design from 4 attributes (3 with 4 levels and 1 with 3 levels) were 192 (i.e. 4^3*3=192). This is very large combination that could not be feasible. Hence, we used fractional factorial design, which consisted of only the main effects, which Louviere *et al.* (2010) referred it as orthogonal main effects plan (OMEP). To develop an efficient and optimal design we followed the principles of (i) *level balance*, where attribute levels occur the same number of times within a choice sets; (ii) *orthogonal*, where the frequencies for level pairs are proportional or equal and where attribute levels of the alternatives within each choice set are not correlated and (iii) *minimal overlap*, where attribute levels occur the same number of times within a choice sets (Scarpa & Rose, 2008). Because an orthogonal and balanced experimental design was used, the D-efficiency of the design was 100%. In the OPTEX procedure of SAS statistical software using orthogonal design[33] 12 different improvement alternative scenarios were generated and randomly assembled in six choice sets. In each choice set there were three alternatives: a status quo alternative and two others with different combination of wetland improvement alternatives.

Step 3) Questionnaire development*:* The CE section of the survey questionnaire first presented the scenario followed by six consecutive choice sets. Each choice sets has three alternatives-the status quo option and two alternatives of wetland improvement/management plans- from which households have to choose their preferred alternative in each choice set. Next to CE are follow up questions that aimed at seeking information about the households' reason for the choice of alternatives in the choice set questions.

Step 4) Sampling and data collection*:* The sampling and data collection procedures are as described in sections 3.3 and presented in Table 3.1 above.

[33] A design where attribute levels of the alternatives within each choice set are not correlated (Yimenu & Rao, 2015).

Model Specification for Wetland Resource

Multinomial logit models (MNLMs)

Choice modeling involves the probability of selecting an alternative from a given set of alternatives. Logit and probit models have got desirable statistical properties for modeling of choice behaviors as the probability of choice is bounded between 0 and 1. When a choice decision is inherently a multivariate decision, binomial modeling such as binary logit or probit model cannot be appropriate as it exclude useful economic information contained in the interdependent and simultaneous choice decisions (Dorfman, 1996). In a condition where the dependent variable is multiple-outcomes (more than two outcomes) and the objective is to see the choice decision among the outcomes, it is more appropriate to treat factors which are supposed to determine individual's decision on the choice of the options as a multiple choice decision. For this the appropriate economic model would be either multinomial logit or multinomial probit model (Amare, 2018). Both models are used when the dependent variable involve multiple choices with unordered response categories (Greene, 2000). Because of the estimation ease as well as its efficiency to predict households' choices of wetland management options (Yimenu & Rao, 2015), in this study, a multinomial logit model was used. The dependent variable i.e. household's choice of wetland management options has three alternatives: the status quo, wetland improvement plan 1 and wetland improvement plan 2[34].

Basic MNLM: is derived based on the assumptions that individuals' preference is homogeneous and each unobserved factor (*e*) is independently and identically distributed (iid)[35] extreme value (Birol *et al.*, 2006). The indirect utility is therefore a function of wetland attributes only and the model estimates the direction of the impact of the attributes in explaining individuals' probability of choosing an alternative scenario. Hence, the model can help to know the significance of the attributes, selected for the study, in the households' choice of wetland improvement plan without accounting for households' preference heterogeneity. Indirect utility is, therefore, given as:

[34] As it has been described earlier (under sub-section 3.5.2.1), the wetland improvement plan 1 and plan 2 are the alternatives that are formed by combining the levels of attributes. Then these alternatives are assembled, together with the status quo option, in the choice sets from which the individuals are supposed to choose.

[35] The *iid* assumption is similar to IIA (*independence of irrelevant alternatives*)– i.e probability of choosing an alternative is unaffected by the presence or absence of other alternative in the choice set (Kjaer, 2005).

$$V_j = ASC + \beta_{Biod}Biod + \beta_{water}Water + \beta_{recret}Recret + \beta_{paym}Paym \qquad (3.5)$$

Where $V_{j,}$ (j = 0, 1, 2) represent indirect utility from the status quo, wetland improvement alternative plan 1 and plan 2 respectively; β_{Biod}, $\beta_{water,}$ $\beta_{recret, and}$ β_{paym} are coefficients of the wetland attributes: biodiversity, water availability and recreation, and monetary payment respectively. Because we used generic format and an orthogonal design to develop the choice sets, the alternative specific constant (ASC)[36] was specified to equal 0 for the status quo (the comparator) and 1 for the wetland improvement alternative plan 1 and 2 (Birol *et al.*, 2008; Yimenu & Rao, 2015).

Extended MNLM: the assumption here is that preferences are heterogeneous across individuals hence; extended MNLM accounts for this heterogeneity by including socio-economic variables. However, because the socio-economic variables do not vary across choice occasions for any given household, the variables were included as interaction with ASC[37]. Hence, indirect utility is specified as:

$$V_j = ASC + \beta_{Biod}Biod + \beta_{water}Water + \beta_{recret}Recret + \beta_{paym}Paym + \delta_1(ASC * S_1) + \delta_2(ASC * S_2) + \cdots + \delta_n(ASC * S_n) \qquad (3.6)$$

Where, V_j (j = 0, 1, 2) represents indirect utilities for the three alternative scenarios; ASC is the constant; β values are coefficients of the wetland attributes; and δ_1 to δ_n are the vector of the coefficients of the socio-economic variables (S_1 to S_n) included in the model (Table 3.5).

Random parameter logit model (RPLM)

The use of RPLM was justifiable for two main reasons. Firstly, the standard MNLM works with the IIA assumption. Hence, to address possible violation of IIA in the MNLMs it was imperative to use the RPLM that does not exhibit the IIA property. Secondly, the MNLM does not account for unobserved preference heterogeneity. Hence, to account for the unobserved preference heterogeneity RPLM was estimated. Although controlling for unobserved heterogeneity is an advantage in the RPLM, it cannot explain the sources of this heterogeneity unless controlling for socio-economic variables. Accordingly, RPLM with

[36] ASC captures the average effects on utility of all attributes/factors that are not included in the model.
[37] Interacting socio-economic variables with ASC is the common approach to introduce observed heterogeneity in many CEs. In that case it will not affect the MWTP (Birol et al., 2006; Yimenu & Rao, 2015).

interaction was also estimated that includes, in addition to the wetland attributes, the socio-economic variables which are interacted with ASC. Thus, in the RPLM the random utility function for the indirect utility derived by an individual *i* from an alternative *j* (*j* = 0, 1, 2) is:

$$V_{ij} \equiv V_{ij} + e_{ij} \equiv V\left(Z_j(\beta + \eta_i), S_i\right) + e\left(Z_j, S_i\right) \quad (3.7)$$

Where Z_j represent the wetland attributes with parameters β, which due to preference heterogeneity may vary across households by a random component η_i, and S_i represent the socio-economic characteristics. In the RPLM except the monetary payment all other attributes are assumed to be normally distributed random parameter. The assumption for the payment attribute is to be fixed (log-normal) because the distribution of MWTP for an attribute is given by the distribution of the coefficient of the attribute (Carlsson *et al.*, 2003).

The overall explanatory power and goodness-of-fit of the MNLMs and RPLMs were assessed using log likelihood ratio test (LL-test) and McFadden R^2 (pseudo R^2). In the MNLMs as well as in the RPLMs the LL-tests rejects the null hypothesis that the regression parameters are equal at 5% significance level; revealing strong explanatory power of the models. Although the McFadden pseudo R^2 values for the basic MNLM is 0.18, this was improved in the extended model R^2=0.26 implying better overall fit of the extended MNLM to the observed data by conventional standards[38]. The RPLM and the RPLM with interaction also fit the data well with respective pseudo R^2 values of 0.37 and 0.38. The LL value[39] of RPLM with interaction suggests improvement in explanatory power of the model over the MNLMs and RPLM.

Description of variables and working hypotheses

To decide on the variables to be considered in the CE analysis (MNLMs and RPLMs), existing theoretical explanations and results of previous related research works were consulted. The dependent variable is household's choice of wetland management options. Hereunder is description of the potential explanatory variables that are hypothesized to

[38] McFadden's ρ^2 values between 0.2 and 0.4 imply that the model fits the data well (Hauber et al., 2016).
[39] Models with less negative LL-test value better explain the pattern of the choice in the data (Hauber et al., 2016).

predict household's choice for wetland management plan. A summary on the variables, their measurement and hypothesized relationship is also given in Table 3.5.

Age (AGE): is a continuous variable which represents the age of the household head measured in years. Empirical literature revealed mixed finding regarding the impact of age on households' choice of wetland management options. Carlsson *et al.* (2003) and Yimenu and Rao (2015) found significant negative relationship implying aged individuals are less likely to choose an improved and most costly wetland. Whereas Berhanu (2012) and Dahmardeh and Shahraki (2014) found a significant positive relation with WTP for improvement in wetland attributes. In this research age is hypothesized to have positive relationship on the premise that as the age of an individual increases, the individual's interest for environmental improvement also increases.

Sex (SEX): the dummy variable sex of the household head takes the value of 1 for male headed household and 0 otherwise. Findings of previous research works on the influence of sex on the choice of wetland management options are contradictory. In the findings of Yimenu and Rao (2015) and Carlsson *et al.* (2003) sex has positive influence on household's choice of wetland management option. On the other hand, Dahmardeh and Shahraki (2014) found a negative effect. In this dissertation it was hypothesized that male and female headed households significantly differ in their choice for wetland management options, yet the sign of influence was Indeterminate a *priori.*

Education (EDUC): being a continuous variable it represents household head's educational level measured in years spent in school. In different valuation studies (Birol *et al.* (2006); Berhanu (2012); Dahmardeh and Shahraki (2014) and Yimenu and Rao (2015)) it has been shown that education has a positive influence with household's choice for wetland improvement plan. More years of schooling is generally expected to lead to greater awareness of the importance wetland resources. Thus, in this herein a positive influence of education on household's choice of wetland management plan was hypothesized.

Household Size (HOUSIZ): is a continuous variable measured in number of people living in a household. There are mixed research findings regarding the influence of household size on household's choice of wetland management options. Berhanu (2012) found negative but

insignificant effect, whereas Biriol *et al.* (2006) and Yimenu and Rao (2015) found a negative significant effect on household's choice of wetland management options. In this research negative relationship is expected with the probabilities of choosing wetland improvement options because higher household size is accompanied with larger household expenditure, which consequently reduce household cash resources.

Gross household income (GHI): this is a continuous variable that refers to the households' estimated gross annual income measured in ETB. Bateman *et al.* (1995); Birol *et al.* (2006); Berhanu (2012) and Yimenu and Rao (2015) have found a positive influence of income on household's choice for wetland management options. In this dissertation it is assumed that with increase in the income of the household, the ability of the household to pay for improvement in wetland improvement will increase. So, it was hypothesized that household income has a positive effect on household's choice for wetland management options.

Distance from home to the wetland areas (DIST): this is continuous variable that represents the proximity of household's residence to the shoreline area of either the lake or associated wetlands. It is measured by the average time in minutes to walk from the household's home to the nearest edge of the lake or associated wetlands. Berhanu (2012) and Bateman *et al.* (1995) found that distance has a significant negative impact on household's choice of wetland improvement option and their WTP for improvement in wetland attributes. Contrary to these, the finding of Birol *et al.* (2006) revealed a positive influence of distance on household's preference for improved wetland resource though the underlying reason for their finding is not explained. In this dissertation it was also hypothesized to have negative effect on household's choice for wetland improvement plan. This is on the assumption that households that are located farther away from the lakes and associated wetlands are less likely to have livelihood attachment with these ecosystems, which could reduce their WTP for the improvement of wetland resources.

Location (**LOCAT**): herein location refers to a site or a place, i.e. whether the residence of the household is in Lake Ziway bordering *kebele* or Lake Abijata bordering *kebele.* It is a dummy variable which takes a value of 1 if the household resides in Lake Ziway bordering *kebele* and 0 if the household resides in Lake Abijata bordering *kebele*. In this dissertation, it was just considered to examine whether or not location factor determine household's choice

of wetland management options. The relationship of this variable with the dependent variable is indeterminate in *a-priori* hypothesis but it was assumed that households who live around Lake Ziway and Lake Abijata differ significantly in their preference for wetland management options.

Table 3.5 Description and measurement of variables used in the Choice Experiment analysis

Dependent Variable	**Description and Measurement**				
Choice	HH's[a] choice for wetland management/improvement option (a discrete variable that take value of 1 if wetland improvement alternative is chosen and 0 otherwise (i.e. if the status quo is chosen)				
Independent Variables	**Description and measurement**	**Type**	**Hypothesized relationship**	**Identified relationship in studies**	
				Positive	**Negative**
AGE	Age of HH head (in years)	Continuous	(+)	Berhanu (2012); Dahmardeh and Shahraki (2014)	Carlsoon *et al.* (2003); Yimenu and Rao (2015)
SEX	Sex of HH head (male=1, otherwise=0)	Dummy	Indeterminate a priori	Yimenu and Rao (2015)	Dahmardeh and Shahraki (2014)
EDUC	Education level of HH head (in years spent in school)	Continuous	(+)	Birol *et al.* (2006); Dahmardeh and Shahraki (2014) Yimenu and Rao (2015)	
HOUSIZ	Household size (in number)	Continuous	(-)		Birol *et al.* (2006); Yimenu and Rao (2015)
GHI	Estimated gross annual income of HH (in ETB[a])	Continuous	(+)	Bateman *et al.* (1995); Birol *et al.* (2006); Yimenu and Rao (2015)	
DIST	Distance from home to the nearest edge of the lake or associated wetlands (in minutes to walk)	Continuous	(-)	Birol *et al.* (2006)	Bateman *et al.* (1995); Berhanu (2012)
LOCAT	Bordering lake (lake Ziway=1, otherwise=0)	Dummy	Indeterminate a priori		

Note: [a] HH stands for household

Estimations of marginal willingness to pay

Marginal willingness to pay (MWTP), also called 'part worth' or 'implicit price', is the marginal rate of substitution or tradeoff between one attribute and another. When the monetary attribute is the one being sacrificed, MWTP reflects the estimated value of people's WTP for an additional unit of improvement in the wetland attribute of concern, *ceteris paribus*. Estimation of MWTP could provide some information on the relative

importance of individual attributes and the tradeoff between them; thereby contributes to policy making in designing resource use alternatives (Carlsson *et al.*, 2003; Yimenu & Rao, 2015). The parameters (β coefficients) estimated in the MNLMs or RPLMs can be used to estimate the MWTP. Accordingly, following Birol *et al.* (2006), for linear utility the rate at which households are willing to tradeoff price for changes in any of the other wetland attributes, the MWTP, is calculated as:

$$MWTP = -1\left(\frac{\beta\ wetland\ attribute}{\beta\ payment\ attribute}\right) \quad (3.8)$$

The parameters (β coefficients) of the wetland and payment attributes estimated in the MNLMs or RPLMs were used to estimate the MWTP.

Estimation of welfare measures

The CE method of valuation has a particular strength of its ability to generate estimates of the value of various alternative scenarios from a set of choice data (Bennet & Blamey, 2001). Thus, by reallocating resources, from one set of data, the values of a range of alternative wetland improvement scenarios can be estimated[40]. Economic welfare measure or compensating surplus (CS) measures the difference between the utilities of individuals that could be obtained from the initial (status quo) alternative and improved alternative scenarios assuming the individual has the right to benefit from the initial utility level. CS equals the amount of money that an individual can give up for an increase in utility without being worse off with the absence of change. CS therefore reflect individuals' WTP to benefit from an improvement in wetland management and it can be obtained for different wetland management scenarios having multiple changes in attribute (Birol *et al.*, 2006; Abebe *et al.*, 2014). The CS is estimated as follows:

$$CS = \left(-{}^{1}/_{\beta_m}\right)(V_0 - V_i) \quad (3.9)$$

Where, V_0 represent the indirect utility values from the status quo levels of the attributes and V_i represent the indirect utility from different alternative improvement scenarios; and β_m is the coefficient for monetary payment estimated in the MNLMs or RPLMs. To estimate the

[40] The CE method has this feature because if particularly investigates trade-offs between attributes (Yimenu & Rao, 2015)

CS we used the parameter estimates of the attributes in the RPLM with interaction (which is the best fit model compared to other models) and the attributes' levels in the respective wetland improvement scenarios. The coefficient for ASC was included to capture the unobserved information of household's choices.

3.2.4.3. Analysis of Stakeholders' Actions and Involvement in wetland management

The analysis of stakeholders' action and involvement in the management of wetland resources is informed by Ostrom's IAD framework, a widely used framework in studying management of CPRs. The framework has a conceptual unit, i.e. an 'action arena' where the human environment interaction is conceptualized. In the context of this study, which deals about wetlands, the action arena is the management of wetlands. This action arena – wetland management- involves several stakeholders. As Reed *et al*. (2009) noted stakeholder analysis typically involves three steps: identifying stakeholders, differentiating between and categorizing stakeholders, and investigating relationship between stakeholders. Accordingly, this dissertation firstly aimed at identifying stakeholders in to different groups of stakeholders– typology of stakeholders. As Rao (2013) asserts, there is no one set of stakeholders who are universally significant because their importance, incentives and roles depend on the country or resource context and these can change over time. Clarke and Clegg (1998) have also noted that, it is often impossible to include all stakeholders and a line must be drawn at some point, based on criteria (such as geographic or demographic) established by the research analyst. In view of these arguments, in this dissertation stakeholders that are found with the national boundary are just considered. To recall, through the semi-structured interview and snowball technique 78 stakeholders have been identified[41] (*see* Appendix XI for the list of the stakeholders identified).

Secondly, for analysis of stakeholders' action and involvement in wetland management there was a need to differentiate and classify stakeholders, i.e. the typology of stakeholders. According to Grimble, *et al.* (1998), the most common division of stakeholders is likely to be between those who affect (determine) an action or a decision and those who are affected,

[41] Identification of stakeholders is usually an iterative process whereby stakeholders are first selected using expert opinion, focus groups, semi-structured interviews, snowball samplings, or a combination of these (Reed *et al.*, 2009).

either positively or negatively. Cohen-Shacham *et al.* (2014), for example classified stakeholders in to "Primary stakeholders''-those stakeholders directly affected by the outcome of a project, either in a positive or negative way and ''secondary stakeholders''-those stakeholders that are indirectly affected by the outcome of the project. Likewise, Chevalier and Buckles (2008), classify stakeholders as the most affected by the problem or action; moderately affected by the action, least affected by the action, most influence the action, moderately influence the action and least influence the action. However, as Grimble and Wellard (1997) and Grimble, *et al.* (1998) argued such distinction of stakeholders between those 'who affect' and those 'who are affected' may not be absolute as some groups may not be involved in natural resource management both actively and passively.

Grimble and Wellard (1997) forwarded a more specific typology of stakeholders in natural (tree) resource as: global and international, national, regional, local off-site and local on-site stakeholders. Hailu *et al.* (2017) classified stakeholders in (water) resource in to four: government stakeholders, private sectors and public enterprises, local community and external bodies. Darradi *et al*. (2006) have also classified stakeholders in to three: local stakeholders, external stakeholders and researchers, while the classification of Smrekar *et al.* (2020) results in four groups of stakeholders, viz. public authorities, knowledge providers, civil society and economic entities. Brown *et al.* (2016), in their study of stakeholder analysis for marine conservation, forwarded a more specific classification of stakeholders. They identify nine stakeholder identity categories. In this dissertation the researcher adapted the classification of Smrekar *et al.* (2020), Hailu *et al.*, (2017) and Darradi *et al*. (2006) for two main reasons: firstly, as these research were conducted on wetland and water issues, their classification suggest good insight about the potential groups of stakeholders in wetlands; secondly these classifications give more gradations and more specific classifications unlike to most other classifications which merely relied on broad classification of those 'who affect' and those 'who are affected'.

To analyze data collected using interview and PRAs thematic analysis was used through the use of NVivo 8 qualitative data organization and analysis software. Thematic analysis is the most widely used qualitative approach to analyze interviews by identifying and analyzing

patterns or themes[42] within data (Judger, 2016; Maguire & Delahunt, 2017). In this study we follow Braun and Clarke's (2006) 6-step approach of doing thematic analysis, which is the most widely used approach in social science (Maguire & Delahunt, 2017). The analysis process however is not necessarily linear where one move from one step to the next, rather as Braun and Clarke (2006) recommend it is more recursive, where there is a back and forth move throughout the steps. Accordingly, at first to develop a general understanding of the entire data set the transcripts of the interviews were reviewed by repeated reading while taking summary notes/memos/ on key issues that helped to develop initial coding.

The second step was organizing the data in a meaningful and systematic way by generating initial codes[43], thereby reduce the data into small meaningful chunks (*see* Appendix XII-Code book). Coding is to some extent dictated by whether an inductive[44] or deductive approach is used. In this study, deductive/theoretical/ thematic analysis was used. Hence, the segment of data that is relevant to or captured something that addresses the research questions was coded. Although we had a general coding frame developed based on analytical preconceptions, we also used open coding thereby the codes were added, modified and enriched while working through the coding process. The next step was collating and sorting all the relevant coded data extracts into themes (with working title). Tables were used to help the sorting into overarching themes and sub-themes. Next was reviewing and refining the themes to check for their meaningful internal consistency and external heterogeneity or distinctiveness. Here validity and 'accurate' representation of individual themes (i.e. whether it works in relation to the data set) was also checked. In the fifth step the themes are defined and further refined. In doing so, a detailed analysis was written for each theme by identifying the essence of what each theme is about and what aspect of the data each theme captures. Lastly the results were written from the analytic narrative by capturing similarities and differences, and confirming and disconfirming evidences.

[42] A theme is something that captures a specific key idea about the data in relation to the research question and represents some level of patterned response or meaning within the data set (Braun & Clarke's, 2006).
[43] A code is the most basic segment or feature of the raw data that is often narrower than theme yet meaningful and appears interesting to the analyst regarding the research questions (Braun & Clarke's, 2006).
[44] Inductive thematic analysis follows line-by-line coding of every piece of text in every single line; and the coding is done without trying to fit into a pre-existing coding frame or researcher's analytical preconception thereby the research questions evolve through the coding process (Braun & Clarke's, 2006).

The data collected from secondary sources were analyzed using deductive content analysis[45]. For this a general coding frame was developed based on the research issues to be addressed. Then repeated reading of the documents was done. While reading, notes and headings were written on the margin based on the coding frame. Thus, information that captures or addresses the research issues was coded. Afterward the headings were collected to a coding sheet and categories/themes were generated by naming each category using content-characteristic words. All the headings pertaining to particular category were assembled and summaries were written for each category. Then by exploring and uncovering patterns within and among the categories the results were synthesized and meaningful inferences were drawn.

To analyze stakeholders' level of interest and power of influence in the management of wetland resources stakeholders were systematically represented in 2X2 interest-influence matrix, following De Lopez (2001), Reed *et al.* (2009), Aapaoja and Haapasalo (2014); Hailu *et al.,* 2017 and Smrekar *et al.,* 2020. In this dissertation stakeholders' interest refers to the position and the priority the stakeholders ascribe to conservation and management of wetlands, whereas stakeholders' influence refers to the power they possess or entitled to access, control, allocate and manage resources. In developing the interest-influence matrix the researcher adapted criteria developed by previous related studies (Hailu *et al.*, 2017; Vogler *et al.*, 2017). As it has been briefly explained in section 3.4, a four point Likert scale with weighting of 1 to 4 ("Very low", "slightly low", "slightly high" and "very high") was used to rate the scores of the stakeholders' responses for the eight items used to assess stakeholders' interest as well as for the eight items used to assess stakeholders' influence. Accordingly, the maximum total score in each scale will be 32 (4*8). By taking half of the maximum possible TS, i.e. 16 as a demarcation, TS $\leq$ 16 was labeled as 'low' whereas TS > 16 was labeled as 'high'. The use of the matrix was intended to consider the stakeholders' relative level of interest in the management of the wetlands versus their relative level of

[45] Deductive content analysis is used when the structure of analysis is operationalized on the basis of previous knowledge. A deductive approach is based on an earlier theory or model/framework/ and therefore it moves from the general to the specific. Inductive content analysis, on the other hand, is used in cases where there is no enough former knowledge or studies dealing about the phenomenon or when it is fragmented. An approach based on inductive data moves from the specific to the general, so that particular instances are observed and then combined into a larger whole or general statement (Burns & Grove, 2005; Elo & Kyngas, 2007).

influence. The visual representation of stakeholders in the interest-influence matrix makes it easy to show in an understandable way which stakeholders demand the most attention in policy formulation and decision-makings (Smrekar *et* al., 2020).

Each stakeholder group in the matrix (Figure 3.5) is assumed to have a different engagement form in management of wetland resources. The stakeholders located in the upper-right quadrant represent the "Key players", i.e. stakeholders with high interest and high influence/power. They are the ones that should be involved and consulted regularly. Stakeholder groups that have high interest but low power are referred as "Subjects". They are affected by the wetland and are eager to influence the process of wetland management but they do not have power to change decisions. By definition they are supportive, yet they lack the capacity for impact. They could be influential by forming alliance with other stakeholders. Stakeholders that have low interest but high power are "Context setters". They affect the wetland management but they have little interest; hence, they may be a significant risk, and should be monitored regularly. The "Crowd" represents stakeholder groups with low interest and low power over desired outcomes, hence there is little need to consider them in much detail or to engage with them (Reed *et al.*, 2009; Smrekar *et al.*, 2020).

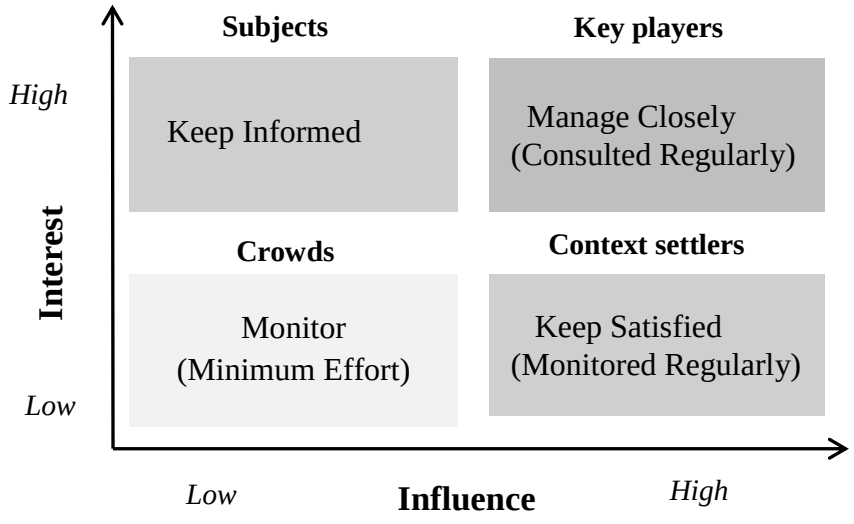

Figure 3.5 Interest-influence matrix used to visualize stakeholders with different levels of interest and influence in wetland management; *Source*: Adapted from Reed *et al.* (2009) and Smrekar *et al.* (2020).

CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents the findings of this dissertation complemented with discussion of empirical findings of previous related studies. The first section of the chapter explains findings on households' knowledge of wetlands and their ecosystem services as well as households' attitude and participation intention to management of wetland resources; and at first it gives brief description of the background - demographic and socio-economic-characteristics of household respondents. Section two reports the findings on households' wetland management behavior and its determinants. Section three presents the economic value of wetland ecosystem services and the determinants of households' preferences for wetland management plans. The fourth section discusses stakeholders' perspectives regarding wetlands, interests and influences, roles and responsibilities and their synergy in management of wetland resources as well as their views on the capacity and functionality of existing institutional arrangements that guide management of wetland resources.

4.1. Households' Knowledge, Attitude and Intention of Wetland and its Management

4.1.1. Background Characteristics of Household Respondents

Descriptive statistics for demographic and socio-economic characteristics of the survey households showed that 67.4% are male-headed households while 32.6% are female-headed[46]. The age of the sample households ranges between 20 and 80 with a mean age of 39.59 and SD of 10.6. It is also found out that household heads of young age[47] constituted 40.5% of the samples while those in the middle age and old age groups accounted for 53.1% and 6.4% respectively. About 66% of sampled households are married, while widowed, divorced and polygamy accounted for about 17%, 10.9% and 5.4%. Among the sample population the household sizes ranges from 1 to 19 with an average household size of 6.69 and SD of 2.4. It is noted that the mean household size is above the national average of 4.7 persons per household (CSA, 2008). The finding for educational status in years of schooling revealed that the highest level of education among the study population was secondary education; and average highest grade attended is 5.7. Typically, the educational attainment

[46] This figure of female-headed HHs might be attributable to the prevalence of polygamy in the study area

[47] Young aged (age 20-35), middle aged (age 36-55) and old aged (age above 55); after Adem (2017)

of the households drops with the rise in the educational level. Accordingly, household heads who attended secondary (Grade 9-12) education constituted 12.6% while those who attended primary (Grade 1-8) education and those who didn't attend formal schooling represented 52.6% and 34.8% respectively.

Households that accounted for about 54% were residents of Lake Ziway bordering *Kebeles*, while 46 % of the households live in Lake Abijata bordering *Kebeles*. The finding for occupational type revealed that households who are engaged in farming accounted for 96% of whom the majorities (87%) have farming experience of more than 10 years. Slightly more than half (53%) of the households have off-farm job by which they eke out their living. Of the total 405 households considered in this study 99.5% own farmland[48]; with average farmland holding size of 1.78 hectares, which is slightly higher than the national average of 1.17 (FDRE, 2005c). Households who own farmland that is converted from wetlands made up 7.9%, and almost all of them are living in Lake Ziway area. Regarding livestock, a very large proportion (95.3%) of the sample households own livestock of different kind; with mean livestock holding in Tropical Livestock Unit (TLU) of 3.68. The study result further revealed that of the total households who own livestock more than half (51.6%) of them usually feed/graze their livestock around Lakesides or wetlands implying that wetlands are the main source of feed. The sample households travel on an average 46.82 minutes from their home to the nearest age of the lake or wetland. Based on estimated gross annual household income (GHI) (generated from farm, livestock and other income sources) the average GHI among the sample population is 22,386.8 ETB, yet the SD value suggests the wide disparity in income among the households (Table 4.6).

4.1.2. Profile of Households' Level of Knowledge, Attitude and Intention

These days management approach through participation of the local communities is recognized as a promising resource management approach for sustainability of natural resources such as wetlands. However, the success of the local communities' involvement and the management activity depends on the communities' knowledge of wetlands and their

[48] In Ethiopia, land is under the ownership of the state, and the farmers have holding right. Hence, in this study for the sake of clarity, we used the term 'own land' to refer 'household's holding of land'.

ecosystem services[49] as well as communities' attitude and intention to the management of the resources. Hence, understanding these behavioral factors, i.e. the communities' knowledge about wetlands (and their ecosystem services) as well as their attitude and participation intention to the management of wetlands is useful to design the required intervention measures that enhance locals' participation in the management of wetland resources. This sub-section and the next sub-section (section 4.1.3) present the findings and discussions on these issues.

The findings of the study depicted that, the mean of the households' TS for the knowledge test is 10.92[50] with SD of 5.21. The study result for the overall knowledge about wetlands and their ecosystem services depicted that more than half of the survey households (55.6%) showed high knowledge level (Figure 4.1). However, from the analysis it is also evident that the proportion of households with low level of knowledge (23.2%) is not small. The SD value (5.2) attests that there is a visible difference in the level of knowledge among households. Other studies for example, Birhanu (2014) and Adem (2017) have also revealed disparities in the levels of knowledge among their study populations. Such disparities may be attributed to individuals' differences in terms of demographic, socio-economic and environmental factors. Despite the expected variation, which can be caused by different factors, the proportion of households with a low level knowledge, in the present study, suggests the need for intervention measures to enhance the knowledge level of the locals or the households about wetlands and their ecosystem services. This is because as Frick *et al.* (2004) documented, although it is not always the case, knowledge is essential for successful action and seen as a necessary precondition for a person's action. Ntongani *et al.* (2014) also argued that in wetland resources management local knowledge of the ecology of wetland ecosystems is very useful among wetland users and stakeholders, as it can be integrated with scientific knowledge in order to introduce better conservation and management strategies of the wetland ecosystems.

[49] Ecosystem services encompass both tangible and intangible benefits, sometimes referred as "goods" and "services" that humans obtain from ecosystems (MEA, 2005b).
[50] To recall: 17 is the maximum possible TS (Total score) in the knowledge test items.

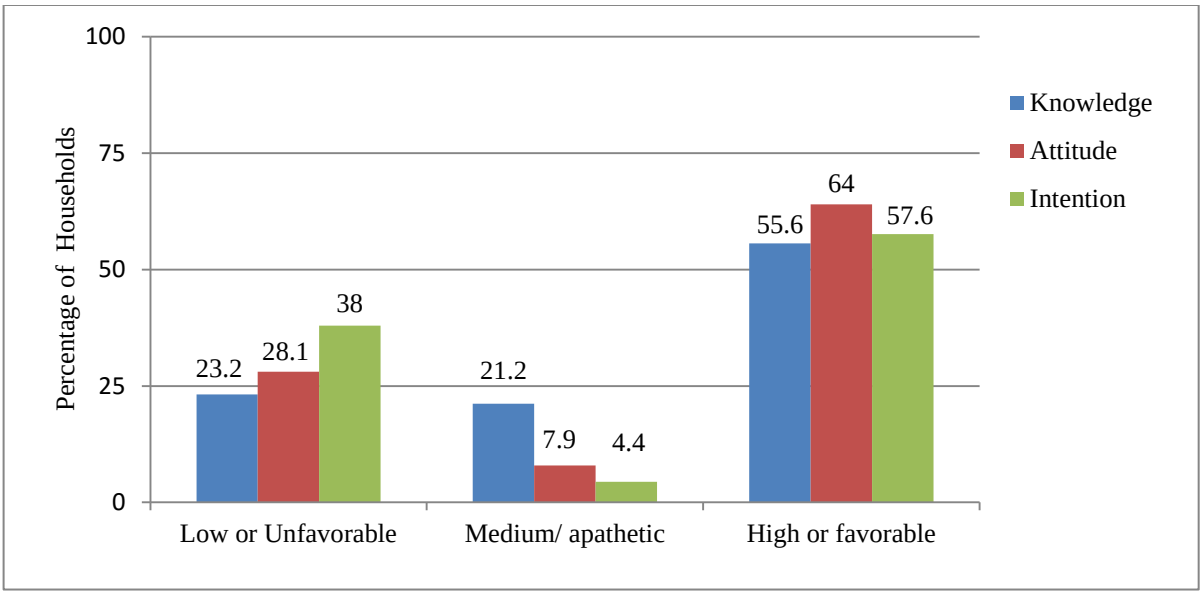

Figure 4.1 Households categorization based on level of knowledge, attitude and intention
Source: Own survey, 2017

A closer look at the households' responses to the knowledge test items further tell that households' knowledge about wetlands was relatively better than their knowledge about the ecosystem services of wetlands. As it can be noticed from Table 4.1 higher proportions of households responded correctly to the questions about the nature of wetlands or what wetlands are (items K1, K3, K5, K9, K15, K17 and K19) than to the questions about ecosystem services of wetlands. For each of the items that address the ecosystem services of wetlands (K2, K4, K6, K7, K8, K10, K11, K12, K16 and K18) a fairly large proportion of households responded incorrectly. This suggests that households have poor grasp of the ecosystem services of wetlands. The low level of knowledge, about the ecosystem services of wetlands, is possibly attributed to the fact that some of the households do not acquire benefit from the wetland ecosystems. This is because, typically, it is expected and apparent that a person who acquire some sort of benefit from a given resource know well about the values of that resource opposed to one who does not acquire any benefit. As the descriptive finding from this study revealed around 20% of the studied households reported no benefit gain from the wetlands, and so there is less possibility for these households to realize the ecosystem services of the wetlands. Moreover, as the statistical finding from the Independent sample t-test analysis revealed (in section 4.1.3, Table 4.5) revealed there is a

statistically significant difference in the level of knowledge between households who reported any benefit gain from the Lakes and associated wetlands and those who did not.

Table 4.1 Results of households' responses to the knowledge test items

	Items (Statements)	Proportion of households	
		Respond correctly (%)	Respond Incorrectly (%)
K1	Wetlands are lands periodically or permanently covered by water.	69.1	30.9
K2	Wetlands provide fertile soils for the cultivation of crops during dry season.	59	41
K3	Wetlands are wastelands.*	70.6	29.4
K4	Wetlands provide habitats for a wide variety of animal and plant species.	57.3	42.7
K5	Draining wetlands speed up the drying of the ecosystems.	71.9	28.1
K6	Wetlands retain sediments and thus protect siltation of lakes or dams.	55.1	44.9
K7	Wetlands have residual moisture that can support production of crops.	58.5	41.5
K8	Wetlands filter pollutants and help us to get clean water.	58	42
K9	Conserving and preserving wetlands offer no advantage or benefit.*	72.1	27.9
K10	Wetlands control flooding since they hold floodwaters back and keep rivers at normal levels.	58	42
K11	Wetlands serve as sources of water or fodder for domestic and wild animals.	56.4	43.6
K12	Wetlands play a great role in regulating the local climatic condition.	53.2	46.8
K15	Wetland ecosystems can easily be degraded and loss their natural characteristics due to overstocking or year-round grazing in the wetlands.	67.9	32.7
K16	Restoring wetlands around lakes would help to improve water quality of the lakes.	54.2	45.8
K17	Unlimited accesses to a lake and associated wetland ecosystems will lead to disappearance of these ecosystems.	69.9	30.1
K18	Improving wetland management has recreational and scientific values.	52	48
K19	Release of fertilizers, herbicides and pesticides from agricultural land to wetland areas could reduce water quality and affect aquatic lives.	68.4	31.6

Source: Own survey, 2017; *Note*: *negatively worded items

The study has also tried to examine households' knowledge about the different ecosystem services of wetlands. MEA categorized ecosystem services in to four- provisioning, regulating, cultural and supporting; recognizing some overlaps and linkages among the categories. Due to the overlaps and linkages, in the present study, it was difficult to infer from the survey result regarding households' knowledge about wetlands services with respect to each of the four categories of ecosystem services. For instance, item K2 (Table 4.1) ('wetlands provide fertile soils for the cultivation of crops during dry season') relates to

the categories of both provisioning in terms of soil provision for food production and supportive in terms of soil formation service. Although difficult to deduce, the finding from PRA discussions (Table 4.2) provide better information regarding the local communities' knowledge about wetland services with respect to the four ecosystem service categories.

Table 4.2 Summary of the ecosystem services of wetlands mentioned by PRAs participants

Ecosystem service categories	**Ecosystems services mentioned by PRAs participants**
Provisioning: good/products/ provided by wetlands	• water for consumptive uses like domestic, irrigation/farming , animals watering and industries; • use of small grass for animal feed and long grass of different type (such as, papyrus, sedge locally called *Filla or Aware or Gubo*) for roofing as well as to generate income by selling; • extraction of salty soil (locally called *Boji*) for animal feed and sand to generate income by selling; • fish and other animals (such as Duiker and Antelope/Bushbuck/) for food; • wood as an input for house building, fencing, fuel and to generate income by selling; • water for non-consumptive uses like transportation; medicinal values (eg. heal wound); • ornamental values of different types of plants (like papyrus, sedge) and skins of wetland animals such as hippopotamus • farming mainly vegetable production on the fertile soil of the lake retreat areas
Regulating: benefits obtained from ecosystem regulation process	• local climate regulation (cooling of atmospheric temperature) • control formation of siltation in lake
Cultural: non-material benefits from wetlands	• tourism values • aesthetic values reflected by the wide diversity of wetland bird species, wildlife and vegetation; • outdoor recreation/ spending leisure time for local communities
Supporting: services necessary for the production of all other ecosystem services	• habitat for birds and aquatic lives • fertile soil of the lake retreat areas for farming • erosion control/ holding silts back from entering to the lake

Source: Synthesized from own qualitative field data, 2017

From the findings of the PRA discussions, it is plausible to reckon that, the local communities likely have better knowledge about provisioning services of wetlands, as opposed to other ecosystem services. Moreover, participants have better know-how about direct/consumptive/ use values of wetlands- goods which can be extracted and consumed

directly, as opposed to non-use values. Non-use values are benefits that wetlands provide which do not involve the use of them in any way, directly or indirectly. The most important of such benefits are their intrinsic values; such as, biodiversity, cultural heritage, aesthetic, religious and bequest; despite their current or future use possibilities (De Groot *et al.*, 2016).

With regard to the level of attitude the descriptive analysis showed that, the maximum and minimum TS among the survey households were 89 and 24 respectively. The mean for households' TS of attitude was 66.08, which is higher than 57 (the mid-point value between the lowest (19) and the highest (95) possible TS). Congruently, the maximum and minimum TS for households' participation intention were 89 and 23 respectively. The mean for households' TS of intention was 57.27, which is slightly higher than 54 (the mid-point value between the lowest (18) and highest (90) possible TS). Despite these mean values, the SD values of attitude (14.69) and intention (14.93) suggest the wide disparity among households in their level of attitude and intention, which could be attributed to individuals' difference in terms of demographic, socio-economic and biophysical factors. Further analysis based on individuals' MS in the constituent items of attitude and intention scales showed that, households with favorable attitude and high participation intention towards the management of wetlands accounted for 64% and 57.6% respectively (Figure 4.1). Despite these, it is also apparent that the proportions of households with unfavorable attitude (28.1%) and low level of intention (38%) is not quite small. These figures of unfavorable attitude and low intention to the management of wetlands call for due attention owing to the recognition, in many studies and theories (Ajzen, 1991; Ajzen, 2005; Bagherian *et al.*, 2009; Bagherian *et al.*, 2011; Macura, 2011; Suwarto, 2013), about the important role of attitude and intention to the management of natural resources, among others are wetlands.

To have an added understanding about the attitude of the households to the management of wetlands the households were asked whether or not they need the sustainability of wetland ecosystems; and the reason for their preference. The overwhelmingly majority (403 households of the total 405) opted for sustainability of wetlands. However, among the 403 households, only 31.8% favored the establishment of protected areas or preservation as forested lands. The majority (around 68.2 %) of the households prefer the sustainability of

wetlands in order to maintain and be able to use the wetlands for farming or grazing purpose, in the future. This seems to confound with their preference for sustainability of wetlands. Given their preference is the sustainability of wetlands; what was typically expected is their support for protection and conservation of wetlands. However, owing to the fact that the lakes and associated wetlands, particularly that of Lake Ziway, were their major source of water and fodder in the past times, they need to maintain the use of these resource for the future. This is also substantiated with the findings from the PRA discussions that most participants asserted the need for conservation of wetlands; so that they can extract more, in the future, from these resources.

The descriptive analysis results for the households' responses to few of the Liker scale questions in the attitude construct attest the above findings. Around 54.3% of the households agree with the idea that 'people should be allowed to farm in any part of the wetlands.' Only about 38.3% of the surveyed households opposed restriction on the use of fuelwood from the trees of the lakeshore area. Likewise, around one third (33.5%) of the households have responses of 'disagree' and 'strongly disagree' for the question which state 'uncontrolled livestock grazing around lakes and associated wetlands should be prohibited', implying their negative attitude for the prohibition of uncontrolled livestock grazing. Most PRA participants were not also in favor of restricted use or area closures on the argument that, for many years in the past the wetlands had been places where they freely access and collect resources such as grass, sand, salt soil (*Boji*), water, firewood and graze their animals. These findings suggest that although the majority of the survey households preferred sustainability of wetlands, their truly need is for immediate livelihood and economic benefits than for sustainability. Concurrent with this, in a study of the environmental concern of coastal residents to management of coastal zone in Ghana, Lawson (2014) revealed that the main environmental concerns of the coastal residents were linked to their desire for better living condition.

To better capture the households' intension to the management of wetlands, in this study, the researcher has also made a closer look at the responses of the households to the Likert scale questions that were used to assess the intension to participate in conservation and

management of wetland resources. As Zhang and Lei (2011) noted an individual's intention to participate in resource management can happen in different forms, among others are the willingness to reduce negative impact activities, and the motivation or willingness to engage in or provide support for resource conservation and restoration activities. In the present study, as the descriptive analysis revealed, 43.5% of the households revealed their opposition to the question that asks their willingness to accept limitation imposed on the amount of fodder extracted from the grasses around the wetland or lakeshore area. Almost similar proportion (41.2%) of the households also hold similar stand for the question on the willingness to accept restriction imposed on the use of wetland areas for farming purpose. Opposed to this, for the question that asks their willingness to farm in any of the wetland area, the proportion of households who reported to 'disagree' and 'strongly disagree' add up to only 19% while 75.6% responded 'agree' and 'strongly agree'. Although these are negative impact activities, it seems that most households are not willing to reduce these activities. These findings on the households' intention to the management of wetland resources could be attributed to the fact that for the overwhelmingly majority of the households (96%) the main source of livelihood is farming, which in one way or another demands them to keep on such motives.

In general, from the descriptive findings on the household's KAI one can understand and comprehended that most households possess good level of knowledge, favorable attitude and high participation intention. However, still considerable proportions of the households have low level of knowledge, unfavorable attitude and low level of participation intention to management of wetland resources. For better understanding of the households' KAI, on top of the descriptive findings discussed above, it is also worthy to capture the variation among households in their level of KAI that can be attributed to different demographic, socio economic and biophysical factors. As Dixon (2005) asserted Knowledge about wetlands is not possessed and shared equally throughout a society and so variance in knowledge level may occur as a result of demographic, socio-economic and geographic variables. Likewise, differences are presumed to exist among people in their level of attitude and participation intention to the management of resources (Shibia, 2010; Zhang & Lei, 2011). To examine such differences, in this study different variables were considered including demographic,

socio-economic and physical variables namely, age, sex, education, benefit, training, extension contact, knowledge, attitude intention, distance and location. The selection of the variables was based on empirical studies elsewhere, (Baral and Heinen (2007) in Nepal, Chandool, C. (2007) in Trinidad and Tobago, Shibia (2010) in Kenya, Zhang and Lei (2011) in Taiwan, Gebrelibanos and Assen (2013) in Ethiopia, Birhanu (2014) in Ethiopia, Ntongani *et al.* (2014) in Tanzania, Cobbinah (2015) in Ghana, and Adem, (2017) in Ethiopia). Hereunder is the discussion on the findings of the variation in the households' level of KAI.

4.1.3. Variation of Households' Level of Knowledge, Attitude and Intention

Among the demographic factors that partake in variance of KAI of people in a particular area is the age of individuals (Gebrelibanos & Assen, 2013; Adem, 2017). In the present study ANOVA analysis revealed significant difference in the level of knowledge about wetlands and their ecosystem services across households of different age groups (Table 4.3). In a study on farmers' environmental knowledge, attitude and awareness of in Chencha Woreda, South Ethiopia, Adem (2017) has also found difference in knowledge level among farmers of different age groups. The eta square value (η^2=0.167) reflected that age account for 16.7% of the variability in households' level of knowledge. Further examination of the Post-hoc analysis showed that households in the young age adult group have on average lower level of knowledge and differed significantly from each of the other two groups (*P<0.001)*; however, the difference between middle age and old age groups was not statistically significant (Table 4.4). In the PRA discussion with different groups of the study community it was also found that older people mentioned more ecosystem services of wetlands than young and middle age adults. This is presumably attributed to older people's longer knowledge horizon which they can obtain through their life experience and longer time observation of their environment. The result also lend support to Ntongani *et al.* (2014) that found higher age led to an increased awareness of wetland resources.

Conversely the ANOVA statistics did not reveal statistically significant differences in the level of attitude and participation intention across household heads of different age groups (Table 4.3). The eta square values also showed that age of household heads account for only 1% and 0.3% of the variability in households' level of attitude and participation intention

respectively. The result conforms to the findings by Baral and Heinen (2007) in Nepal and Adem (2017) in Ethiopia that found no statistically significant difference in environmental or conservation attitude among people of different age groups. The study finding, however, contradicts to the findings by Chandool (2007) in Trinidad and Tobago and Shibia (2010) in Kenya that showed older people have a less favorable attitude towards conservation and management than younger; and they asserted that young people may have had more exposure to environmental awareness at school.

Table 4.3 ANOVA results for differences in household's level of KAI with respect to different variables

Explanatory Variable	Dependent/Test Variable	F	Sig	eta square (η^2) value
Age	Knowledge	40.183***	0.000	0.167
	Attitude	1.960	0.142	0.010
	Intention	.610	0.544	0.003
Education	Knowledge	.986	0.374	0.005
	Attitude	1.421	0.243	0.007
	Intention	.675	0.510	0.003
Knowledge	Attitude	28.614***	0.000	0.125
	Intention	14.586***	0.000	0.068
Attitude	Intention	34.930***	0.000	0.148

***P $\leq$ 0.001 Df $_{(2, 402)}$ *Source*: Own survey, 2017

Various studies (e.g., Birhanu, 2014; Ntongani *et al.*, 2014; Adem, 2017) have indicated that education highly enhance local ecological knowledge. It is thought to impart information and so presumed to contribute for variation in the level of ecological knowledge and concern among people. In this study, however, the ANOVA results (Table 4.3) did not revealed statistically significant differences in the level of KAI among households of illiterate, primary education and secondary education groups[51]. This implies that topics on wetland issues might be insufficiently incorporated in schools' programs and curriculums. Besides formal schooling or study, the knowledge that an individual or group of community have about the local environment/resource might also be accumulated through personal observation or life experience (Birhanu, 2014; Adem, 2017); and so, peoples' attitude and intention to resources management is presumed to vary on the basis of such knowledge developed through experience. In this study, ANOVA analyses (Table 4.3) revealed

[51] Grade 12 or secondary education is the highest grade level attended among the studied households

significant differences in the level of attitude and participation intention among households of different knowledge level, a result that is consistent with Zhang and Lei (2011), in a study on wetland community's intention to participate in ecotourism in Taiwan. The Post-hoc test analyses for both attitude and intention revealed that households in the category of high knowledge level significantly differ from those in the medium and low knowledge level categories (*P<0.001*) (Table 4.4). The eta square values (Table 4.3) also showed that knowledge account for 12.5% and 6.8% of the variability in households' level of attitude and participation intention respectively. The study results highlight that the knowledge possessed by the households could be 'indigenous'[52] which have evolved and bequeathed from ancestors as opposed to the one obtained from formal schooling. Hence, these findings suggest that such knowledge is preferably imparted at a comprehensive level for the locals, to encourage positive attitude and strong intention to management of wetlands.

Studies have pointed out that besides knowledge, attitude to resource management can cause variation in participation intention. Herein Zhang and Lei (2011) noted that attitudes have positive effect on residents' feelings for local resources and also increase their willingness to participate in NRM. In the present study, ANOVA result showed significant difference in the level of participation intention across households of the three attitude categories; whereby attitude accounted for 14.8% of the variability (Table 4.3). The Post-hoc test analysis showed that households with favorable attitude significantly differ, in their level of intention, from households with unfavorable attitude (*P<0.001*) and those with apathetic attitude (*P<0.05*) (Table 4.4). The study findings suggest that identifying mechanisms to develop a more positive attitude of local people is helpful to translate such attitude to strong intention in the management of wetlands. Similar result of the influence of attitude to variation in wetland communities' participation intention to management of local resources was reported by Zhang and Lei (2011) in a study in Taiwan.

[52] Indigenous knowledge is "the systematic body of knowledge acquired by local people through the accumulation of experiences, informal experiments and intimate understanding of the environment in a given culture" Rajasekaran (1993:13). It is a knowledge system independently developed by local communities to fulfill a variety of needs and wants sustainably from the limited resources available within the ecosystem or the territory where they live (Ulluwishewa *et al.*, 2008).

Table 4.4 Post-hoc analyses results for KAI across categories of different variables

Dependent Variable	(I) Age Categories	(J) Age category	Mean Difference (I-J)	Std. Error	Sig
Knowledge	Young age adult	Middle age adult	-4.189***	.494	0.000
		Old age adult	-5.045***	1.005	0.000
	Middle age adult	Young age adult	4.189***	.494	0.000
		Old age adult	-.856	.989	0.688
	Old age adult	Young age adult	5.045***	1.005	0.000
		Middle age adult	.856	.989	0.688
Dependent Variable	(I) Knowledge categories	(J) Knowledge category	Mean Difference (I-J)	Std. Error	Sig
Attitude	Low	Medium	1.708	2.056	0.708
		High	-9.546***	1.692	0.000
	Medium	Low	-1.708	2.056	0.708
		High	-11.254***	1.747	0.000
	High	Low	9.546***	1.692	0.000
		Medium	11.254***	1.747	0.000
Intention	Low	Medium	-1.366	2.156	0.818
		High	-8.402***	1.774	0.000
	Medium	Low	1.365	2.156	0.818
		High	-7.037***	1.832	0.000
	High	Low	8.403***	1.774	0.000
		Medium	7.037***	1.832	0.000
Dependent Variable	(I) Attitude categories	(J) Attitude categories	Mean Difference (I-J)	Std. Error	Sig
Intention	Unfavorable	Apathetic	-5.191	2.763	0.173
		favorable	-12.780***	1.552	0.000
	Apathetic	Unfavorable	5.191	2.763	0.173
		Favorable	-7.588*	2.588	0.014
	Favorable	Unfavorable	12.779***	1.552	0.000
		Apathetic	7.588*	2.588	0.014

***P $\leq$ 0.001, *P $\leq$ 0.05 level. *Source*: Own survey, 2017

There is a popular wisdom in the rural society that recognizes specific roles and activities of males and females. Depending on the activities they are engaged in and their attachment to natural resources, the level of KAI varies between males and females (Chandool, 2007). In the present study, however, the independent sample t-test analyses based on sex did not present statistically significant differences between male and female household heads in their level of KAI (Table 4.5). Attesting the survey finding the PRA discussions with male and female groups of the study community also revealed that ecosystem services of wetlands mentioned by the two groups; as well as the concern and interest they have for management of wetlands are almost similar. The result conforms to the findings of De la Vega (2004); Baral and Heinen (2007) and Adem (2017) that no significant differences exist in environmental knowledge or conservation attitude and intention between male and female

study subjects. The finding, however, contradicts to the study result by Chandool (2007) that found significant difference between male and female in their attitude towards protection of Nariva swamp, in Trinidad and Tobago. In the present study, the absence of variation in households' KAI based on sex is possibly be due to similarity between male and female households in their custom of resource use from wetlands. In this regard, descriptive analysis revealed that 81% of the male and 77% of the female households reported use of wetlands for different purposes. The Chi-square text result (χ^2= 1.075; *P> 0.05*) also revealed a non-significant association between resource use and sex of households.

Based on distance from home to the lake or associated wetlands the independent samples t-test analysis revealed significant variation in households' level of knowledge between those who live in nearby areas and those who live in distant areas. The analyses for households' levels of attitude and participation intention, however, didn't reveal statistically significant differences between the two groups (Table 4.5), findings that concur with the findings in a study by Shibia (2010) on the factors that determine attitude and perception of resource use and management in Kenya. Regarding location of residence it is argued that people's level of KAI to resources and their management could vary between locations since there could be variation in the levels of resource availability, access to resources and management system (Macura *et al.*, 2011). In the present study, however, the analysis result did not reveal statistically significant differences in the households' level of KAI between those who live in Lake Abijata area and those who live in Lake Ziway area (Table 4.5). The results agree with the findings of Macura *et al.* (2011) who found no statistically significant differences in comparing attitudes toward reserved resource/forest/ management from people living under three different regimes of land tenure, resource access and management in India. In the PRA discussion, however, participants who live in Lake Abijata areas seemed to exhibit a relatively less favorable attitude and lower intention to management of wetlands. Inhabitants of these areas especially dwellers in ASLNP were complaining about loss of livelihood benefit and job opportunities due to bans on extraction of resources of the lake and associated wetlands, such as wood (used for fuel, fencing or building), sand, salt soil (*Boji*). The degraded quality and quantity of resources (e.g. lake's water, fish, grass) due to the impact of Abijata Soda Ash Plant (ASAP) was the most frequently mentioned reason

for their low intention to the management of these resources. The explanation given by an elderly man exemplifies the concern of most participants:

> *Due to degradation of the lake and surrounding Cheffe*[53] *lands, nowadays it is difficult to see different wild animals, birds, fishes and plant species in the lake and in the lakeshore. I think the Soda Ash plant is the main reason for the deterioration in the quality and size of the lake and the surrounding Cheffe lands. It has negatively affected the fish resource and other aquatic animals including birds. For many years the local peoples have observed and repeatedly reported this reality to government officials since it is beyond their capacity. However, so far no response has been given by the government and this has saddened the local community and let them to be less concerned about it.* (Male, age 62, PRA-trend analysis, *Gallefi Qello kebele*)

A key lesson from this quote is that concerned government agencies should hear the voice of the locals thereby build trust among the communities in any future actions that calls for their involvement. As Gawler (2002) asserted, unfortunately, in most situations where local communities are in a subsistence relationship with resources, their trust in government agencies is very low or even non-existent since they are hardly communicated by the government in decisions affecting their life. Thus, unless a relationship of trust between the local communities and government agencies can be established and maintained, it is less likely that the resource management regime can survive. In view of this, the finding in the PRA discussion might be an important insight for concerned body to initiate wetland resources management approach in which local people will be involved in planning and program implementation. Such strategy could maximize local communities' concern for these resources and build up a more positive attitude and stronger intention across the community. Highlighting this Gebrelibanos and Assen (2013) noted that positive attitude of locals is crucial as initial step for prevention of future resource degradation and implementation of a more viable management method.

[53] *Cheffe* is local name for wetlands

Table 4.5 Independent samples t-test results for differences in households' level of KAI

Grouping Variable	Dependent Variable	Group	N	Mean [54]	SD	t-value	P-value (2-tailed)	eta square (η^2) value
Sex	Knowledge	Male	132	10.39	5.43	-1.404	0.161	0.005
		Female	273	11.37	5.09			
	Attitude	Male	132	65.05	13.66	-.984	0.326	0.002
		Female	273	66.58	15.17			
	Intention	Male	132	55.22	14.39	.893	0.372	0.002
		Female	273	56.81	15.18			
Distance[55]	Knowledge	Nearby	195	12.14	4.65	4.687***	0.000	0.052
		Distant	210	9.73	5.45			
	Attitude	Nearby	195	67.39	14.58	1.734	0.084	0.007
		Distant	210	64.86	14.72			
	Intention	Nearby	195	56.11	15.21	-1.508	0.132	0.006
		Distant	210	58.34	14.62			
Location[56]	Knowledge	Abijata Area	185	11.49	5.71	-2.839	0.121	0.014
		Ziway Area	220	12.05	5.07			
	Attitude	Abijata Area	185	64.77	14.16	-1.651	0.100	0.007
		Ziway Area	220	67.18	15.07			
	Intention	Abijata Area	185	58.17	14.52	1.114	0.226	0.003
		Ziway Area	220	56.51	14.25			
Benefit	Knowledge	Don't derive benefit	83	8.93	5.22	-3.971***	0.000	0.083
		Derive benefit	322	11.43	5.09			
	Attitude	Don't derive benefit	83	48.58	14.33	-15.273***	0.000	0.367
		Derive benefit	322	70.59	10.94			
	Intention	Don't derive benefit	83	52.47	14.57	-3.324***	0.001	0.270
		Derive benefit	322	58.50	14.79			
Training	Knowledge	Didn't attend	299	9.60	5.28	-9.403***	0.000	0.180
		Attended	106	14.62	2.53			
	Attitude	Didn't attend	299	64.61	14.76	-3.43***	0.001	0.028
		Attended	106	70.23	13.74			
	Intention	Didn't attend	299	56.62	14.61	-1.477	0.140	0.005
		Attended	106	59.10	15.70			
Extension contact	Knowledge	Didn't have contact	293	10.31	5.51	-3.870***	0.000	0.036
		Had contact	112	12.52	3.91			
	Attitude	Didn't have contact	293	65.28	14.98	-1.837	0.078	0.008
		Had contact	112	68.16	13.75			
	Intention	Didn't have contact	293	56.94	14.78	-.708	0.480	0.001
		Had contact	112	58.12	14.34			

***P $\leq$ 0.001, ** P $\leq$ 0.01 Df $_{(403)}$ *Source*: Own survey, 2017

Benefit obtained from a given resource is an economic variable which is thought to cause variation among people in the level of KAI they have to resources and their management

[54] Mean for the TS of households in the scales of KAI

[55] Walk distance measured in minutes to walk from home to the nearest edge of the lake or associated wetlands. The categorization is based on PRA participants' labeling of a place with $\leq$ 30 minutes travel as nearby area, otherwise distant.

[56] Refers to the place where the households residence is –whether it is surrounding Lake Abijata or Lake Ziway

(Macura *et al.*, 2011; Gebrelibanos & Assen, 2013). It is argued that resources availability and benefits derived could differ across locations (Macura *et al.*, 2011) and distance from the resource (Cobbinah, 2015). Therefore, at first we examine for association of benefit gain with the location of residence (living in Lake Ziway or Lake Abijata area) and with distance from home to lake or associated wetlands. The results for Chi-square test analysis did not reveal statistically significant association between benefit and location (χ^2= .224; *P>0.05*) as well as between benefit and distance (χ^2= .953; *P>0.05*); implying that households' gain of benefit is independent of the location of their residence and distance from home to the lake or wetlands. The Independent samples t-test analyses for comparison of households' level of KAI in terms of benefit gain revealed a statistically significant difference between households who reported any benefit gain from the Lakes and associated wetlands and those who did not (Table 4.5). The variability in households' level of knowledge, attitude and participation intention explained by benefit gain is 36.7%, 27% and 8.3% respectively. It is apparent that the more benefit a household acquires from a wetland, the more know-how the household will have about the ecosystems and the services the wetland provide. Likewise, the levels of attitude and intention to participate in management of wetland resource are expected to be high for a household that acquire benefit from wetlands opposed to the household that does not. These findings got support from the findings of Chandool (2007); Shibia (2010); Gebrelibanos and Assen (2013) and Cobbinah (2015) that reported benefits gained from natural resources explained significant variance in local farmers' understanding and attitude towards conservation of resources.

Training and contact with agricultural extension workers or DAs are also thought to have a paramount importance in people's level of KAI since they are means of accessing information and creating mass awareness about resources (Badal *et al.*, 2006). The finding of the present study revealed statistically significant differences in households' level of knowledge and attitude between those who attended training and those who didn't (Table 4.5), attesting the finding of a study by Baral and Heinen (2007), on peoples' resource use and conservation attitude in Nepal. PRA discussants also pointed out some ecosystem services of wetlands such as micro climate stabilization and siltation control, affirming that they are aware of these services through the trainings they received. Conversely, the level of

intention was not different between households who attended training and those who did not. This could possibly be related to the short duration of the trainings that the majority of the households attended. Descriptive statistics showed that in the past three years only 26.2% of the sample households attended trainings related to wetland resources; and the majority (64.2%) of them claimed that the trainings they attended were of short duration- 5 days and less. The study findings therefore suggest greater efforts on training about wetlands and their ecosystem services as well as their management. Training is worthwhile for the local people to have better knowledge and understanding of wetlands; to ensure a more favorable attitude and motivate participation in management of wetlands. Herein, Adem (2017) noted that lack of organized trainings; insufficient information and poor environmental education provision are among the constraints of people's environmental knowledge.

Comparison of households' level of knowledge based on contact with agricultural extension workers revealed a statistically significant difference between those who had contact and those who hadn't. This can imply that agricultural extension workers have imparted some sort of information on wetlands and their ecosystems services. Conversely, the analysis results did not present statistically significant differences in the level of attitude and participation intention between households who had contact with agricultural extension and those who hadn't (Table 4.5). These results contradict to the study findings by Gebrelibanos and Assen (2013) that found farmers who had extension contact had higher attitude towards conservation efforts than their counterparts. The differing finding in the present study could partly be due to the limited number of extension contacts that most households experienced. In this regard, the descriptive statistics revealed that, of the total 112 households who reported to have contact with extension workers in the past three years, the majority (56.3%) had contacts for 5 days and less. This could in turn be related to distance factor that the majority (65.4%) of the households reported walk distance of 30 minutes and more from their home to the office of extension workers. Moreover, as the finding from PRA discussions and interviews with DAs of the study *Kebeles* revealed extension workers seldom talk about wetland issues; they mostly focus on technical advices on how to increase agricultural production. These facts provide enough reasons to make a claim that the

minimal focus by extension workers on issues related to wetland resources seems to reduce the role of extension contact on households' level of attitude and intention to management of wetland resources.

In general the analysis evidenced the presence of significant variations among households in their levels of KAI that are attributed to different demographic and socio-economic factors. It is therefore crucial to design different strategies, based on these factors, to enhance the local communities' KAI since these are viable for effective engagement of the locals in the management of the wetlands.

4.2. Households' Wetland Resources Management Behavior and its Determinants

In many contexts despite the recognition given for active involvement of the local communities, wetlands continue to be threatened and degraded, which is also the case in the CRV of Ethiopia. This may raise the question that 'how do the local communities behave in the management of wetlands? As Gawler (2002) argued locals' traditional practices such as voluntary restrictions on access and use can be very useful for wetland management, yet such practices do not necessarily result in the sustainability of the ecosystems, and they must be objectively assessed in light of changing population dynamics and pressure on the resources. In view of this, a study on local communities' wetland management behavior and its determinant factors can provide empirical information that can contribute to the design of appropriate intervention measures for the prevailing degradation of wetlands. Hence, this study has examined households' PEB and its determinants in the CRV lakes area of Ethiopia. The findings are discussed in the following sub-sections (4.2.1 and 4.2.2.).

4.2.1. Profile of Households' Pro-environmental Behavior

The descriptive analysis revealed that the maximum and minimum TS of households in the behavior scale were 46 and 12 respectively, with respective highest and lowest possible TS of 48 and 12. The overall MS of behavior among the survey households was 29 with a SD of 5.58. A further examination of households' level of PEB to management of wetland resources revealed that out of the total (405) survey households considered in the study, 54.1% have high level of PEB (TS $\geq$ 25), yet a fairly large proportion (45.9%) of the

households had low level of PEB (TS $\leq$ 24). Cognizant of the local communities' great role for sustainability and effective management of wetland resources, the proportion of households with low level of PEB suggests the need for measures to encourage and enhance locals' PEB.

Unlike casual visitors, the local people can easily notice changes in the status of wetlands since they are situated close to wetland ecosystems for longer time and so presumed to develop better PEB (Mulugeta, 2004). Cognizant of this, one important facet of inquiry of this study is to assess households' awareness of the changes in the status of the ecosystems in the study area, thereby examine whether their awareness of the changes corresponds to better PEB. Accordingly, household heads were asked if they have noticed any change over the past ten or more years. Here, because households' years of staying in the area highly matter, the researcher has first looked at household heads' place of birth. It was found that 281 (69.1%) of the household heads were born and were living (up to the time of data collection) in that particular *Kebele*, while the remaining 124 (30.6%) born in other place. From the latter group, the overwhelming majority (98.4%) have lived for ten years and more in their present *kebele* of residence. Based on this fact, the finding on the households' perception of the status of wetlands revealed that the majority (94.1%) of them considered the deteriorating status of the ecosystems while only 2.7% and 3.2% felt improvement and no change respectively.

Despite the fact that a very large proportion of the study subjects recognized the degradation of the wetlands, only slightly more than half (54.1%) have high level of PEB. The study result seems to have divergence in households' awareness of the deteriorating status of the ecosystems and their level of PEB to management of wetlands. These findings conform to the findings of Evangelista *et al.* (2016) that all knowledge is not always translated to actual practice/behavior. Likewise, Kollmuss and Agyeman (2002) have contended that only a small fraction of PEB can be linked to environmental knowledge. However, the finding contradict with the finding of Bagherian *et al.* (2009), a study in Iran, and Suwarto (2013), a study in Indonesia, that found individuals with greater knowledge of environmental issues are more likely to engaging in responsible environmental behaviors. The discrepancy of the

present finding with these research findings may be because the knowledge the households possess is just "system knowledge*"* and not an "action-related knowledge"[57]. According to Frick *et al.* (2004) an action-related knowledge allows people to act appropriately in situations and represents a better predictor of conservation behavior than system knowledge.

Likewise, PRA discussants affirmed that despite their claim for degradation of wetland resources, they lack incentive for conservation, management and prudent use of the resources. Most participants mentioned their frustration due to unlimited access and the ever-increasing demand to wetland resources, especially extraction of water from Lake Abijata for ASAP and from Lake Ziway for small- and large-scale irrigation farming. There were also participants who relate the degradation of wetlands to climate change and so they end up doing nothing otherwise solicit divine intercession and wait for better condition. On the other hand, some participants claimed that it is the responsibility of the government to take measure and design mechanisms for proper management of wetland resources. Similarly, Lawson (2014), in a study on local communities' attitude on coastal zone management in Ghana, indicated that majority of local resource users believed that the management of coastal natural resources is just the responsibility of the government on the argument that the monies they paid in the form of tax should be used for resource management and conservation programs. In general, it is uncontested that there is a gap between locals' realization of the degradation of the wetland ecosystems and their behavioral responses to the management of these ecosystems. There could be several factors that contribute to this, and thus investigating the factors that determine household's behavior in the management of wetland resources is imperative.

4.2.2. Determinants of Households' Pro-environmental Behavior

In studying households' PEB in the management of wetland resources, the researcher attempted to assess the determinants of this behavior. Table 4.6 presents the summary of descriptive statistics of the explanatory variables used in the MLR model.

[57] *System knowledge* is defined as "knowledge of what", that is some understanding of the natural states of the ecosystems and the processes within them, whereas *action-related knowledge* refers to "knowing how", that is to know what can be done about environmental problems (Frick, Kaiser and Wilson (2004).

Table 4.6 Descriptive summary of explanatory variables used in the MLR model

Variables	Mean	SD
Dependent Variable		
Household wetland resources management behavior (TS in behavior scale)	29.00	9.584
Independent variables		
Household head age (years)	39.59	10.59
Household head sex (male=1)	.67	.469
Household head education (years in school)	5.70	2.71
Household size (number)	6.69	2.39
Gross annual income of Household (ETB)	22386.8	15065.58
Benefit (Household derive benefit=1)	.80	.404
Off-farm job (Household has off-farm job=1)	.53	.500
Livestock owned (TLU)	3.68	3.24
Farmland size (Hectare[58])	1.78	1.41
Training on wetland (Attend =1)	.26	.440
Extension contact (Have contact=1)	.28	.448
Distance to wetland (minutes to walk)	46.82	38.43
Location (Lake Ziway area=1)	.54	.499
Knowledge about wetlands (TS in knowledge test)	10.92	5.21
Attitude to wetland management (TS in attitude scale)	66.08	14.69
Intention to wetland management (TS in intention scale)	57.27	14.93

Source: Own survey, 2017

The result of the MLR model is presented in Table 4.7. Among the 16 variables controlled in the model, eleven variables (AGE, FAMSIZ, GHI, BENEF, OFFJOB, TLU, FARSIZ, DIST, KNOW, ATTIT and INTEN) were found to be statistically significant predictors of households' behavior in the management of wetlands. Looking at the unstandardized Beta (β) coefficients (second column in Table 4.7), we can see that all the significant predictors have the expected effect on the level of participation behavior. On the other hand, the standardized Beta (*B*) values (third column) show the unique contribution of the independent variables in explaining the dependent variable- household's behavior. Looking at these values, Age is the variable with the highest significant unique contribution (*B=0.236*) followed by intention (*B=0.150*), whereas gross annual household income (GHI) made the lowest significant unique contribution (*B=0.086*). These imply that among the variables controlled in the model, the age of the household head has the greatest role in determining the households' behavior in wetland resources management while GHI has the least role. Hereunder, following Table 4.7., is the findings and discussion of significant variables.

[58] [58] The communities used a local unit of measurement *Keret* which refers to ¼ of a hectare (0.4 hectare), so herein the value in hectare is obtained by adding the farmland size reported in *Keret*.

Table 4.7 Results of MLR analysis for PEB model

Explanatory variables	*β*	*B*	S.E.	T	P-values (2-tailed)
AGE	0.214***	0.236	0.047	4.530	0.000
SEX	-1.174	-0.057	0.760	-1.545	0.124
EDUC	0.220	0.062	0.135	1.633	0.104
FAMSIZ	0.426**	0.107	0.192	2.222	0.027
GHI	0.010**	0.086	0.001	2.089	0.038
BENEF	2.256**	0.095	0.021	2.210	0.028
OFFJOB	-2.195**	-0.114	0.044	-2.602	0.010
TLU	0.288**	0.097	0.138	2.077	0.039
FARSIZ	0.565**	0.089	0.271	2.086	0.038
TRAIN	0.124	0.006	0.892	0.139	0.889
EXTCON	0.392	0.018	0.840	0.467	0.641
DIST	-0.030***	-0.122	0.010	-2.951	0.003
LOCAT	0.041	0.002	0.846	0.049	0.961
KNOW	0.261***	0.142	0.085	3.091	0.002
ATTIT	0.090***	0.138	0.027	3.290	0.001
INTEN	0.102***	0.150	0.026	3.891	0.000

Note: B= Standardized Beta, β= Unstandardized Beta; *** Significant at 1%; ** Significant at 5% level; R=.834 R^2=.696 Adjusted R^2=.675 F= 34.010 Sig = 0.000; *Source*: Own survey, 2017

Age of the household head

The age hypothesis, in this study, posits that household's level of PEB to wetland resources increase with increase in household head's age based on the premise that concern about resources increases with age. Moreover, older people have longer life (and farming) experiences that could help them to adopt new techniques of resource management and conservation. Concurrent with the hypothesis, the result shows a significant ($p<0.001$) positive effect of age on PEB. This result conforms to the findings of number of studies elsewhere (Badal *et al.*, 2006; Atmis *et al.*, 2007; Udo, 2014; Okuma & Muchapondwa, 2017). Conversely, Samuel (2017), in a study of determinants of sustainable land management practices in Jeldu District, West Shewa Zone of Ethiopia, found a significant negative effect of age. As to Samuel, this is because older farmers are less likely to engage in or adopt sustainable resource management practices that could be due to a short planning horizon of older farmers as opposed to the younger ones. Our finding suggests the need for efforts that target on younger people of the community to behave pro-environmentally in the management of the lakes and associated wetland resources. The older farmers may have

indigenous knowledge. So, one strategy to enhance the PEB of the young group can be through bequeathing indigenous knowledge from the old people to the younger generation.

Household size

The involvement of a household in resource management activity depends on the labor force available in the household. Although it is not always the case, large household size is an indicative of labor availability in a family that could have important role in resource conservation and management. The larger the size of the family the lower the work load will be to the family members, and so can get time to engage in resource management activities. Hence, households with large household size might not face labor constraint to engage in resource conservation and management activities. The study result revealed a significant ($p<0.05$) and positive effect of household size on households' PEB. Given that the labor for almost all farm and off-farm activities in the study area is generally provided by the family rather than hired labor, lack of adequate family labor could constraint household's PEB to wetland resources. In line with this Okuthe *et al.* (2013) noted that family labor assumes great importance in resource management particularly in a condition where low income constraints financial liquidity for hiring wage laborers. The present study result concur with the findings of Zidana *et al.* (2007) in Malawi; Getacher and Tafere (2013) in Ethiopia; Ranjit (2014) in Nepal; Okuthe *et al.* (2013) and Okuma and Muchapondwa (2017) in Kenya that found a significant positive influence of household size on the level of participation in resource management.

Gross annual income of household (GHI)

Gross income is one of the key variables predicting household PEB to wetland resources. In agreement with the *a priori* hypothesis GHI has a significant ($p<0.05$) and positive effect on household behavior. A plausible reason for this finding could be that economically poor people usually have high level of dependence on natural resources that could trigger higher exploitation opposed to prudent use of resources. The other assertion is that, low income for a household could constrain the ability of the household to contribute money for resource conservation and management activities; hence an increase in household's income increases participation in resource conservation and management. The present study finding is in

tandem with Bagherian, *et al.* (2009) and Ranjit (2014) who found that income has a significant and positive impact on the level of participation in resource management.

Benefit

Benefit as a dummy variable, herein refers to whether household derive any benefit from the lake or associated wetlands. In view of that, household that report deriving benefit accounted for 80% of the total sample. It is indicative that people who derive benefit from a given resource are more likely to exhibit high PEB in the management of the resource. Herein, Bagherian *et al.* (2009), in a study on the determinants of local people's participation in watershed management programs in Iran, noted that people are not expected to exhibit PEB toward resource management if they are not benefited out of their participations. In our finding benefit is a significant ($p<0.05$) positive predictor of household's PEB. The result revealed that *ceteris paribus* household that derive any benefit from wetlands is predicted to score 2.256 more points for the TS of participation behavior than household that do not derive any benefit. This result lends support to the findings of related studies (Agrawal & Chhatre, 2006; Getacher & Tafere, 2013). From the findings of PRAs, however, we learned that locals' effort in the wise use and management of wetland resources depend not only on the mere generation of benefit but also the extent to which the livelihood of the household depend on these resources. In line with this Agrawal and Chhatre (2006) stated that, subsistence rather than general benefits from resources prompt greater efforts to protect and manage the resources, which mean that people make greater efforts when they assess the resource to be more useful for subsistence and livelihood.

Participation in off-farm job

Although farming is the main livelihood system for the local community in the study area, there are people that are engaged in different off-farm activities to eke out their living. In the present study it was assumed that household's participation in off-farm activities negatively influence the PEB of the household in the management of wetland resources. This is based on the assumption that households who are engaged in off-farm activities could feel secured by the income they generate from these sources, and so less likely to engage in management of wetland resources. Consistent with the hypothesis, the result revealed that household's

level of PEB is negatively ($p<0.05$) influenced by availability of off-farm job. The negative coefficient implies that *ceteris paribus* the TS for the level of participation behavior decrease by 2.195 points for household that has off-farm job. Hence, household's level of PEB to wetland resources decrease with availability off-farm income source. The study result conforms to the findings of Badal *et al.* (2006) and Samuel (2017). The negative influence could possibly be due to the fact that off-farm jobs/activities/ usually demand people to move out from village; and so households who are involved in off-farm job may encounter time and labor constraints to participate in resource conservation and management activities. Cognizant of this, promoting and creating off-farm livelihood options in their locality is recommended. This will not only enhance /or ensure/ participation, but also safeguard and improve the livelihood of people thereby eases the pressure on wetlands as many households could shift their livelihood to off-farm activities that would otherwise (totally) depend on wetlands. On the other hand, household's level of PEB could also be reduced if opportunity costs of the household increase due to availability of off-farm activities. Moreover, households that have off-farm job may feel secure by the income they generate from these sources, thereby less likely to behave pro-environmentally. Herein, Okuma and Muchapondwa (2017) noted that households employed in off-farm jobs are less likely to be actively engage in resource management activities due to possibility of exit options from farm work.

Livestock owned in TLU

Livestock is an important component of the livelihood system in the study area. The livestock owned (measured in TLU) is another variable that was hypothesized to influence the level of PEB to wetland resources. Consistent with the *a priori* hypothesis TLU has a significant ($p<0.05$) positive influence on household level of PEB; implying that household's level of PEB to wetland resource increase with increase in the number of livestock owned by the household. This is possibly because with higher number of livestock, the probability of dependence on these resources for livestock grazing and watering is high and so more PEB is a requisite for greater and sustainable availability of water and fodder. The finding mirrors the results of the works by Damena (2012); Ranjit (2014) and Samuel

(2017) that have found the number of livestock owned as a significant positive determinant of the level of participation behavior.

Farm landholding size

The size of total farmland owned by household is the other significant ($p<0.05$) positive predictor of household PEB to wetland resources. The possible reason is with increase in the size of the farmland holding, the farmers expect an increase in the benefit from management of the lakes and associated wetlands because the tendency and the likelihood to use water for irrigation or to have farmland around the wetland areas of the lakefront increases. Previous studies revealed mixed results. The findings of Okuthe *et al.* (2013) and Ranjit (2014) conform to the present study finding. On the other hands Udo (2014), in a study on determinants of farmers' participation in community-based programme in Nigeria, found a significant negative effect of farmland size that with increase in farmland size, the participation in resource management decreases.

Distance of household from the lake or wetlands

Using minutes to walk as proxy for distance from home to the nearest edge of the lake or associated wetlands, a negative influence of distance on household's level of PEB to wetland resources was hypothesized. The study result revealed a significant negative coefficient ($P<0.001$) implying that with increase in the distance from the household's home to the nearest edge of the lake or associated wetlands, there is a decrease in the households level of PEB. This is most likely because a distant household might cost more in terms of time and energy to travel and participate in resource conservation and management activities. The other plausible reason could be that it is less likely for a distant household to generate more benefit from these resources and so they could have less incentive for PEB. The study result concurs with the findings of Getacher and Tafere (2013), Ranjit (2014) and Okuma and Muchapondwa (2017), studies in Ethiopia Nepal and Kenya respectively.

Knowledge of wetlands and their ecosystem services

On a premise that knowledge of an issue is an important reason to act in a particular way; we hypothesized that household's PEB to wetlands is influenced by the level of knowledge

of wetlands and their ecosystem services. The study finding revealed a significant (*P<0.001*) positive influence of knowledge suggesting that better knowledge of wetlands and their ecosystem services enhances PEB to wetlands. The finding is consistent with theories and empirical works. It corroborates with TPB which posit: human being usually behave by considering available knowledge and information (Ajzen, 2005). In the linear models of PEB environmental knowledge is thought to lead to positive environmental behavior (Lawson 2014). The finding is also in tandem with works of Bagherian *et al.* (2009) and Suwarto (2013) that found individuals with greater knowledge of environmental issues are more likely to engaging in responsible environmental behaviors.

Attitude to wetland resources management

Attitude to wetland resources management is the other variable that significantly (*P<0.001*) and positively influence household's level of PEB to wetland resources. This result is consistent with the premise of TPB that states, with a more positive evaluation of a behavior the strongest will be the behavior (Ajzen, 2005). The finding is also in tandem with the results of Bagherian *et al*. (2009; 2011) and Suwarto (2013) that found a significant positive impact of attitude on the level of participation in resource management, in their research in Iran and Indonesia respectively. Our study findings from PRAs however revealed a conflicting result that the knowledge and attitude is not in unison with PEB. Herein, Kollmuss and Agyeman (2002) noted that people's behavior is sometimes in conflict with their professed knowledge and attitudes. In the present study PRA discussants of fisher men groups, for example, stated that despite their knowhow about the detrimental effect of using monofilament fishnet (narrow mesh size) and despite its use being penal, some people still use the fishnet. Some participants, particularly residents of Lake Ziway area, have also stated that although they perceive the negative impact of large scale irrigation farming on the Lake and associated wetlands, they rent out their farmland of the lakeshore area for large scale irrigation farming to generate income for their living. There were also participants who claim farming in the lake retreat areas since these areas are more productive and need less effort to irrigate. Moreover, most PRA discussants affirmed that rather than using the 'cut and carry' method of feeding their animals, they usually prefer to freely graze in the wetland areas. Although the locals know and believe that such practices are threatening for

sustainability of wetlands, they still claim these practices. According to their argument this is because of community's urge to meet livelihood. Hence, this could be an important area of policy interventions by which alternative livelihood options need be designed.

Intention to participate in wetland resources management

Participation intention in management of wetland resources was hypothesized to positively influence household's level of PEB to management of wetland resources because with higher level of willingness and motivation to perform an activity the more likely is to perform. Verifying the *a priori* hypothesis, the study results revealed a significant ($P<0.001$) positive influence. This finding corroborates the assertion of the TPB that the stronger the intention to engage in a behavior, the higher is the performance because people usually behave in accordance with their intentions (Ajzen, 1991, 2005). Albeit empirical evidences on the predictive ability, in a linear relationship, of knowledge and attitude on PEB, the TPB theorized that intention is the immediate antecedent of an overt behavior, hence the influence of both knowledge and attitude on a given behavior is mediated by intention. Affirming this, Kitzmuller (2009) also noted that environmental knowledge is shown to have an indirect effect on PEB. Hence, the present study was also interested to examine the mediation role of intention in the relationship between knowledge and PEB as well as between attitude and PEB. The mediation effects of intention were examined by the Sobel Mediator Test analyses (Table 4.8 and Table 4.9).

Table 4.8 Mediation effect of intention in the relationship between knowledge and behavior

	Test Statistics	Std. Error	*p-value*
Sobel test	4.68916563	0.03533464	0.00000274
Aroian test	4.66551965	0.03551373	0.00000308
Goodman test	4.71317482	0.03515465	0.00000244

Source: Own survey, 2017

Table 4.9 Mediation effect of intention in the relationship between attitude and behavior

	Test Statistics	Std. Error	*p-value*
Sobel test	4.46682902	0.01393177	0.00000495
Aroian test	4.54484356	0.01399916	0.0000055
Goodman test	4.58913666	0.01386405	0.00000445

Source: Own survey, 2017

The result of the Sobel Mediator Test revealed statistically significant results for both knowledge (*P<0.001*) and attitude (*P<0.001*) suggesting the presence of mediation effect. These imply that, households that have high level of knowledge about wetlands and their ecosystem services or a more favorable attitude to management of wetlands will possess high level of PEB provided that they have high participation intention. This result therefore supports the idea posited by the TPB that intentions are close antecedents of overt actions, so that tendencies to perform particular behaviors can indeed be well predicted from corresponding behavioral intentions. Hence, the mediation effect of intention in the relationship between knowledge and PEB as well as between attitude and PEB implies that knowledge and attitude have more of an indirect effect. In the works of Kollmuss and Agyeman (2002) and Kitzmuller (2009) environmental knowledge is also shown to have an indirect effect on PEB. Kollmuss and Agyeman (2002) particularly claim that only a small fraction of PEB can be linked to environmental knowledge. However, as Kitzmuller (2009) argued although there is no direct influence of knowledge, it is a necessary variable because peoples' pro-environmental action is only possible if they know what they can or could do, and hence without knowledge, there will be no chance to act in an environmentally friendly way. Based on the present research findings the researcher have a strong conviction that the PEB of the local communities to the management of wetland resource cannot be enhanced by targeting on one or two of these factors, rather it is highly recommended to design measures that enhance the locals' knowledge, attitude and participation intention.

In general, the study findings revealed that household's PEB is significantly influenced by a number of demographic, socio-economic and physical factors. The findings suggested the need to devise strategies to reinforce locals' PEB to management of wetland resources of the

study area. However, while designing strategies to enhance local's PEB, equally important is to know the economic value the locals ascribe to wetland resources. This is because most development decisions are made based on economic ground, hence any intervention measure that need to be taken to foster and enhance local's PEB needs information on the economic values of wetlands.

4.3. Economic Value of Wetlands' Ecosystem Services

Like most wetlands elsewhere the socio-economic and ecological services of wetland resources in CRV of Ethiopia are manifold, but they are under threats of severe degradation. Proper management and conservation measures are therefore pressing to reverse degradation and ensure sustainability of these resources. To design proper and feasible program for management of wetland resources, it is imperative to examine the value of these resources in monetary term. In the absence of information on the economic/monetary/ values of wetlands, the importance of these ecosystems has often tended to be neglected among policy and decision-makers in conservation and management activities. Given the prevalence of degradation of the wetlands of CRV lakes, a study on economic values of wetlands is imperative and timely to initiate better-informed, more efficient and sustainable wetland management measures. The sub-sections that follow discuss the findings of present study on these issues.

4.3.1. Households' View on the Degradation of Wetlands and the Need for Management

Various studies (Jansen *et al.*, 2007; Ewnetu *et al.*, 2013; Temesgen *et al.*, 2013; Pascual-Ferrer *et al.*, 2014; Mengesha *et al.*, 2015; Abera, 2016; Gebretsadik & Mereke, 2017; Girmay *et al.*, 2017; Elias *et al.*, 2019) in the CRV region documented that the lakes ecosystems as well as associated wetlands and the biodiversity they support are highly degraded, and they attribute the degradation to different human and anthropogenic causes. Owing to this, the researcher was interested to capture the view of the local communities about the status of wetlands, the causes of the resources' degradation as well the need for management. This is on the assumption that households' realization of the status of wetland resources, their level of degradation and the need for management can partly dictate households' preference and WTP for the improvement of these resources.

Descriptive result of the household survey showed that out of the total 403 sample households who reported ten or more years of residence in the locality (the *kebele* of data collection), the overwhelming majority (94.1%) asserted that the wetland resources of the area are deteriorating. In a multiple responses question about the causes of wetland degradation, many household heads (69.4%) mentioned climate change as a cause followed by different human activities. Among the reported human related factors were overgrazing (59.8%), conversion to farmland (40.7%), water extraction (39.5%), expansion of settlement/population growth/ (20%), release of waste (11.6%) and deforestation (8.1%). From this it can be understood that the households recognize that different human activities in the area are adversely affecting the wetland resources. Various studies (Schuyt, 2005; Ali, 2007; Abebe *et al.*, 2014) have also revealed that such human activities impose unbearable impact and severe threat to wetlands. As it can be noticed from the households' responses among the human related factors overgrazing was reported by a great number of the household respondents, as a causal factor. The fact that the livelihood system in the area is mostly mixed farming may contribute to this. The survey result also revealed that of the total 386 households who own livestock 51.6% of the households mostly feed their livestock around the wetlands or Lakesides, which implies that wetlands are the main sources of feed for the livestock.

The findings of interviews with the DAs as well as the informal talks with the residents of the sample *kebeles* during the field observation revealed that the limited attention given by the government to these resources is a very critical factor that contributes to the degradation of the wetland resources. The PRAs discussants have also highlighted the absence of consistent and noticeable arrangement from the government or among the local community on how to enhance proper management and sustainable use of the resources. Likewise, about 69% of the sample households claimed the absence of sound management strategies of the resources. There seems to be no defined responsible body and institutional frameworks that govern these resources since the area gives right for unlimited use and exploitation of the resources of the lakes and associated wetlands, including water, grasses, fish and sand. The reason for this possibly be the lack information on the monetary values of wetlands, and hence they are left as free resource for anyone to use them. In line with this Smrekar (2020)

noted that the nature of wetlands is still considered, especially in southern countries, as free capital in development options, and the water component of wetlands captures interest for purposes of irrigation, water supply, tourism, industry, etc. As most DAs suggested because these ecosystems have multiple services, there need to be intervention measures of conservation and proper management to safeguard the resources from further degradation and loss. Herein, the researcher has strong conviction that valuation of wetlands can give better information for resource planners about the value of the resources, and so to justify spending on management and conservation of them.

4.3.2. Households' Preference for Wetlands Attributes

The descriptive statistics result from the responses of the CE analysis[59]revealed that 89.6% of the sample households have chosen wetland improvement plans (plan 1 and 2) implying that the majority of the households favors a policy change for the improvement of wetland resources. Studies of Carlsson *et al.* (2003) and Abebe *et al.* (2014) confirmed that wetland improvement plans are highly favored by majority of wetland community. Table 4.10 presents descriptive statistics for households' responses in the CE.

Table 4.10 Summary of households' response in Choice Experiment

Responses in CE	Frequency	%
Status quo	252	10.4
Wetland improvement plan 1	1008	41.5
Wetland improvement plan 2	1170	48.1
Total	2430	100

Source: Own survey, 2017

The analysis results of the basic MNLM results, in Table 4.11, have shown that the wetland attributes- biodiversity, water availability and recreation[60]- are statistically significant at 1% level. This suggests that the attributes selected for the study were important factors in the households' choice of wetland management plans. The positive sign of the coefficients imply that, *Ceteris paribus,* improvement in the levels of these attributes increases

[59] Because wetlands are multi-attribute ecosystems, the valuation method used is choice experiment (CE) method which is a multi-attribute valuation method (*see* section 2.2.2., for detail).

[60] The descriptions of these attributes and the method of selecting the attributes and their levels have already been given under section 3.5.2.1.

households' probability of choosing wetland improvement plans over status quo. The finding from PRA discussions revealed that local communities expect socio-economic and ecological benefits from wetland resources in terms of, for example, animal feed, fuelwood consumption, grass and wood for construction, water for domestic and farming use, fish for consumption and sale, job opportunity, recreational use, and improved climate. Hence, they recognize that conservation and management of wetlands needs high attention. In conformity with our findings previous studies (Carlsson *et al.*, 2003; Birol *et al.*, 2006; Birol *et al.*, 2008; Dahmardeh & Shahraki, 2014) have shown the significant positive impact of wetland attributes on the choice probability of wetland management plans.

On the other hand, the payment attribute has a significant ($p < 0.001$) negative coefficient that infers the probability of choosing an alternative decrease with higher payment level, *Ceteris paribus*. This is consistent with the demand theory indicating that households prefer alternatives with lower payment rate to that of higher payment rate. The finding also mirrors the results of several wetland valuation studies elsewhere (Carlsson *et al.*, 2003; Birol *et al.*, 2006; Birol *et al.*, 2008; Dahmardeh & Shahraki, 2014; Yimenu & Rao, 2015). For ASC we found a significant ($p < 0.05$) positive coefficient which implies that a positive utility impact occurs as we move away from the status quo. So, design of wetland improvement plan in any move away from the status quo significantly adds to the households' or wetland communities' utility from the wetlands. The result supports the findings by Birol *et al.* (2006) and Birol *et al.* (2008), in a study in Greece and Poland respectively, which revealed welfare improvement in any plan further than the status quo. Contrary to this Yimenu & Rao (2015), in their study on the economic analysis of household preferences for wetland attributes in Lake Tana wetlands, found a negative coefficient for ASC, which implies that a negative utility impact could occur in any move away from the status quo. Hence, based on their finding they underscored that care needs to be taken in designing the improvement plans so that disutility might not occur to the wetland community in the new wetland management plan.

Table 4.11 Results of multinomial logit models and random parameter logit models [a]

Variable	Basic MNLM		Extended MNLM		RPLM model		RPLM with interaction	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
ASC	0.360**	0.180	0.264	0.387	6.562***	1.771	4.285***	1.413
Biodiversity	0.668***	0.425^{E-01}	0.670***	0.426^{E-01}	1.745***	0.372	1.278***	0.222
Water avail	0.522***	0.346^{E-01}	0.523***	0.347^{E-01}	1.234***	0.255	0.879***	0.131
Recreation	0.382***	0.796^{E-01}	0.387***	0.800^{E-01}	0.296	0.169	0.234	0.144
Payment	-0.056***	0.053^{E-01}	-0.051***	0.053^{E-01}	-0.048***	0.285	-0.038***	0.201
ASC*Age			-0.406***	0.691^{E-02}			-0.843***	0.248^{E-01}
ASC*Education			0.607^{E-01}*	0.210^{E-01}			0.149*	0.635^{E-01}
ASC*Income			0.412***	0.714^{E-05}			0.100***	0.232^{E-04}
ASC*Location			0.326**	0.142			1.357***	0.497
ASC*Distance			-0.363**	0.186^{E-02}				
Derived standard deviations of parameter distribution								
ASC					2.081***	0.654	2.411**	1.031
Biodiversity					3.291***	0.765	2.092***	0.506
Water avail					2.935***	0.752	1.731***	0.379
Recreation					0.300	0.254	0.521	0.324
Log-likelihood		-991.790		-948.471		-940.840		-908.378
Pseudo R^2		0.180		0.256		0.372		0.383
Iteration completed		6		7		27		34
Number of observations		2430		2430		2430		2430

***, **, * significant at 1%, 5% and 10% level respectively; [a] The status quo is the base category; *Source*: Own survey, 2017

In the extended MNLM the parameter estimates of wetland attributes including the payment attribute mirror the coefficients in the basic MNLM in both their signs and significance levels despite minor differences in their relative magnitudes. The results are in tandem with other findings (Birol *et al.*, 2006; Yimenu & Rao, 2015) that found similar coefficients for wetland and payment attributes in both the basic and extended MNLMs. However, in this study the ASC in the extended MNLM has a positive, yet insignificant coefficient suggesting that wetland improvement plan in any move away from the status quo have positive utility impact though not significant, i.e. it may not significantly add utility to the wetland community.

Results of the RPLM and RPLM with interaction have showed that despite improvement in their relative magnitude the coefficients for biodiversity and water availability have similar

sign and significance level with the respective coefficients in MNLMs. However, the results in the RPLMs revealed significant derived SD values ($p < 0.001$) for these attributes implying that households have significant choice specific unobserved preference heterogeneity for the attributes. A key lesson here is that the RPLMs provide less restrictive information that could not be revealed in the MNLMs. The finding suggests that certain households may still prefer lower levels of these attributes. A possible reason for this finding is that households may think the improvement plans could result in restriction of resources use or area closure and so reduce their current benefits from these resources. For recreation attribute in the RPLMs we found a positive but insignificant parameter estimate denoting that recreation hardly has effect on households' choice of wetland improvement plan.

The ASC in the RPLMs has a highly significant ($p < 0.001$) positive coefficient. Hence, wetland improvement plan in any move away from the status quo enhance utility to the wetland community. However, the significant SD for the ASC is an indication that certain households prefer the current situation which could also strength the fact that 10.4% of the households choose the status quo (Table 4.10). In this respect our result coincide with the finding of Birol *et al.* (2006) and Yimenu and Rao (2015) while it deviates from the results of Birol *et al.* (2008) that found insignificant ASC. Regarding the payment variable in the RPLMs, alike the result in the MNLMs, we found a negative and highly significant coefficient ($p < 0.001$), implying *Ceteris paribus* households' probability of choosing an alternative decreases with higher payment level. In general, the findings of the MNLMs and RPLMs indicate that among the survey households positive and significant economic values exist for higher levels of wetland attributes, particularly for biodiversity and water availability although the households do not need to pay high.

4.3.3. Determinants of Households' Preferences for Wetland Management Plans

The results of models estimations for the determinants of households' preference for wetland management plans are presented in Table 4.11. The extended MNLM that has a good data fit includes the variables age, education, gross annual household income, location and distance to the wetland, whereas in the RPLM with interaction, the model that best fit

the data include the variables age, education, gross annual household income and location[61] (Table 4.11). The parameter estimates of the variables in the two models revealed similar sign and significance level except that the significance level of location variable improved in the RPLM with interaction.

Age of household head

Although we hypothesized that awareness, concern and interest about improvement of wetland resources increase with longer life experience, the results have shown that, *Ceteris paribus*, age of the household heads significantly decrease ($p < 0.001$) the probability of choosing wetland improvement plans over the status quo. The possible reason for this finding is that older household heads may perceive high opportunity cost of choosing improved management alternatives because they may expect a decline or loss of benefits that they have been deriving from the lakes and associated wetland resources in their lifetime. According to Van Liere and Dunlap (1980), youth support and accept environmental reform and pro-environmental ideologies more readily than elders. Our results concur with the findings Carlsoon *et al.* (2003) and Yimenu and Rao (2015), wetland valuation study in Sweden and Ethiopia respectively. Yimenu and Rao, in their finding noted that older age household heads have a fear of decline of income from improved management scenarios due to less awareness creation done before. In contrast to our finding, Dahmardeh and Shahraki (2014) in their study on economic valuation of environmental resources in Hamoon International Wetland in Iran reported that older peoples more likely choose wetland improvement scenarios than their counterparts.

Education status of household head

It is apparent and likely that more years of schooling lead to greater awareness of the importance of the environment or wetland resources thereby place high values for improvement of the resources. In agreement with the *a priori* hypothesis, the results have shown that with increase in years of schooling of the household head the probability of choosing wetland improvement plans increases. The results lend support to the findings of

[61] Although at the outset the variables sex and household size were hypothesized to have significant impact on the households' preference for wetland management plan, they did not appear to have significant bearing in the model fit.

previous studies (Dahmardeh & Shahraki, 2014; Yimenu & Rao, 2015) that show the significant positive impact of education on choice probability of wetland improvement scenarios. However, in our study the effect of education is marginally significant (at 10% level) suggesting that wetland issues might be insufficiently integrated in schools' programs and curriculums. Hence, the important policy implication is the call for the schools' programs and curriculum that adequately address wetland issues.

Household's gross annual income

Gross annual income of household was expected to positively influence the utility of choosing improved alternative plan. In agreement with the prior expectation, the gross annual income of household significantly ($p < 0.001$) increases the probability of choosing wetland improvement plans. The plausible explanation for this is that income reflects the ability to pay, and so an increase in income likely increase WTP for wetland improvement plans. In favor of our argument Cambell (2007) in a study of determinants of WTP for improvements of rural landscape in Ireland asserts that WTP for landscape improvement is positively related to income. Likewise, studies by Bateman *et al.* (1995), in Great Britain, and Yimenu and Rao (2015), in Ethiopia, have found that households with higher levels of income more likely prefer wetland improvement plans than their counterparts.

Location

The relationship of the dummy variable location with the dependent variable was indeterminate *a priori*. The analysis result revealed that *Ceteris paribus,* location has a positive significant effect ($p < 0.05$ in the extended MNLM and $p < 0.001$ in the RPLM) on the choice probability of wetland improvement plans. The probability of choosing wetland improvement plans increase for households residing around Lake Ziway areas. One possible reason for this could be that owing to the rapid shrinking of Lake Abijata and deterioration of its wetland resources (Menbere & Menbere, 2018) households might perceive that improvement of wetland attributes will not enhance their benefits from these ecosystems, and so ascribe less value. Although difficult to make inference, we got substantiation from the findings of PRAs. In the PRA (trend analysis) with elderly community members residing in Lake Abijata bordering *kebeles* discussants claimed that the ecosystem services of the

lake and associated wetlands have severely degraded over the past 30 years. Previously, in 1970s and early 1980s, they used to fish and get plenty of wetland grasses for animal feed and roofing, but nowadays it is hardly possible to get such benefits. To mention the account of a participant: "in our age it was with ease that we catch fish, but now one cannot find a single" (Male, age 75, PRA-trend analysis, *Desta Abijata kebele*). The views of all discussants in the area vividly reflect their despairing feeling about the future of the lakes and wetland resources; and they seem to lack interest for management of the resources there. In view of this, Engida and Mengistu (2013) noted that location with a better resource stock enhance the probability of households' participation in resource conservation and management.

Distance to the lake or associated wetlands

A negative influence of distance on the probability of choosing wetland improvement plan was hypothesized. This is because the farther the household is from the lakes and associated wetlands, the less likely is to access and use (especially direct use values) the wetland resources. Attesting the hypothesis the extended MNLM result revealed that distance significantly ($p < 0.05$) reduces the likelihood of choosing wetland improvement plans. The PRAs discussants especially those who consider their residency as 'distant' reiterated that people who reside in the 'nearby' area of the lakes or associated wetlands are more beneficial because they can regularly use wetland resources. Given this widely voiced notion among 'distant' residents, it is less likely for these residents to expect better utility from wetland improvement plans thereby increase the value they ascribe to wetlands. The finding agree with the distance-decay finding of Bateman *et al.* (1995) that revealed distance from wetlands significantly decreases people's preference to preserved wetland areas.

4.3.4. Households' Marginal Willingness to Pay for Wetland Resources Management

The MWTP values for the wetland attributes, estimated using the Wald procedure in LIMDEP 8.0 or NLOGIT 3.0, are presented in Table 4.12. Estimations were done for the four models for comparisons. The result revealed significant ($p < 0.001$) MWTP for biodiversity and water availability in all the models implying households' positive WTP for an increase/improvement in these attributes. Recreation attribute has a significant ($p <$

0.001) MWTP in the MNLMs; but the value is insignificant in the RPLMs implying that the MWTP for this attribute hardly has contribution for the wetland improvement plans when considering unobserved information of households' choices.

Table 4.12 Estimates of marginal willingness to pay for wetland attributes

Attributes	**Basic MNLM**	**Extended MNLM**	**RPLM**	**RPLM with Interaction**
	Coefficient (S.e)	**Coefficient (S.e)**	**Coefficient (S.e)**	**Coefficient (S.e)**
Biodiversity	11.93*** (0.952)	13.14*** (0.796)	36.35*** (0.137)	33.63*** (0.196)
Water avail	9.32*** (0.899)	10.25*** (0.664)	25.71*** (0.131)	23.13*** (0.203)
Recreation	6.82*** (0.963)	7.59*** (0.575)	6.17 (0.121)	6.16 (0.325)

Note: MWTP is measured in ETB[62] a one-off payment; *** Significant at 1% level; *Source*: Own survey, 2017

It is clear from the result that the MWTP values for all attributes in the basic MNLM are lower than in the extended MNLM which are also lower than the values in the RPLMs. These findings signal that the MWTP in the basic model may be underestimated without the consideration of households' preferences heterogeneity; likewise, the values in the extended MNLM may be underestimated without considering unobserved preference heterogeneity among households. However, one key finding is that the ranking of the attributes remains consistent in all the models, a finding which conforms to Birol *et al.* (2006). Biodiversity has the highest MWTP followed by water availability and recreation insinuating that households place more value for biodiversity than water availability and recreation. Recreation has low MWTP possibly because households expect low benefit from this attribute in the proposed wetland improvement plans. This can vividly be noticed from the results of the follow-up questions (Table 4.13) that reveal household heads' response statements that best describe their reasons and motivation for choice of alternative improvement plans in answering the choice set questions.

[62] 1 U.S. $ averagely equals to 27 ETB, during data collection time; i.e. in December 2016 to February 2017

As descriptive analysis result of the follow-up questions revealed the majority (31.9%) of the households give weight to the management plan that provide highest improvement of the three attributes regardless of the payment level. Households that account for 17.5 and 17.3% reported that they found biodiversity and water attributes more relevant, and so choose the plans with the highest level of these attributes respectively. On the other hand, only 4.7% of the households give weight for recreation services and opt for plans with the highest level of this attribute. The results support the above findings that positive and significant economic values exist for higher levels of wetland attributes, particularly biodiversity and water. The finding from the descriptive analysis of the follow-up question has also revealed that there are also households (18.3%) that choose the cheapest plans whatever the levels of the attributes are. From this one can understand that although they support and prefer for wetland improvement plans, they opt for a plan with the lowest payment. These findings lend support to the Theory of Rational Choice (TRC) which assumes that an individual always knows what he or she needs, and best able to make choices that affect his or her welfare. With regard to those households who choose the cheapest plans, the reason of choice for such plans may be attributed to different factors among others are their economic status or income level or their perception of who will have the right to use the resource in the future. In this regard, Hanemann (1991) noted that if individuals found the proposed program contradicting with their perception of property right over the resource, they may reflect their opposition of the program, possibly by lowering their WTP values.

Table 4.13 Results of follow-up questions of the Choice Experiment

Response	**Frequency**	**%**
I choose the plans with the highest level of all attributes whatever the payment level	129	31.9
I choose the status quo options whatever the levels of the attributes since I don't have the ability to pay for cost of improvement	42	10.4
I choose the plans with highest level of biodiversity attribute because I found that the improvement in this attribute is relevant	70	17.3
I choose the cheapest plans whatever the levels of the attributes	74	18.3
I found that the attributes of availability of water is important and chose the plans with the highest level of such attribute	71	17.5
I choose the plans with the highest level of recreational services	19	4.7
Total	405	100

Source: Own survey, 2017

4.3.5. Welfare Implication of Wetland Improvement Interventions

Estimation of welfare measure or compensating surplus (CS) enables evaluation of values for a range of alternative ways of resource allocation thereby contributes to policy making in designing efficient wetland management plans (Carlsson *et al.*, 2003; Yimenu & Rao, 2015). To estimate households' CS, for improvements in wetland management over the status quo, we have developed five possible alternative scenarios of wetland improvement (Table 4.14).

Table 4.14 Alternative wetland scenarios and their attributes

Alternative Scenarios	Attribute levels
Status quo	Biodiversity is deteriorating with no strict management; water is available in one season and size of open water is decreasing; low provision of recreational services
Low impact improvement scenario	Biodiversity is managed at low level (25% improvement); water is available in two seasons; infrastructural development only
Medium impact improvement scenario I	Biodiversity is managed at medium level (50% improvement); water is available in two seasons; infrastructural development only
Medium impact improvement scenario II	Biodiversity is managed at medium level (50% improvement); water is available in three seasons; infrastructural development only
Medium impact improvement scenario III	Biodiversity is managed at medium level (50% improvement); water is available in two seasons; provision of infrastructure, resting facilities and waste monitoring
High impact improvement scenario	Biodiversity is managed at high level (75% improvement); water is available in four seasons; provision of infrastructure, resting facilities and waste monitoring

Source: Own survey, 2017

The results of CS estimates (Table 4.15) have shown that all improvement scenarios have positive CS values suggesting that the improvement scenarios will enhance the welfare of the households or the wetland community of the study areas. Prior wetland valuation studies (Birol *et al.*, 2006; Abebe *et al.*, 2014; Yimenu & Rao, 2015) have also found out that local households have positive WTP for improvement in wetlands, thereby experience better utility. Looking closely at our study results, the households' WTP increase with increase/improvement/ in the level of the wetland attributes, mainly biodiversity and water availability. A key finding is that households' WTP for the medium impact improvement scenario III (152.55 ETB) is lower than medium impact improvement II (169.53 ETB) which is related to the recreation attribute. This suggests and further confirms households'

expectation of low benefit from the improvement of recreation attribute, as opposed to improvement in biodiversity and water availability. Hence, in conformity with what the TRC stated individuals choose the consumption bundle (which in this study denote wetland improvement scenario) with the highest level of utility.

Table 4.15 Results of compensating surplus estimate for wetland improvement scenarios

Improvement Scenario	Attribute levels			Mean WTP (one-off payment)	
	Biodiversity	Water avail	Recreation	ETB	US $
Low impact improvement I	1	1	1	112.76	4.18
Medium impact improvement I	2	1	1	146.32	5.41
Medium impact improvement II	2	2	1	169.53	6.28
Medium impact improvement III	2	1	2	152.55	5.65
High impact improvement	3	3	2	202.45	7.5

Source: Own survey, 2017

The CS estimates reported in Table 4.15 can be aggregated over the entire sampling frame to obtain the total WTP value (the total economic welfare) for each scenario. Accordingly, based on the total households size of the three study *woredas* (which amount to 92,575)[63], the aggregate WTP to achieve improvement of the wetlands, for example, in the low impact scenario is 10,438,757 ETB (U.S. $ 386,620), while it amounts to 18,741,809 ETB (U.S. $ 694,141) in the high impact scenario. These monetary values of wetland resources of Lakes Ziway and Abijata could be considered as lower bound; and it is worth to mention that if we had consider other ecosystem services of these wetlands (such as, flood and water regulation, local climate stabilization), their value might have been more. Hence, policy makers can use these values to compare with estimated cost of improving the wetland attributes, in cost benefit analysis, thereby design feasible program for improvement of the wetland resources of the study area.

In general, from the study finding it can be concluded that the economic benefits associated with the wetland services are significant. Biodiversity and water availability are the important wetland attributes in the utility of the wetland community. This was implied by

[63] Sources: the *woredas'* rural land administration and environmental protection bureaus and *woredas'* agriculture and rural development offices

higher MWTP values for the two attributes. Hence, it can be concluded that there is high tendency of public support and preference for conservation and management of wetland resources, particularly for biodiversity and water. However, households revealed heterogeneity in their preferences for these attributes which is reflected in significant derived standard deviations.

4.4. Stakeholders Actions and Involvement in Management of Wetlands

In Ethiopia attention has been given for conservation and development of natural resources. Although wetland resources are not out of this domain, degradation of these resources is continuing in many wetlands of the country, as in the case of the CRV lakes area. The prevailing degradation of wetland resources in Ethiopia in general and the CRV lakes area, in particular, implies that the management of these resources is overlooked or concrete conservation and management actions for these resources are lacking on the ground. Among the prominent reason for this may be the fact that wetland resources have cross-sectorial nature, where the management of the resources is in the realm of multiple stakeholders. The different components of wetlands, such as the water, land, and biodiversity capture the interests of many stakeholders for various purposes, among others are irrigation, water supply, fishing, industry, recreation, and tourism. Hence, the engagement of stakeholders in the management of wetlands is indispensable to protect wetlands from the threats they are facing and sustain the goods and services they are providing, As Koopmanschap and Gevers (2012) argue it is not only about the participation of local people, rather the sustainable management of wetlands requires the involvement and support of all those who have a stake in the wetlands; and for this stakeholder analysis is indispensable. Given this, the present study has examined the action and involvement of the stakeholders in the management of wetland resources as well as the perspective of stakeholders regarding the functionality of existing institutional arrangements. The findings of the study are discussed in the sub-sections that follow hereunder.

4.4.1. Typology of Stakeholders in the Action Arena

The management of wetlands often involves a large number of different stakeholders. Regarding stakeholders' typology, scholars forwarded different ways of identifying the categories (typologies) of stakeholders. According to, Grimble and Wellard (1997), the

exact identification and degree of breakdown of stakeholders' categories cannot be pre-determined and it depends on the needs of the individual case. Based on the justification given in sub-section 3.5.3, this dissertation adapted stakeholders typology used by Smrekar *et al.* (2020), Hailu *et al.*, (2017), and Darradi *et al*. (2006). Accordingly, in this study stakeholders[64] are classified as local stakeholders, government institutions, economic actors, research institutions and universities, and the wider public or external bodies, as described shortly.

Local stakeholders

According to Darradi *et al.* (2006), local stakeholders refer to people that reside close to the wetland areas. In this dissertation the stakeholders identified under this category were: local communities (i.e. households near Lakes Ziway and Abijata) that use wetland resources for various purposes, fishermen cooperatives, irrigation cooperatives or Water Users Associations (WUAs), local community leaders, water desks, DAs, *Kebele* office administrators (KAs), *Kebele* watershed committee (KWC), *Kebele* land administration and use committee (KLAUC), Water Supply and Sanitation Committee (WSSC). They are mostly affected, either in a positive or negative way, by the outcome of the wetland resources management system, and so are immediate recipients of the action. In their study, Darradi *et al.* (2006) labeled local community members as stakeholders that consider wetlands mainly as agricultural resources for their livelihoods. Hailu *et al.* (2017) also stated that local communities typically use water resources for different purposes and so are victims of negative aspects of water resources development programs.

Government institutions

Stakeholders in the category of governmental institutions include Ministry of Agriculture and Natural Resource (MoANR), Ministry of Environment Forest and Climate Change (MoEFCC), Ministry of Water Irrigation and Electricity (MoWIE), Ministry of Livestock and Fishery Resource Development (MoLFRD), Ministry of Culture and Tourism (MoCT), Ethiopian Investment Commission (EIC), and their respective tiers at lower levels of

[64] Some of the stakeholders identified, via snowball sampling, were not interviewed because they are either mostly involved in PRAs, unavailable, inaccessible, or unwilling to be part of the study (*see* in Appendix X).

government: regional (Oromia), zonal[65], *woreda* and even some at the town level. At these lower echelons, there were some specialized bureaus/offices and authorities, such as Rural Land Administration and Land Use Implementation Bureau/office (RLALUIB/O) and Irrigation Development Authority (IDA) which are independent Bureau/office and authority at lower tiers- regional, zonal and woreda while not existing independently at the federal level. Although their mandates and decision-making power differ at each tier, they functionally possessed the same vision. There are also other government authorities, such as Abijata-Shalla Lakes National Park (ASLNP), Rift Valley Lakes Basin Authority (RVLBA) - both Hawassa main office and Batu branch office. At the town level, there was Batu Town Administration Environment Forest and Climate Change Authority (BTAEFCCA) and Batu Town Culture and Tourism Office (BTCTO). Stakeholders in this category, i.e. the government institutions or authorities, have multiple roles and responsibilities to engage in conservation and management of wetland resources despite the fact that they may not have an immediate direct interest to use or generate benefit out of it. Hailu *et al.* (2017) in their finding have also revealed that government stakeholders have different institutional affiliations and multiple roles among others are policy formulation, implementation, and enforcement. Darradi *et al*. (2006) have also stated that some of the government stakeholders are influential in policy making and have decision power over the use and management of wetland resources.

Economic actors

Private sectors including among other small-, medium- and large-scale commercial farms such as floriculture and horticulture enterprises, ELFORA Agro-Industries private limited company as well as hotels, resorts, or recreational industries were the stakeholders categorized as economic actors. There are also semi-autonomous public enterprises[66] such as Abijata Soda Ash Plant (ASAP). As Darradi *et al.* (2006) noted these groups of stakeholders consider wetlands as a good opportunity to develop economically. For Hailu *et al.* (2017) such stakeholders are mainly profiting sectors owned and operated either by public or private actors and they are obliged to meet 'corporate social responsibility'

[65] In this study experts and/or officials in the respective offices were consulted from three zones, viz. East Shewa, West Arsi, and Arsi where the respective three study *woredas* – ATJK, Arsi Negelle, and Ziway Dugda- are located.

[66] Enterprises that are wholly or partially owned by the federal or regional government (FDRE, 2012)

(CSR)[67]. However, as the finding of Kassa (2018) showed Ethiopian private sector is not taking the leadership in CSR and there is a limited private-public partnership. This might be because of the high priorities that have been given by the government to businesses and enterprises that contribute to growth and survival with little emphasis on CSR performance with regard to environment values (Robertson, 2009).

Research institutions and universities

Many universities and research centers have interest in the CRV lakes areas, among others are Addis Ababa University, Hawassa University, Arsi University, Adama University, Haromaya University, Ziway Fishery Research Centre (ZFRC), Ethiopian Environment and Forest Research Institute (EEFRI) and Ethiopian Biodiversity Institute (EBI). These actors are not directly involved in the management of wetlands of the CRV lakes ecosystem but they have roles in doing research and organizing and providing training on issues related to the management of wetlands. In the stakeholders' typology used by Smrekar *et al.* (2020) these groups are labeled as 'Knowledge Providers', which refers to professionals and experts from research or development centers and universities.

The wider public or external bodies

This class of stakeholders includes semi-governmental and NGOs, most of which are non-profit making that indirectly influences conservation and management of wetland resources. In this study, the stakeholders classified in this category include Horn of Africa Regional Environment Center and Network (HoA-REC&N), Ethio-Wetlands and Natural Resources Association (EWNRA), Catholic Relief Service (CRS), Ethiopian Wildlife and Natural History Society (EWNHS) and International Water Management Institutes (IWMI). It has been found out that, these stakeholders mostly provide support for wetland management activities, either through finance, technical or material, and research output (information) and advocacy. Smrekar *et al.* (2020) referred to these stakeholders as 'Civil Society', and their classification encompasses associations that represent the interests of individuals, citizens, civil society organizations, and right-holders. Hailu *et al.* (2017) noted that some of

[67] CRS is "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" (European Commission 2011:3) or "the extent to which firms integrated on a voluntary basis social and environmental demonstrate concern in their ongoing operations and interactions with stakeholders" (Idowu *et al*., 2015:8).

the stakeholders of this group are at the heart of advocacy, policy prescriptions, and political interests.

The forgoing stakeholders have their own functional relationship and stake in the management of wetland resources. Detail discussion on the roles and responsibilities of stakeholders are presented under section 4.4.2 and in a summary form in Table 4.16. Chevalier and Buckles (2008) recommended the use of a 'rainbow diagram' for easy demonstration of the relationship of stakeholders to practical action projects. By adapting this diagram, in this dissertation, the stakeholders were placed in a rainbow diagram that shows their relationship to wetlands in terms of the management of these resources. Accordingly, the inner semicircle of the diagram represents local stakeholders (Figure 4.2). Local stakeholders are typically users (particularly direct use values[68]) of wetland resources, and they hardly have the authority to influence institutional settings of wetland management. According to Hailu *et al.* (2017), local communities are 'primary stakeholders' that have significant roles in proper resource (water) utilization. However, in the view of Cohen-Shacham *et al.* (2014), these stakeholders are 'passive stakeholders' since they are affected, either positively or negatively, by the actions or decisions of others.

The stakeholders represented in the middle semicircle of the rainbow diagram are government institutions. These stakeholders mostly hold the authority to directly affect the institutional settings of wetland management. For Hailu *et al.* (2017), such stakeholders are 'secondary stakeholders' that are considered to be of high importance and influence in resource management, yet with a low level of coordination. In the study of Cohen-Shacham *et al.* (2014), most of the government institutions are considered as 'active stakeholders' as they determine an action or a decision in a project. However, there are some government institutions such as Nature and parks authority that are labeled as 'key stakeholders' (Cohen-Shacham *et al.*, 2014) or 'key actors' (Hailu et al., 2017) since they are specialized agencies or authorities that are considered to have significant role and influence in the success of resource or ecosystem management. The outer semicircle represents the three groups of

[68] Also known as extractive, consumptive, or structural use values are mainly derived from goods which can be extracted and consumed directly; such as fish, irrigation, fuelwood, recreation, transport (Groot et al., 2016).

stakeholders: the wider public, economic actors, and research institutions and universities. These stakeholders do not have the authority to directly influence wetland management but can indirectly assist and influence wetland management via research, advocacy, capacity building, and financing.

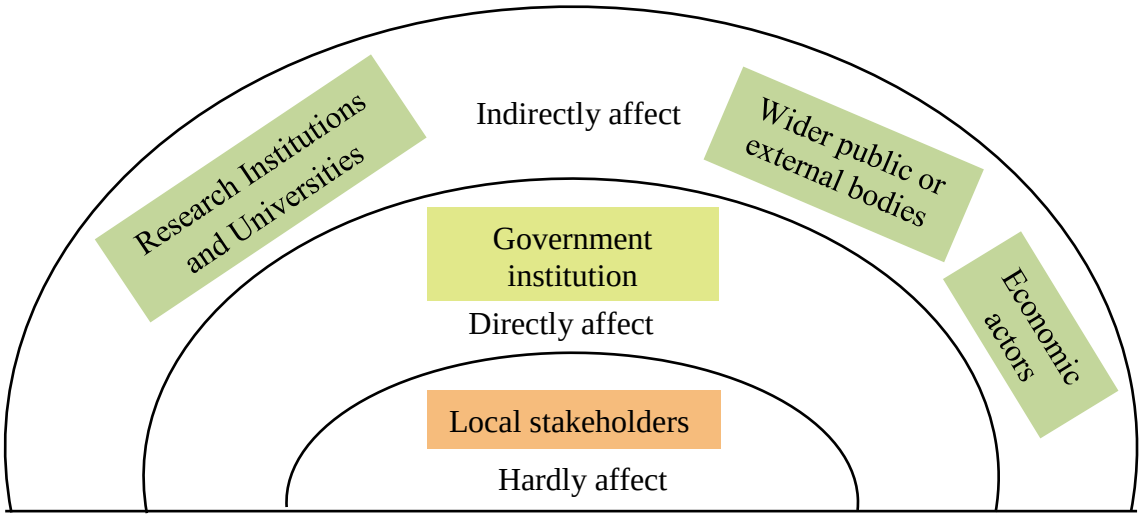

Figure 4.2 A rainbow diagram to represent stakeholders according to their relation in wetland management; *Source*: Researcher's own construction using field data by adapting from Chevalier and Buckles (2008).

4.4.2. Stakeholders' Roles, Responsibilities, Interests and Influence

As it has already been discussed in the preceding sub-section, like in many other wetland contexts, the management of wetlands of the CRV lakes area involves multiple stakeholders, from local to national levels that have direct or indirect involvements. However, the stakeholders differ in their roles and responsibilities, for example, some stakeholders such as the government institutions have multiple roles and functions while others such as research centers and universities have specialized functions (Table 4.16). Likewise, they vary in their interest and influence on the management of the resources. Hence, as Aapaoja and Haapasalo (2014) noted it is not enough to identify and categorize stakeholders; there is also a need to assess their roles and responsibilities as well as their level of interest and influence that can help in designing appropriate and sustainable resource management strategies. Herein, Reed *et al.* (2009) and Ramsar Convection Secretary (2010a) have also underscored

that stakeholders' interest and influence can have considerable implications for wetland management, and so understanding stakeholders' interest and influence can help to specify how they might be engaged in an activity. To recall, in this dissertation '*interest'* refers to the position and the priority the stakeholders ascribe to conservation and management of wetlands, whereas '*influence'* refers to the power the stakeholders possess in the management of wetland resources.

The present study finding revealed that stakeholders' engagement partly suggests their interests and influence in the management of wetland resources. Nevertheless a high level of interest or influence may not necessarily refer to high engagement and vice versa. For example, the local stakeholders are practically important in conservation and management practices; and they have a high interest as well as considerable roles and responsibilities in conservation and management of wetland resources. Nevertheless, they have a weak power to influence the management system as the higher government structures vested with the powers (Table 4.16 and Figure 4.3). The findings showed that the local stakeholders; particularly local communities, small-scale irrigators, and fishermen contribute, mainly through labor, to resource conservation activities such as watershed management (WSM) and tree plantation. These stakeholders typically engage in resource conservation to maintain and if possible to generate more benefits. In this regard, Darradi *et al.* (2006) stated that the local stakeholders' concern of preserving or conserving wetlands is strongly attached to their uses of the wetlands and the problem they can face in their life if wetlands are degraded or lost. So, for this group of stakeholders particularly for the local communities who are dependent on wetlands, for their livelihood, protection and conservation of wetlands are among the practical roles and responsibilities. Moreover, they have a great role in resolving conflicts and disputes related to resource management (Table 4.16).

Regarding the interest of local stakeholders it has been found out that besides the conservation of wetland resources and involvement in conflict resolution, local stakeholders have high interest to coordinate and control the management of wetland resources (Table 4.16). Despite their high interest, local stakeholders with *de facto*[69] rights to manage

[69] Actual or exercising power without being legally or officially sanctioned

resources of their locality are usually voiceless and marginalized. They are expected just to participate in resource conservation activities that are planned and organized by experts or government officials at the higher administration levels, i.e. *woreda* and above. Interviewees of these stakeholders group and discussants of the PRAs often referred to the inability to confront and influence stakeholders at the higher level towards their interests, unlike other stakeholders (such as the economic actors) do. Concurrent with these findings Aapaoja and Haapasalo (2014) pointed out that local people are just "Keep informed" groups or stakeholders with the low impact that do not have the power to (directly) control management of resources although they may have the interest. Likewise, Reed *et al.* (2009) labeled these stakeholders as "Subjects" that have high interest but low influence (Figure 4.3). They further stated that typically these stakeholders are supportive although they lack the capacity for impact. Hence, they need to be empowered because they are often marginal stakeholders and may become influential by forming alliances with other stakeholders.

As it has been underscored in Ramsar Convection Secretary (2010a), local stakeholders, particularly local communities and indigenous people are the custodian and legitimate stakeholders that should take active roles in planning and joint management of wetlands. However, in the present study, it is evident that the stakeholders are not entitled to this legitimate right. The local communities in ASLNP area for example strongly claimed that they are less privileged because of the absence of institutional frameworks that protect their interest. Although the park is meant for protection of biodiversity and their habitats, this does not correspond to local communities' claim of livelihood security. This suggests that stakeholders with high interest but low power to secure their stake may not serve their interests. In this regard, our finding corroborates the claim that existing policies cannot respond to the interest of stakeholders in a given landscape (Hailemariam *et al.*, 2016). Herein, Teferra and Beyene (2014) noted that the state, which is the *de jure* owner of ASLNP, is ineffective to devise means to accommodate local communities' interests into some resources where indigenous claims are based on customary rights to resources in the park areas before its delineation. Because the local communities are the mainstay of resource conservation and management practices, underrating their concern may not lead to sustainable resource management outcome that necessitates synergy.

Table 4.16 Stakeholders' roles and responsibilities, interest and influence in management of wetland resources

Stakeholders (Nature or basis of the stake)	Stakeholders' practical roles and responsibilities[70]	Stakeholders' potential roles and responsibilities	Areas of high interest	Areas of high influence
Local stakeholders (A *de facto* livelihood-customary right)	Participate in wetland resources conservation activities of (contribute labor); mobilize labor for resource conservation (for example, WSM, tree plantation); resolve disputes or conflicts in resource management	Proper monitoring of the use of wetland resources; share resources equitably; control pollution through management of agrochemicals; manage resource wastage; create awareness, promote and sensitize on wise use of wetland resources and resource-saving technologies(For DAs, *Kebele* administrator, KLAUC, KWC, WSSC	-Protect wetlands (to maintain or generate more benefits); -Coordinate resource management activities; - Resolve conflicts related to management of wetland resources' -Control management of wetland resources	- Resolve conflicts related to management of wetland resources
Government institutions (Regulatory, administrative right and obligation)	Formulate rules-in-use (policy guidance); plan, supervise, coordinate and implement activities related to wetland resources development, conservation and management (such as watershed development and management, IWRM); design strategies to halt resource degradation; capacity building through training; request submission of EIA from major development activities or investments; promote resource-saving technologies; determine allocation and manner of resources use; collect water fees; conduct assessment of available (wetland) resources and establish resource database; conduct studies and disseminate information	Restoration of disturbed wetland ecosystems; promote and enhance efforts towards an efficient, equitable, and optimum utilization of (wetland) resources to ensure sustainability; evaluate the environmental and social impact and regulate the conformity of the activities of development projects with EIA and other standards; ensure the enforcement of the rules-in-use and environmental standards while issuing resource use and investment permit; control water quality; control and monitor proper treatment and disposal of wastes and ensure the quality following standards; introduce resource-saving technologies and plan for efficient use of resources; conduct assessment of available resources and establish resource database; conduct studies and disseminate information	-Collection of fee for the use of wetland resources; -Control management of wetland resources; -Protection of wetland resources -Capacity building or funding for management of wetland resources; -Formulate rules for managements of wetland resources; - Coordinate resource management activities	-Collection of fee for the use of wetland resources; -Control management of wetland resources; -Protection of wetland resources -Capacity building or funding for management of wetland resources; -Formulation of rules for managements of wetland resources; - Coordinate resource management activities

[70] Practical roles and responsibilities refer to the roles and responsibilities that stakeholders are now actually performing; whereas the potential roles and responsibilities are those that the stakeholders are supposed to perform but they are in most cases not well performed

Economic actors (Economic/profit making- ownership right)	Use resource-saving technologies (for example, sprinkler for irrigation) and employ recycling in resource use(particularly water use); participate in or fund activities of (wetland) resources conservation and management	Proper and efficient use of wetland resources; equitable use of resources with the local community (for irrigations and other/domestic/ purposes); pollution control through proper waste disposal, proper management of agrochemicals and use of waste treatment technologies	-Protection of wetland resources (to generate more benefits);- Capacity building or funding for management of wetland resources	-Capacity building or funding for management of wetland resources
Research institutions and universities (Study, training, knowledge generation- intellectual right and social obligation)	Conduct studies/research; facilitate capacity building via training of human resources in NRM; design and publish national strategy and documents on Ethiopia's biodiversity and distribute to relevant stakeholders;	Disseminate information and/or research outputs; design and implement projects for conservation and management of lakes, associated wetlands and their biodiversity; facilitate and create platform (through worships, meetings, Learning and Practice Alliance (LPA) approach) for stakeholders to work collaboratively.	-Protection of wetland resources; -Capacity building (mostly through training and awareness creation); -Conduct studies related to wetland resources; - Coordinate resource management activities	-Capacity building (mostly through training and awareness creation); -Conduct studies related to wetland resources
Wider public or external bodies (conservation, protection- intellectual right and social obligation	Facilitate capacity building through training and provision of financial and technical assistances for (wetland) resource conservation and management; awareness creation and advocate sustainable use of (wetland) resources; conduct studies; develop land use or lake management plan.	Disseminate information and/or research outputs	-Protection of wetland resources; -Capacity building (either through training or funding); -Conduct studies related to wetland resources	-Capacity building (either through training or funding); -Conduct studies related to wetland resources

Source: Synthesized from own qualitative field data, 2017

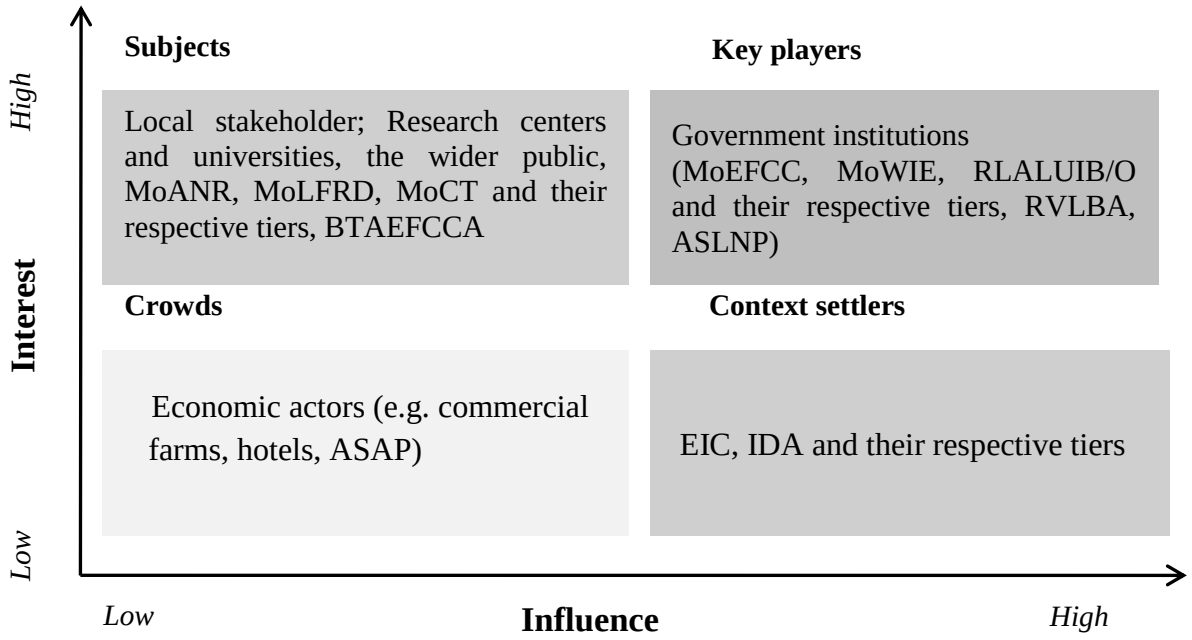

Figure 4.3 Representation of stakeholders' level of interest and influence to wetland resources management; *Source*: constructed based on filed work in 2017.

On the other hand, the findings on the roles and responsibilities of government institutions revealed that almost all of these stakeholders have regulatory and administrative rights and obligations in the management of wetland resources. There are several roles and responsibilities that these stakeholders are practicing; among many others are formulating rules-in-use (such as policies, strategies, regulations, guidance); plan, supervise, coordinate and implement activities related to wetland resources development, conservation, and management (such as WSM); capacity building through training; promote resource-saving technologies; determine allocation and manner of resources use; collect water fees; conduct assessment of available (wetland) resources and establish resource database. Despite these practical roles and responsibilities, many others have been also mentioned by the government institutions as potential roles and responsibilities of these stakeholders. Ensuring the enforcement of the rules-in-use and environmental standards while issuing resource use and investment permit; control for water quality; controlling and monitoring proper treatment and disposal of wastes and ensuring the quality in accordance with standards are among the mentioned potential roles and responsibilities that need proper enforcement and practice by concerned government institutions (Table 4.16).

Although there are government institutions that are responsible for these activities, the stakeholders themselves and other stakeholders affirmed that these activities are not sufficiently realized. From the study finding it was possible to identify three major reasons for this. Firstly, the activities of these stakeholders often contradict each other; and the mandates the stakeholders are entitled with regard to the management of wetland resources lack clarity. A typical example herein could be the challenge that the *Woreda* Rural Land and Environmental Protection Offices (WRLEPO) are facing. As per the account of an expert from Ziway Dugda WRLEPO, the major challenge that the office has faced was the presence of multiple sectors that are claiming the legitimate power to manage wetland resources (detail discussion on the challenges is given in sub-section 4.4.5). Secondly, some of the government institutions, particularly those at the *woreda* level, faced limitation of capital (financial, human and/or physical) to ensure effective enforcement of the rules-in-use. Thirdly, some government institutions (such as EIC and IDA) appear to be more concerned on supporting the economy through promoting different development activities, and so give less emphasis to the environment in general and these ecosystems in particular. Herein, Darradi *et al.* (2006) argued that, unlike the local stakeholders, external stakeholders[71] are more concerned about the expansion of development activities.

The analysis result for the interest and influence of the government institutions revealed that the stakeholders in this group vary in their level of interest and influence on the management of wetland resources. There are some government institutions, such as MoANR, MoLFRD and MoCT and their respective tiers and BTAEFCCA that have high interest in the management of wetland resources, and yet low influence. Although they are presumed to have high influence the study result revealed that these stakeholders possess low influence in the management of wetlands. They occupy the upper left corner of the interest-influence matrix and labeled as “Subjects” or “keep informed”, and (Figure 4.3). These stakeholders reported that they are less involved in decision-making compared with other government institutions and stakeholders. These stakeholders are also blamed, by other stakeholders, for having a superficial high interest just because of the administrative obligation they are

[71] In their stakeholders’ typology external stakeholders refers to the different levels of government from the local to the national levels

assigned to manage resources. There is also a claim that these stakeholders are inept in execution of their roles and responsibilities. Hence, they are quasi influencing stakeholders that just possess the power given by virtue of the law but not exercising it. Similarly, Hagedorn (2013) and Hailu *et al.* (2017) documented that some stakeholders seem to 'abuse power' in the sense that they have high importance and potent power yet unable to influence and get involved in management of resources.

On the other hand some government institutions mainly MoEFCC, MoWIE, RLALUIB/O and their respective tiers, RVLBA and ASLNP occupied the upper right quadrant in the interest-influence matrix (Figure 4.3), which Reed *et al.* (2009) labeled as "Key players". These stakeholders represent the actual and expected high interest and influence in terms of mandate and power of decision-making. The stakeholders have legally vested power to influence the management of resources related to wetlands, such as water and land resources. For example, the Federal Democratic Republic of Ethiopia (FDRE) Proclamation No. 916/2015 (FDRE, 2015), Proclamation No. 197/2000 (FDRE, 2000) and Regulation No. 115/2005 (FDRE, 2005a) have vested power for the MoWIE to plan, manage, protect and equitably allocate and utilize water resources of Ethiopia to contribute to the socio-economic benefit of its people. The RLALUIB and its lower tiers have been also assigned, by ONRS, with different duties and responsibilities proclaimed in Oromia Region Rural Land Administration and Use Regulation No. 151/2012 (ONRS, 2012) to handle issues related to the use and management of rural land resource, which wetlands possess part of it. Likewise through River Basin Council and Authorities Proclamation No. 534/2007 (FDRE, 2007) and the Councils of Minsters Regulation No. 253/2011 (FDRE, 2011) the RVLBA has been established as an autonomous federal government organ with a very objective of promoting and monitoring the implementation of IWRM process in a manner which is equitable and participatory in the Rift Valley Lakes Basin. Together with the power they are legal vested these stakeholders are also assigned with different duties and responsibilities in the management of resources of the study area. For example, RVLBA has been given duties, among other, of collecting water charges from users and issuing permits relating to water use and water works. However, some of these responsibilities overlap, and so challenge

stakeholders' involvement and synergy in the management of the resources (*see* sub-section 4.4.5).

It has been also found out that, a few number of government institutions revealed low interest and yet high influence in the management of wetland resources. According to Reed *et al.* (2009) these stakeholders are referred as "Context setters". The prominent stakeholders in this group are EIC and IDA and their respective tiers at the lower levels of the government structure. It is worth to recognize that these stakeholders have significant role in the management of wetland resources because most investments (such as the horticulture and floriculture and other irrigation farms) in the study area get the permit for resource use and investment from these stakeholders. Thus, the low interest level of these stakeholders in the management of wetland should not be neglected, and thus there is a need to boost the interest of these stakeholders in the management of the resources. Rees *et al.* (2009) argued that, unless there is some mechanism to monitor and manage the "Context settlers", they could be a significant risk.

The study findings further showed that economic actors mainly floriculture and horticulture commercial farms, ELFORA Agro-industry, and ASAP are stakeholders that are direct users of wetland resources, particularly lakes' water, thereby maximize profit out of it. According to Cohen-Shacham *et al.* (2014), the stakeholders in this group are merely interested in developing their projects for greater income. In the CRV area, economic actors are highly blamed, by most other stakeholders particularly by the local stakeholders, for their imprudent use of wetland resources and reluctance in management of the resources. Although they have the capacity and so are expected to play great roles in the management of the resources, it seems that they are not well engaged in performing most of their roles and responsibilities. Proper and efficient use of wetland resources; equitable use of resources with the local community (for irrigations and other purposes); pollution control through proper waste disposal; proper management of agro-chemicals and use of waste treatment technologies are among the potential roles and responsibilities of these stakeholders, and yet are not being performed (Table 4.16). In fact, from the study findings, it can be understood that these stakeholders are taking some actions for conservation and management of wetland

resources, including the use of resource-saving technologies (for example, sprinkler for irrigation), recycling of resource use (e.g. water use) and financing conservation activities.

In this study finding economic actors revealed a high interest in the protection of wetland resources (mainly to generate more economic benefits) and capacity building through the funding of wetland resources conservation activities. They occupied the bottom left corner in the interest-influence matrix, that Reed *et al.* (2009) refer to these groups as 'crowds' as they revealed low interest in the management of wetland resources as well as low power to influence and reinforce the management (Figure 4.3). In fact, the stakeholders in this group (i.e the economic actors) can have the potential to influence the management of wetlands at least using their financial capacity. However, in this study, the interest-influence matrix analysis revealed that economic actors have low influence. Contrary to this, Hailu *et al.* (2017) documented that despite their limited commitments to contribute to (water) resource management; private sectors have 'silence power', and so gained a better position both in access to resource and power to influence public stakeholders. This suggests that financially strong stakeholders with perhaps low interest in the management may still have greater power to secure their stake. Hence, the power of influence could not only be vested politically but also via the financial capital of stakeholders.

Given the multiple roles and responsibilities as well as the financial capacity the economic actors have for the management of wetland resources of the CRV area, it is unquestionable that due emphasis should be given for an active involvement of these stakeholders in the management of wetland resources. In fact, the Ethiopian Water Resource Management Policy (EWRMP) advocates and encourages the involvement and meaningful participation of the private sector in the management of water resources (MoWR 1999). However, in Ethiopia owing to the underdeveloped public-private partnership (PPP), the private sectors are little involved in the management and decision-makings. In this regard, Hailu *et al.* (2017) posited that the PPP is useful for sustainability and effective management of resources and the job remains to be done in developing countries like Ethiopia. Accordingly, in the present study, the action situation of the economic actors, i.e. their low interest and

low influence, by no means should be overlooked because their interest and influence could have severe impact on the sustainability of the wetland resources.

Having different institutional affiliation, research institutes and universities have indirect roles in the management of wetland resources of the CRV lakes area. Their roles and responsibilities mainly involve human capacity building through provision of training in NRM and carry out part of their research at the CRV lakes ecosystem and resources (Table 4.16). They have high interest to support the conservation and management of these resources. Some of these stakeholders, for example the EBI, are highly engaged in research and conservation activities of biodiversity. Although their research and capacity building activities are of great significance, these stakeholders do not possess the power to directly influence the resource management activities. Hence, they are "Subjects" that occupy the upper left corner of the interest-influence matrix (Figure 4.3). Likewise, stakeholders of the wider public or external bodies have also a great role in providing technical and financial assistances. They are often advocators of research and studies, as well as conservation, management and sustainable use of natural resources (Table 4.16). These stakeholders have high interest in conservation, sustainable use and management of wetland resources; however, they hardly have the power for decision on the management of the resources. They are strong when they work in collaboration with other stakeholders and are mostly well-resourced in terms of finance and/or expertise. The role of environmental NGOs and their voluntary cooperation for mobilizing public in conservation of lakes' ecosystem and associated wetland resources is significant. Hailu *et al.* (2017) referred these stakeholders as 'architects behind policy prescriptions' such as Integrated Water Resources Management (IWRM) and Millennium Development Goals (MDGs); particularly NGOs and donors are often behind the scene of institutional reforms and implementation. Aapaoja and Haapasalo (2014) have also noted that tertiary stakeholders are important in the functioning of partnerships among stakeholders.

4.4.3. Stakeholders' Views on the Status of Wetlands and Predicaments of their Sustainability

Stakeholders' involvement in wetland resource management is partly driven by their perception of the status of wetlands and their realization of the threats the wetlands are

facing. As Frick *et al.* (2004) argued before a person can act, he or she must have some understanding of the natural state of the ecosystem, the processes and the problems within them, and what can be done about the environmental problem. In view of this, we attempted to capture stakeholders' views about the status of wetlands of the CRV area, particularly of Lakes Ziway and Abijata, and the prevailing predicaments of their sustainability.

4.4.3.1. Stakeholders' Perception of the Status of Wetlands

The findings from the KIIs and PRAs revealed that almost all stakeholders have high concern about the existing condition of the lakes and associated wetland resources. Stakeholders unanimously affirmed the degradation of these resources over the past decades. Informants, particularly those who have worked or lived longer in the area have noticed the continuous degradation of these ecosystems over the past two to three decades. They particularly underscored the condition of Lake Abijata which is under a big threat and a rapid rate of degradation despite its location in one of the protected areas of the country – ASLNP. In fact the park itself is one of the country's most fragile areas that exhibit loss of habitat, mainly Acacia (Gebeyehu *et al.,* 2015). The account of an official (with 20 years' work experience) from ATJK *Woreda* Agriculture and Natural Resource Office (WANRO) illustrates the stakeholders' perception about the trends of the change and the prevailing condition of the lakes and associated wetlands. He explained his concern as:

> *Years ago, both Lakes Ziway and Abijata and the surrounding Cheffes*[72] *had large area coverage and water volume. Lake Ziway, for example, had a depth of around 8 meters, but currently its maximum depth is not more than 4 meters, and during winter season of 2016 a depth of 2.5 meters was also recorded. The case of Lake Abijata is worse than this; and it is possible to say that the size of the lake has already reduced by half. The existing condition of Lake Abijata is very alarming; and what I personally feel is that it is a lake destined to die. I said this because there is high water extraction from the lake by Abijata Soda Ash Plant; and as per its plan the water extraction will continue for many years in the future. It was during the Derg regime*[73] *that the Soda Ash Plant was established; and by then the plan of the factory was to produce soda ash for about 80 years by extracting water from Lake*

[72] *Cheffes* is local name for wetlands
[73] A military socialist government in Ethiopia that ruled the country between 1974 and 1991

Abijata. From this one can realize what the outcome could be after 80 years. The most terrifying thing is that the factory has also a plan to extend water abstraction from the nearby Lake Shalla. (Male ATJK *Woreda*)

Concurrent with our finding on stakeholders' views and concerns, various studies (Meshesha *et al.*, 2010; Temesgen *et al.*, 2013; Pascual-Ferrer *et al.*, 2014; Gebeyehu *et al.*, 2015) documented that the water body of Lake Abijata has been in almost constant decline since mid-1970s (Figure 4.4). In their LULC study, Girmay *et al.* (2017) reported that Lake Abijata showed a progressive decline by 25.6% between 1985 and 2015. The lake's retreat area, which was subject to prolonged ecological succession, contributed for grazing land accounting 28% in 2000, which was estimated at 20% in 1973. If the retreat of the lake and the existing natural and socio-economic conditions continue, it is likely to disappear in few decades (Meshesha *et al.*, 2010; Temesgen *et al.*, 2013; Girmay *et al.*, 2017).

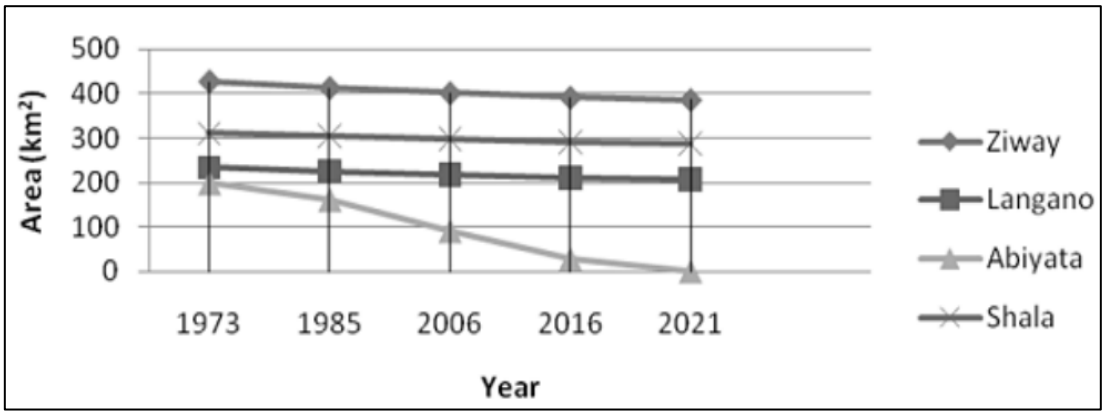

Figure 4.4 Areas of CRV lakes from 1973-2006 and projected areas between 2016 and 2021. Source: Meshesha *et al.* (2010)

Besides the reduction in the size or volume of the lakes and associated wetlands many stakeholders have repeatedly proclaimed the degradation in the quality of these ecosystems that in turn affected the biodiversity in the area. Previous studies (Kumssa & Bekele, 2014; Gebeyehu *et al.*, 2015; Mengesha *et al.*, 2015) have recognized the roles of Lakes Ziway and Abijata in supporting a considerable aquatic and terrestrial biodiversity. Foremost, Lake Abijata has been recognized as the most bird diversity sites in Ethiopia that has served both as feeding and reproduction site for several aquatic and terrestrial birds of both resident and

migratory ones. Lake Ziway and associated wetlands once supported more than 20,000 water birds (EWNHS, 1996). They serve as habitat for worldwide endangered bird and some endemic bird species, and thus are considered as an important bird area in Ethiopia (Hailu, 2005). These ecosystems could also be regarded as 'Wetlands of International Importance' based on Ramsar criteria 5 for the identification of internationally important wetlands[74]. Lake Ziway is also well-known for varieties of fish and other aquatic animals. In their research Mengesha *et al.* (2015) have noted that Lake Ziway and associated wetlands may qualify a Ramsar site under Ramsar criteria 7 which refers to wetlands that should support indigenous fish subspecies, species or families; and criteria 8 which refers to wetlands that should support food, spawning ground, and nursery and migration path for fishes.

In the present study, the finding from the analysis of the stakeholders' account revealed that owing to the degradation in the size and quality of the lakes and associated wetlands, the biodiversity (both the aquatic and terrestrial) are highly degrading. Many stakeholders, particularly at *woreda* and *kebele* levels as well as PRA discussants underscored that currently these ecosystems are meagerly supporting the once rich bird and fish lives thereby causing decline in the diversity and abundance of biodiversity. In describing the condition of Lake Ziway and associated wetlands the coordinator of the HoA-REC&N in Batu branch office stated that:

> *When we see the nature of Lake Ziway, during the summer season it overflows to adjacent land area whereas during winter season the lake's water retreats. The retreat areas served as wintering ground for wetland birds, even for those that migrate from distant areas. Nowadays, nevertheless, we rarely see these birds during the winter season because the lake retreat areas are commonly used for irrigation farming and livestock grazing by the local people* (Male, interview, HoA-REC&N).

The condition in Lake Abijata areas also revealed similar realities. The findings from the accounts of PRA discussants of elderly groups revealed that some 30 and 40 years back Lake Abijata was rich in fish species. Discussants asserted that in 1970s and 1980s, they

[74] Ramsar's Criteria 5 states: "A wetland should be considered internationally important if it regularly supports 20,000 or more water birds" (Ramsar Convention Secretariat, 2013: 53).

used to fish from Lake Abijata and it was with ease that they were catching fish. However, through time the fish resource degraded; and currently it is hardly likely to find fish, and if any only at the mouth of Bulbula River. Fishery production experts at *woreda* level Livestock Production and Protection Agency (WLPPA) argued that the disappearance of fish from Lake Abijata is mainly because of the gradual increase in the salinity of the lake which is highly associated with abstraction of the lake's water for soda ash production. Girmay *et al.* (2017) have also affirmed that the fish stock of Lake Abijata has totally collapsed. Likewise the finding of Gebeyehu *et al.* (2015) has also revealed that the retreat of Lake Abijata has significantly reduced birds' wetland habitat and feeding area which in turn alters the abundance, diversity and distribution of birds. Given the vital role of the lakes and associated wetlands for the survival of a variety of biodiversity, the degradation of these ecosystems not only influences the current biological diversity but also the future potential of their evolution.

The findings on the views of stakeholders from the research institutions and universities have revealed that the wetlands of the CRV lakes areas are not given due emphasis of conservation and management. They underscored that these ecosystems and the biodiversity they support are at a fast rate of degradation. Not only the birds and fish species, the macro and micro invertebrates and other forms of lives are highly threatened due to the degradation of the lakes and associated wetland ecosystems. They have also affirmed the degradation in woodland vegetation of the area mainly the *Acacia*, which has great contribution in controlling erosion, thereby prevent siltation or sedimentation in the lakes. In this regard Mesfin (2018) has also found out that forty years ago the coverage of the woodland and forest in the CRV area was estimated to be 95% while agriculture was just around 1%; however, these days nearly 45% of the area is covered by agriculture while woodlands account 42% and forest totally disappeared.

4.4.3.2. Predicaments of wetlands sustainability

As Mesfin (2003) noted because wetlands can be impacted in different ways, an early assessment of the ways they will be affected minimizes costs of wetlands restoration once they have been damaged. Accordingly, stakeholders were also asked to expound factors that challenge the sustainability of the wetlands. Different factors, most of which are human-

induced, were identified as drivers of the degradation of wetlands and challenge of their sustainability in the CRV of Ethiopia (Table 4.17). Stakeholders have also proposed ranges of measures to address the challenges of sustainability of wetlands. Although it is unlikely and difficult to have harmony among the voice of stakeholders, the most commonly proposed potential solutions were compiled under respective categories of key factors.

Wetland conversion

With the exception of the local community other stakeholders have claimed wetland conversion to other land uses as a key factor of degradation and predicament of wetlands sustainability. Population growth and the subsequent high demand of natural resources, for livelihood, are the major drivers of the conversion of wetlands in to other land use types mainly farming, grazing and settlement in the study area. This was aggravated by the absence of buffer zones around the lakes and associated wetlands. Farming of the lake retreat areas is therefore rampant particularly along the shore of Lake Ziway (Figure 4.5, upper figures). The office coordinator of the HoA-REC&N, Batu branch, described that "*As it has been prescribed by law any farming or development activity should not be practiced up to 100 to 200 meters from wetland areas as it should be part of the buffer zone. However, currently it is very common to see farming in the lakeshore area of Lake Ziway"* (Male, interview, HoA-REC&N). Attesting these findings Etissa *et al.* (2014) has noted that, spontaneous, anarchic and unregulated proliferation of smallholder private irrigation farming in CRV area may lead to environmental damage.

Figure 4.5 Farming in the shoreline, settlement and grazing on wetlands

Likewise, once wetland or lake retreat areas of Lake Abijata are now mostly covered by short grasses, bushes and vast mineral salt (locally called *Boji*) owing to settlement and grazing (Figure 4.5, lower figures). PRA discussants affirmed that these areas have been and are still playing a great role to over-come feed shortage for livestock especially during dry season. According to the findings from KII, particularly *woreda* and *kebele* level experts of sector offices, despite the livelihood benefits, the ecological recovery of wetlands and vegetation of the area is highly hampered by year round grazing. Consistent with this finding, Babu and Teferi (2015); Gebeyehu *et al.* (2015) and Gebretsadik and Mereke (2017) argued that the unresponsive overgrazing/overstocking/ of wetlands, savanna grasslands and acacia woodlands have caused a major change in abundance and community structure of vegetation and also compaction of the wetlands, due to soil treading, that have impact on soils' infiltration capacity and the general hydrological system. Field observation and discussion with DAs confirmed that the local people always freely graze their livestock in the wetland areas, and so soil tramping is very common in wetlands areas (Figure 4.6).

Figure 4.6 Livestock grazing and watering on wetlands

Deforestation and subsequent siltation

Stakeholders' account further revealed that removal of forest and vegetation covers and overgrazing around the lakes' catchment are rampant due to population growth and the subsequent expansion of farming and grazing lands as well as increased demand of wood for fuel, construction and charcoal making. An expert from Ethiopian Environment and Forest Research Institute (EEFRI) affirmed that owing to population pressure and the prevailing climate variability and change the local community in the area cannot ensure livelihood, and so people make and sell charcoal to eke out their livelihood. Cutting of trees for charcoal making has therefore been a typical practice in the area, which highly contribute to the degradation of the forest and the woodland vegetation. A study by (Teferra & Beyene, 2014) affirmed that owing to charcoal making and farming practice within ASLNP the vegetation cover of the park has already depleted which in turn threatened the ecosystem of Lake Abijata. Key informants particularly experts at *Woreda* Agriculture and Natural Resource Offices (WANRO) and *Woreda* Rural Land and Environmental Protection Offices (WRLEPO) emphasized that these practices together with a poorly coordinated watershed management (WSM) system accelerate and make things easy for soil erosion, usually severe gully erosion, and also affect the inherent structure of the wetlands to trap eroded silt or sediment. Consequently, huge amount of silt is transported from the upper catchment,

increasing the nutrient and sediment loads in the lakes and associated wetland ecosystems that in turn result in the lowering of their size, depth and quality. According to Hailu (2005), accumulation of silt or sediment within a wetland not only affect the water holding capacity of the wetland; but also in the worst cases leads to a complete change in the ecosystem and collapse of the wetland itself. As Adger and Luttrell (2000) clearly noted when the rate of extraction of CPRs, such as wetland resources, exceeds the rate of their replenishment, the resources will be unsustainable.

Over exploitation of wetland resources

Overexploitation of wetland resources is also among the most frequently mentioned key challenges for sustainability of wetland resources of the study area (Table 4.17). In this regard, many key informants, mainly from the government sector institutions, pointed to private commercial sectors and public enterprises; notably to the floriculture irrigation farms and ASAP as principal causes for the degradation (in volume and quality) of Lake Ziway and Lake Abijata respectively. This is partly reinforced by the government's Agriculture Development Led Industrialization (ADLI) policy, which forms the basis for Ethiopia's poverty reduction endeavor (MoFED, 2006). As part of ADLI, Ethiopian government fosters investment in agriculture mostly the development of large-scale export-oriented agriculture in different part of the country among others in the CRV. According to Hengsdijk *et al.* (2010) and Senbeta (2018) this has resulted in an excessive extraction of natural resources and conversion to agricultural land and settlements leading to degradation of the natural ecosystems. In the present study stakeholders have been widely arguing that private commercial sectors and public enterprises are incontestably perpetrators of degradation of lakes and associated wetlands because they are recklessly using the resources.

Table 4.17 Summary of stakeholders' view on predicaments of wetlands sustainability and proposed solutions

Direct and Indirect drivers and/or causes	**Existing Predicaments of wetland sustainability**	**Proposed solutions/measures from stakeholders' view**	**Directly responsible stakeholders**
Population increment/pressure; Livelihood issue; Economic growth; Institutional gaps [75]	Wetland conversion	Develop and implement land-use plan; establish a legally authorized institution with clear mandate and responsibility; define property right; raise public awareness of the value of wetlands; delineate buffer zone following standards; create/provide livelihood alternatives and promote non-consumptive forms of wetland resource use (such as ecotourism); adhere to rules-in-use	Almost all stakeholders [a]
Population increment/pressure; Livelihood issue; Institutional gaps	Deforestation/ removal of wetland vegetation/ and subsequent siltation	Strengthen watershed management (WSM) in the lakes' catchments; ecosystem restoration via tree planting, reforestation, area closure; protection of river banks by gabion to limit erosion; delineate buffer zone; reduce inundation and overflows of irrigation systems; increase awareness of the importance of wetlands	MoEFCC[b]; MoANR[c]; RVLBA; water users mainly irrigators; local community; universities and research centers
Economic growth (e.g. expansion of large-scale farms, ASAP); Population increment/pressure; Livelihood issue; Institutional gaps	Over exploitation of wetland resources(e.g. excessive water abstraction, over fishing)	Introduce water saving technologies (such as sprinkler) among key water users; adhere to environmental standards and rules-in-use; raise awareness and build capacity; reconsider, control and allocate/impose limit on/ resources use (eg. water) through resource use calendar/schedule; assign water use fees/charges/; promote groundwater use; regular water quality monitoring restriction on fishnet/mesh/ size; restriction or banning of beach seines; restriction on the number of fishers; fish catch quotas; provision of (dis)incentives, implement payment for ecosystem service scheme (PES), need for environmental impact assessment (EIA) and water use permit	MoWIE[d]; MoANR[e]; MoLFRD[f] RVLBA; NGOs, EIC[g]; all water users (local community, private and public enterprises such as irrigators, flower farms and ASAP)
Release of agricultural, industrial, and municipal wastes and chemicals; Institutional gaps	Pollution	Reduce agricultural, industrial and municipal waste emission; device appropriate sewerage and waste disposal and management; improve sanitation practices and minimize leakage; regular water quality monitoring; increase awareness about the importance of wetlands; levy cleanup cost for polluted environment; strict enforcement of established institutional arrangements, and adhere to environmental standards and rules-in-use	Water users; municipalities; urban water and sanitation utilities (Batu and Bulbula town); MoEFCC[h], RVLBA; BTAEFCCA

Source: Synthesized from own qualitative field data, 2017; *Note*: [a,b,c, d,e,f,g,h,i,j] include their respective bureaus and offices at (all) the lower tiers of government.

[75] Absence of strong institutional arrangements and institutional setup /or legally authorized institution/ to administer the use and management of wetlands; inadequate provision in and implementation ineffectiveness of the rules-in-use

Excessive water extraction for ASAP is the concern of many stakeholders for the sustainability of Lake Abijata and associated wetlands. Key informants, mostly *woreda* level experts, DAs and PRA discussants claimed that Lake Abijata is saline by nature, yet its salinity is increasing overtime; thereby the survival rate of many aquatic lives including birds and fishes has decline. They underscored that although under natural condition the lake is subject to evaporation which account for its salinity, the prevailing increase in the salinity of the lake is not just because of the evaporation. Rather it is linked to increased water abstraction from the lake for soda ash production. In this regard, Abera (2016) reported that over 75 years evaporation can account for a salinity increase of a few grams per liter only, yet the present salinity of Lake Abijata is more than 2000 mg l^{-1} which cannot be explained by the evaporation process only. Contrariwise to most stakeholders' blame of the ASAP for degradation and increase in the salinity of Lake Abijata and associated wetlands, officials and experts from ASAP attribute these mostly to the sharp decline in water inflow of the lake due to increasing use of water (irrigation, domestic and livestock) from Lake Ziway and Bulbula River, which is the main feeder of Lake Abijata. An expert from ASAP succinctly expressed this as: "*Bulbula River that has been once known for year-round flow is now flowing in a sporadic and meager amount; and it even peter out during the winter season*".

Likewise Lake Ziway is also challenged by excessive and unwise water utilization. On the shores of Lake Ziway and along Bulbula River thousands of motor pumps are being used by small-scale irrigators to pump or divert water. In most areas the irrigation practices are still traditional and inefficient. As the field observation result revealed most of the irrigators supply water for field crop though furrow method which is a very inefficient water use method with a poor on-farm water management practice or flow control (Figure 4.7). Concurrent with this finding, Etissa *et al.* (2014) reported that traditional irrigation water management practices largely dominate smallholder farming of the CRV area where farmers perceive irrigation as a mere diversion of water to the field through either narrow or broad bed furrows. Many other previous studies (e.g. Hailu, 2005; Hengsdijk *et al.*, 2010; Bezabih & Mosissa, 2017; Gebretsadik & Mereke, 2017) have also documented that excessive and unsustainable resources extraction including long term drainage for large- and small-scale irrigation farming

may impede the ecological recovery of wetlands; and in some cases can lead to a direct collapse of the wetlands.

Figure 4.7 Excessive water application of furrow irrigation method (Burqa Lemefo *Kebele*)

Equally is the prevalence of indiscriminate fishing[76] and over exploitation of the fishery resource of Lake Ziway. The finding from PRAs with fishermen disclosed that although they have fishermen cooperatives, they lack customary rules that either define the right for any group to undertake fishing or exclude anyone from using the resource. Most of the cooperatives also lack regulatory measures such as restriction on mesh size; hence there are fishermen who use illegal fishing seine. Explaining existing condition in Lake Ziway, the DA of Burqa Lemefo *Kebele* has stated that: "*Because the lake and its fish stock are open, anyone who is interested can practice fishing with no limit or liability for any payment or governmental obligation; and with reckless disregard of the degradation of the resource*." If a resource generates highly valued products, then it is expected that the lack of rules or the gap in their enforcement for authorized use of the resource will lead to misuse and overconsumption (Ostrom, 1999). According to Spliethoff *et al.* (2009), the larger proportion (54%) of the local communities of Lake Ziway depends solely on fishery. So, we agrue that unless proper management measures are put in place, the sustainibility of the fish resource of Lake Ziway

[76] Young fishes trapping either purposely to catch catfish for bait or unintentional due to the use of small size mesh

and even the sector itself - fishing as a livelihood activity- remain uncertain. The lack of or inadeqaute alternative income generating activities tends to perpetuate the problem.

The gaps and week enforcement of institutional arrangements as well as the indeterminate property regime of wetlands were widely cited by the stakeholders as drivers for the over exploitation and poor management of wetland resources. Stakeholders, particularly from government sector offices, research institute and wider public have been strongly arguing that the lack of clear property regime exposed wetlands for overexploitation of their resources. Most stakeholders asserted that in open access or communal property, rules of sharing reduce the incentive to care for resources, thereby promotes resources degradation. On the other hand, private holdings encourage resource users to protect and develop resources because of tenure security and the observable direct linkage between investment in resource conservation and the benefit from it. Corroborating our finding, Babu and Teferi (2015) found out that wetlands are open for all communities, everyone therefore has access to extract the natural products from them; and no one care for them. Likewise, Ostrom (1999) argue that if anyone can use a resource, no one will be motivated to conserve or to invest in improvements. From our finding we have learned that this is also highly linked with gaps in institutional arrangements that failed to clearly state the mandates, rights and responsibilities of stakeholders; as well as absence of a legally assigned institution duly empowered to issue and enforce rules and coordinate activities in wetland resources management.

Pollution

Pollution of the water of the lakes and associated wetlands is the other predicament of the sustainability of wetlands of the study area. The drivers of pollution, as to the perspectives of the stakeholders are release of agricultural, industrial, and municipal wastes and chemicals. According to Babu and Teferi (2015), poor management and disposal of chemicals and waste is the major pollution threat to wetland resources. Likewise, Etissa *et al.* (2014) noted that, increased dependence on irrigation has high potential for deterioration of water quality through pollution with agrochemicals and fertilizers as well as increased nutrient load in the lakes' water resulting in eutrophication. An expert from BTAEFCCA stated that the degradation problem in Lake Ziway ecosystem is worsened by non-point source municipal wastes, both

liquid and solid, mainly from Batu (previously named Ziway) town. As Beneberu and Mengistou (2009) reported the 'clear water' condition reported few decades ago is now visibly replaced by a brownish turbid Lake Ziway.

Overall, the study findings suggest that the predicaments to sustainability of the lakes and associated wetlands (and their services) center on contesting issues of resource conservation and socio-economic development. Several prevailing socio-economic activities, both subsistence and commercial, are occurring at the expense of degradation of wetlands. It is, therefore, imperative to design strategies in a win-win approach. A win-win approach is an approach where a wetland intervention action results in measurable benefits to both nature and the humans (Gawler, 2002). Such approach is important, in the CRV lakes area, for proactive involvement of stakeholders in sustainable management of wetland resources; thereby simultaneously ensure the resources' sustainability and the socio-economic development. For Gawler (2002), strategies for sustainable management imply taking the long-term view, and devising strategies for outcomes where all stakeholders can be winners. In this regard, a good strategy in the CRV area could be promoting non-consumptive forms of wetland resource use such as ecotourism that has multiple advantages. According to Sfougaris *et al.* (2009), using wetlands for ecotourism not only enhance wetland conservation but also promote maintenance of biodiversity and enhance socio-economic development. In support of this Menbere and Menbere (2018) asserted that the involvement of different stakeholders in community based ecotourism is crucial for effective conservation and sustainability of wetlands and their ecosystem services.

4.4.4. Stakeholders' Synergy in Management of Wetland Resources

Admittedly, collaborative involvement of all stakeholders within (vertical) and across (horizontal) all levels is imperative for a robust and sustainable conservation and management of wetland resources that can ensure their sustainability. As Bandaragoda (2000) asserted collaboration is one of the key instruments to handle problems related to fragmented activities of resource management. Nevertheless, the synergy among stakeholders is perhaps difficult particularly under circumstances where a framework or institution- customary and/or statutory- of wetland management is weak or lacking, which characterizes the wetland resources of CRV Lakes. Despite this there have been few endeavors among stakeholders to work collaboratively

in different activities that can directly or indirectly contribute to the management of wetland resources of the study area. From the study result it has been found out that the stakeholders' main areas of partnership are watershed management (WSM) and ecosystem restoration (ESR); capacity building; research activities and development of resource (or land) use and management plan (Table 4.18).

Table 4.18 Stakeholders' realm of collaboration for management of wetland resources

Areas of collaboration	**Collaborative stakeholders**
WSM and ESR	Local communities, *Kebeles'* chairmen, DAs, *Woredas'* offices [a], zones' offices [b], RVLBA, RVLIWDM, ASLNP, Universities, CRS
Capacity buildings (mass mobilization, training, awareness creation, finance and technical support)	*Kebeles'* chairmen, DAs, Universities, HoA-REC&N, CRS, RVLBA, RVLIWDM, BTAEFCCA, ASLNP, *Woredas'* offices [c], zones' offices [d], Region bureaus [e], Ministries [f]
Research and development of land (resource) use and management plan	Universities, HoA-REC&N, EEFRI, EBI, EWNRA, RVLBA

Source: Synthesized from own qualitative field data, 2017

[a] Woreda Agriculture and Natural Resource Office (WANRO) , Woreda Rural Land and Environmental Protection Office (WRLEPO), Woreda Irrigation Development Authority (WIDA), Woredas Administration Office (WAO)

[b] Zone Agriculture and Natural Resource Office (ZANRO), Zone Rural Land Administration and Land Use Implementation Office (ZRLALUIO), Zone Water, Mineral and Energy Office (ZWMEO)

[c] WANRO, WRLEPO, WIDA, WAO, Woreda Water, Mineral and Energy Office (WWMEO), Woreda Livestock Production and Protection Agency (WLPPA), Woreda Culture and Tourism Office (WCTO)

[d] ZANRO, ZRLALUIO, ZWMEO, Zone Environment Forest and Climate Change Office (ZEFCCO), Zone Livestock and Fishery Development Office- (ZLFDO)

[e] Oromia Rural Land Administration and Land Use Implementation Bureau (ORLALUIB), Oromia Agriculture and Natural Resource Management and Utilization Bureau (OANRMUB), Oromia Environment Forest and Climate Change Authority (OEFCCA), Oromia Livestock and Fishery Development Bureau (OLFDB), Oromia Water Mine and Energy Bureau (OWMEB)

[f] MoANR, MoWIE, MoEFCC, MoLFRD

Watershed management (WSM) and ecosystem restoration (ESR)

One of the areas of collaboration of stakeholders in wetland resource management is WSM and ESR. Following government's resource management policies, mainly the IWRM, stakeholders particularly government sector offices at different tiers of the government structure mainly at *kebele, woreda* and zone levels have been working collaboratively in WSM program. The program can contributes a lot to the rehabilitation of wetland ecosystems and conservation of

their resources because it targets on soil and water conservation activities, and so prevent or reduce siltation in the lakes and associated wetlands. Equally are ESR activities that have received the attention of different stakeholders to rehabilitate degraded ecosystems particularly in the upper catchments of Lakes Ziway and Abijata. Hence, stakeholders have been collaboratively working in both passive and active approaches to ESR[77]. As a passive ESR approach stakeholders have been practicing area closure in both the upper and lower catchments of Lakes Ziway and Abijata. This practice has legal ground that is clearly stated in the FDRE Rural Land Administration and Land Use Proclamation No 456/2005, Article 13(7) as "Rural land of any slope which is highly degraded shall be closed from human and animal interference for a given period of time to let it recover, and shall be put to use when ascertained that it has recovered" (FDRE, 2005b). In the upper catchments of Lake Ziway, for example, area closure and rehabilitation activities that have been conducted with the support (financial and technical) of different actors- such as the RVLBA, HoA-REC&N, CRS and Safety net project, yet difficult to fully restore the ecosystems due to critical degradation.

According to Bongers *et al.* (2006), in some condition, enclosures that protect an area from grazers and other human interventions promote succession and can be sufficient for the restoration of the degraded ecosystem of the area. From the present study finding we have learnt that although area closure has contributed to ESR in some parts of the study area, in most contexts this approach couldn't help for the rejuvenation of the ecosystems. In this regard, Lemenih (2004) noted that ecosystems differ in their ability to recover after disturbance, and so for highly degraded ecosystems or for ecosystems that are slow to recover after disturbances ESR through self-regeneration (i.e. the passive approaches) is less effective. Thus, under such conditions, area closures are not adequate and ecosystems remain in a degraded state unless more active management activities are taken. Hence, in the study area stakeholders have been also engaged in more active ESR approaches such as tree plantation or afforestation and reforestation activities particularly in the upper catchments of the two lakes.

[77] A passive approach seeks to restore the ecosystem by leaving the system alone, hoping that it will regain desirable structure and function through natural succession. Conversely, an active restoration approach involves active human intervention to complement and reinforce the self-regenerating potential of an ecosystem (Lemenih, 2004)

In the WSM as well as active ESR activities local communities are the foremost actors and so highly engaged, via labor contribution, in tree planting, building different physical soil and water conservation structures such as gabions, terracing and canals. Because these activities require expertise in planning, organization as well as physical and financial resources, different stakeholders have been also involved in such activities either directly or indirectly. *Kebeles'* chairmen and DAs have significant role in mobilizing the local communities in such activities. The mass mobilization activity is also backed by experts of different government sector offices at *woreda* and zone levels. Moreover, it is worth to mention the efforts of universities in establishing partnership with local stakeholders and government institutions in WSM program via the Learning and Practice Alliance (LPA) approach as well as involvement in mobilizing the local communities, through awareness creation, to engage in WSM activities. In this regard Arsi University and Hawassa University have been largely working on conservation and management of the watersheds of Arsi highlands and Gurage highlands respectively. Likewise, in collaboration with different government sector offices at *woreda* and zone levels there were some efforts for delineation of buffer by HoA-REC&N and Rift Valley Lakes Integrated Watershed Development and Management (RVLIWDM) project- a project initiated by MoWIE. However, in view of most stakeholders the WSM as well as ESR activities are not satisfactory compared to the area coverage of the lakes' watersheds and the extent of degradation in the area.

Capacity building

The other major aspect of collaboration of stakeholders in wetland resource management is capacity building that could be expressed in different ways including mass mobilization, training, awareness creation, finance and technical supports. Different sector ministries, regional bureaus, and the wider public (for example, HoA-REC&N and CRS) have practical importance in working collaboratively in capacity building activities mainly in finance and technical support. Hailu (2018) noted that government institutions usually establish partnerships with donor agencies for financial, physical and human capacity building; and likewise donors and NGOs create strong relationship with the local communities through provision of funds and trainings. From the present study finding it has been observed that such kind of collaboration is mostly confined between the stakeholders in the wider public and the

stakeholders in the federal and/or regional bureaus. Admittedly, the stakeholders at the lower levels of the government institutions (zonal, *woreda* and *kebele* levels) require support in financial, physical and human resource since they are the one that mostly implement and monitor resource management activities. However, in most cases the stakeholders at these lower levels of the government institutions appear to have weak collaboration with the wider public. In fact, the federal and regional bureaus of each sector institution collaboratively work with and assist the offices at the lower levels, mostly through trainings. The findings have further shown that the horizontal collaboration (among different sectors) is weaker than the vertical collaboration (within sector). From their previous experience informants in many sector institutions affirmed that collaboration among different government sector offices is very limited. However, the collaboration within every sector (i.e from the federal down to *woreda* level) is relatively strong.

While the minister sector institutions, regional bureaus and the wider public established partnership predominantly focusing on provision of physical resources, technical and financial support, universities also collaborate with them in capacity building of human resources via training of experts.

Research and development of land (resource) use and management plan

Stakeholders such as research institutions, universities and environmental NGOs have also partnership in research and the development of land (resource) use and management plan. However, sometimes there are overlaps and duplication of activities, for example in research and studies, due to poor communication and documentation. On the other hand, the study finding revealed that, the partnership of economic actors (private sectors and public enterprises) with any of the other actors is very weak, and hitherto there were limited endeavor to form the partnership. Consistent with our finding Rao (2013) noted that it is rare when the business interest and the public interest are aligned; and mostly it is arduous for these adversarial interests to collaborate in NRM.

4.4.5. Challenges for Collective Actions in Management of Wetland Resources

The need for collaboration in management of wetland resources is unanimously recognized by stakeholders, perhaps except for economic actors. Accordingly, as it has been discussed in the

preceding sub-section, different actors have some forms of partnership in activities that directly or indirectly contribute to the management of wetland resources. However, from the study findings we have learnt that these activities lack robust collaboration of the stakeholders. Stakeholders affirmed that there are different challenges for effective and proper involvement and collaboration. Among the prominent challenges is the absence of framework for joint planning, implementation, follow-up and evaluation of activities. Hence contradictions and conflicting issues are there in their course of actions and activities. Conflicting objectives of different sectors of the government institutions have often resulted in uncoordinated activities that highly threaten wetlands. For example, extraction of soda, by ASAP, from Lake Abijata is in a direct conflict with the conservation objectives of the ASLNP. Hailu *et al.* (2017) have similarly reported that integration of stakeholders is problematic in a context when the stakeholders did not synchronize and collaborate while planning their activities that potentially result in a conflict of interest and claim for legitimacy over the management of resources among stakeholders. Moreover, it is often assumed that the role of coordination in forming partnership is solely the responsibility of the government sectors.

Insight from stakeholders' past experiences have also illustrated that although they have some common ground regarding protection and management of natural (wetland) resources; mostly they focus on their own sectorial tasks which they plan in isolation following their respective sectorial target(s). This holds back their active engagement and collaboration in the management of the resources. In practice, as Vogler *et al.* (2017) described creating framework for collaborative work is challenging because stakeholders have varied and conflicting interests, power, rights and responsibility in resource access, use and control, as well as in policy formulation and decision-makings. Likewise, the present study findings make plain that lack of clarity of mandate as well as conflicting and overlapping roles and responsibilities pose challenge for proper involvement and collaboration of the stakeholders. The problem is vividly seen within (vertical) and among (horizontal) sectors. For example, informants from WRLEPOs stated that it is confusing for them where (at which tier(s) of the government) is the responsibility to monitor and evaluate the compliance of private and public sectors' activities with EIA or other standards. Similarly, as the interviewees from WWMEOs illustrated the multi-sectorial management claim on the lakes' water resources is very contesting for strict

management of the resources. Herein, informants underscored the conflicting power, rights, roles and responsibilities of WWMEOs and WIDA; while the water office is working on permit system for water use; the IDA allows water uses, for small scale irrigation by any person, without holding any permit. There are also overlaps in duties and responsibilities of the MoWIE with RVLBA. For example, issuing water use permit is legally vested to both sectors, which creates duplication of efforts and makes the management of water resources in the area very challenging. Hence, clarity of roles and responsibilities among stakeholders is necessary to avoid such duplication of efforts as well as contesting issues in the management of wetland resources of the area. Consistent with our finding Tambunan (2015) and Hailu *et al.* (2017) highlighted that overlaps and lack of clarity in the roles, functions and activities are among the big challenges for a sustainable collective action in the management of resources.

Stakeholders have also outlined that involvement and collaboration is problematic due to power imbalance among stakeholders in the management of wetland resources of the study area. In this regard, almost all stakeholders from government sectors, research institutions and local actors underlined the difficulty to confront the vested interests of economic actors that are financially powerful. In fact this finding contradicts with what has been found out from the interest-influence matrix analysis that economic actors are 'Crowds' with low interest and low influence. The view of many stakeholders is contrary to this in that they felt that these economic actors consider themselves as one that have the absolute right and power over the resources and they target on maximizing benefit, which is usually occurring at the expense of environment. Moreover, it has been widely argued that most activities of the economic actors do not comply with the statements of different policies and legal frameworks although decisions are usually made in favor of them. Informants of local stakeholders as well as zone and *woreda* level experts of different government sector offices emphasized that because of their financial power and by virtue of their economic importance in generating foreign exchange, economic actors receive great attention and so the tendency to realize their interest is high as opposed to other public. This can bring discords in resources management that in turn results in unsustainable resource management outcomes. According to Rao (2013), this is one of the possible reasons why it is challenging for most resource managers and conservation groups to have open discussion and create common ground among stakeholders about their

responsibility for wise use and management of wetland resources. In agreement with this Oh *et al.* (2005) and Vogler *et al.* (2017) noted that resource managers and policy makers usually prefer to avoid open discussion, and if any with minimal consultation on the assumption that bringing all stakeholders together creates conflict as it is complex to tradeoff stakeholders' interest. Hence, we argue that bringing together stakeholders that have power imbalance, some potent and others voiceless, is grueling in the absence of a common and impartial framework or platform for management of wetland resources.

Apart from the power imbalance, capacity limitation for conservation and management of wetland resources is the other factor that challenges effective involvement of stakeholders, which exacerbate the existing degradation of wetland resources in the study area. Admittedly, adequate human, physical and financial resources are required to undertake the required conservation and management activities thereby ensure sustainability of wetland resources. Nevertheless, the study finding confirmed that budget/finance constraint being the foremost one; the existing human and physical resources are not also adequate to support conservation and management of wetland resources of the study area. Capacity limitations are particularly noticeable for government institutions at the lower administrative levels- zones, *woredas* and *kebeles*. A best case in point is the human capacity limitation of WRLEPOs. In the new administration structure this office (WRLEPO) has been split into two units: 'Rural land administration and land use implementation sector' and 'Environmental protection sector'. Hence, there are finger counting experts running these units. Although local NGOs and donors provide financial and technical support for local stakeholders, the limitation in financial capital, in particular, still persists. As it has been reported in NBI (2013), because many countries do not have a wetland specific policy or strategy, most often funding on wetland conservation and management is lacking and the allocation of funds, if any, does not contain the necessary funding support for wetlands. Hence, in the study area, stakeholders are constrained to undertake surveillance and regular monitoring activities of the status of wetland resources; timely water quality inspections; as well as research and provision of trainings. We therefore argue that all stakeholders should take the initiative to identify mechanisms for capacity (human, physical and financial) building that can contribute for effective management, and thereby to the sustainability of wetland resources of the area.

The study finding has revealed that stakeholders' collaboration and involvement is also challenged due to indeterminate property regime or unclear property rights over the management of these resources. In this regard, the case that most stakeholders particularly zone and *woreda* level experts unanimously agreed on is the contested resource (land) tenure in ASLNP. In the area there is years lasted tension between local people and the parks governing authority. Local community's grievance arises from their fear of loss of the customary right to access and use the land and other resources inside the park. Accounts of elderly groups of the PRA discussants, in Desta Abijata *kebele,* elucidated that local people were living in the area long ago before the establishment of the park[78]; hence they claim that they have the right to use and manage the resources there. This not only restrains stakeholders' synergy in the management of the resources in the park but also aggravated resources degradation in the area due to irresponsible use of the resources. Concurrent with our finding, Teferra and Beyene, (2014), revealed that from historical and socio-economic perspective local communities are *de facto* manager and claimants of the resources in ASLNP, whereas the government is *de jure* owner of the park. While the government intends to protect the park for conservation, tourism development and research, the livelihood security concern of the local communities may trigger dispute and consequently widespread illegal use and encroachment. Such ill-defined property right undermines collective actions in the area which has implications in the proper management of the resources. This is because as Hailemariam *et al.* (2016) noted, despite the fact that most decisions are made at higher level, communities' right matter most. Moreover, insight from the interviews of experts of WRLEPOs illustrated that the jurisdiction on the administration of land and other resources in ASLNP is confusing for them because the park's boundaries[79] do not coincide with any administrative boundaries- *kebeles*, *woredas* or zones.

Beckh *et al.* (2016) noted that multiple and overlapping bundles of tenure rights may hold to resources and in such cases customary tenure system may be legally recognized. However, as Teferra and Beyene, (2014) documented, in the case of ASLNP the challenge for management of the resources is not only related to the overlapping and contested property rights but also to

[78] ASLNP was established in 1974.
[79] ASLNP is located in East Shewa and West Arsi zones of ONRS; the park area lays in three *woredas*: Arsi Negelle, Shalla and ATJK where a respective 85%, 10% and 5% of the park's area is located (Teferra & Beyene, 2014)

the poor information sharing and communication between the parks governing authority and the local communities. This is because local communities have little awareness and familiarity about conservation laws and objectives of the park, equally the park officers failed to learn about the conditions, needs and preferences of the locals. Hence, when the parks authority tried to enforce law, the local communities protest because they considered it as 'illegitimate action' which is against their customary right. Cohen-Shacham *et al.* (2014) pointed out that the influence from higher levels of organization is often viewed by local stakeholders as a cause for conflicts between different stakeholders and within a stakeholder group. Hence, our assertion here is that a mere representation of stakeholders where there is little consultation and open discussion is futile for proper management, thereby the sustainability of wetland resources. In the argument of Darradi *et al*. (2006) local communities' involvement at every step of the development of wetland management plan is important to ensure that the communities take responsibility of the plan and will commit to its implementation.

Gaps in institutional frameworks and the consequent difficulties in their implementation have been also referred as another challenge for stakeholders' collaboration and involvement (*see* section 4.5). Because the management of wetlands involves multiple stakeholders, with varied interests, roles and responsibilities, the tradition of role confusion and power mingling has long been a challenge for *woreda* level stakeholder offices such as the WRLEPO, WWMEO and WLPPA to enforce environmental standards and institutional frameworks. It is apparent that wetlands are ecotones, between marine and terrestrial areas, hence they are characterized by many indivisible resources such as land, water, fish and other biodiversity that are difficult to be physically partitioned. As Adger and Luttrell (2000) noted this multi-resource characteristic of wetlands as well as their dual physical complexity (water-related and terrestrial-related component) influences the structure of resource-tenure and management regimes of wetlands because most resource management strategies are built on specific habitat or boundary. Recognizing this it is therefore sound to argue that all stakeholders that have stake in the management of the different resources of wetlands of the CRV lakes need to have common ground and vision and jointly work to ensure effective management, thereby sustainability of the resources. In this regard, Reed *et al.* (2009) posit that a soft system or a platform whereby

stakeholders with multiple and diverse interests and perspectives negotiate, learn among them and reach consensus is required for sustainable management of natural resources.

4.4.6. Stakeholders' Perspective on the Capacity and Functionality of Institutional Arrangements

Institutional arrangements are responses or solutions to generic challenges, hence absence of strong and dedicated institutions for management of ecosystems or environmental resources could led to loss of the ecosystems or the resources (Hailemariam *et al.*, 2016). In Ethiopia albeit the absence of a stand-alone national policy or other forms of institutional arrangements that specifically and clearly deals with wetlands, there are different institutional frameworks (policies, strategies, proclamations and regulations) which have policy and legal statements that reflect issues related to the management of different aspects of wetland resources (such as land, water, fish). So, in this study before discussing the findings on the stakeholders' perspectives on the capacity and functionality of existing institutional arrangements the researcher wanted to have a look at the provisions given with regard to management of wetland resources on some of existing institutional arrangements[80].

The Environmental Policy of Ethiopia (EPE) and the Conservation Strategy of Ethiopia (CSE), for example, have explicitly decreed the need for protection and rehabilitation of wetlands. Both documents have considered wetland values (ecological, social and economic) as one major criterion that a land-use plan should consider. They have also policy statements on wetlands that recognize natural ecosystems, particularly wetlands and upstream forests, are fundamental in regulating water quality and quantity, and so need to integrate the rehabilitation and protection of wetlands into the conservation, development and management of water resources; as well as the need to promote and protect the interface between water bodies and land (e.g. lake shores, river banks and wetlands) (MoNRDEP, 1994; EPA, 1997). As Mesfin (2003) noted these policy statements could be important entry points to take necessary actions for protection, conservation and rehabilitation of wetlands.

[80] It is not a detailed analysis of institutional arrangements that has been done in this study since the main objective is to capture stakeholders' perspective on the existing institutional arrangements

Provisions for the management of wetland resources have also been given in the Oromia Rural Land Administration and Use Proclamation No. 130/2007. Some of these provisions impose duties and obligations on wetland users stating that rural land users should refrain from doing activities that are damaging to wetlands and springs (Article 20(1)); and prohibition of improper utilization and mismanagement of wetlands (Article 20(2)). These provisions on wetlands are breakthrough or shift in the state of mind that considers wetlands as 'wastelands'. Moreover, the Proclamation has provision on the rules which need to be implemented by other concerned stakeholders. In this regard, Article 18(10) of the proclamation states that "*the biodiversity in rural wetlands shall be conserved and utilized as necessary in accordance with a suitable land-use strategy*" (ONRS, 2007:17). In fact this provision appears to be open for interpretation owing to the fact that there are no prescribed criteria regarding the necessity of using wetlands. On the other hand in the Ethiopian Water Resource Management Policy (EWRMP) wetland management issues seem to be addressed indirectly/implicitly. One of the policy's objectives targets on the sustainable conservation, protection and enhancement of water resources and the overall aquatic environment (MoWR, 1999). However, there is a claim that, in the EWRMP wetland issues are inadequately covered, even to the extent that they are totally ignored as the policy does not even mention the term 'wetland' in a single place.

Because wetlands are threatened due to numerous development activities, different institutional frameworks also give emphasis and stipulate the need for EIA to safeguard wetlands. For example, EPE and CSE target among others, to subject all major water conservation, development and management projects to the EIA process and to include the costs and benefits of protecting watershed forests, wetlands and other relevant key ecosystems in the economic analysis of such water projects; and to ensure that any proposed introduction of exotic species into water ecosystems be subject to detailed ecological studies and EIA (MoNRDEP, 1994; EPA, 1997). Likewise, Ethiopian EIA Proclamation (Proc. no. 299/2002) has clearly stated that EIA is a legal required mandatory action for the implementation of major development projects, programs, and plans (FDRE, 2002a). Such policy statements provide a basis upon which EIA need to be done prior to any development undertaking in an environmentally sensitive area such as wetlands. Because EIA is a proactive means for an early assessment of

the ways wetlands will be affected; it can help to minimize or avoid transaction costs of restoring wetlands after they have been destructed.

As it has been indicated above wetland related issues are somehow reflected either implicitly or explicitly in different sectorial and cross sectorial institutional arrangements. Because of this the need for initiating an independent wetland policy has been contentious. Scholars, such as Mesfin (2003), argue that wetlands are adequately represented in existing sectorial policies and strategies of the nation, thus what is needed is designing strategy that ensure synergy between relevant existing policy and legislation thereby enable local level action to occur. On the other hand there are scholars who are adherent of the assertion of the Ramsar Convention Secretariat and claim the need for an independent national wetland policy in Ethiopia. According to Ramsar Convention Secretariat (2010), development of a unique wetland policy statement and/or strategy is imperative in addressing wetland problems because in most cases at a national level wetlands are hardly explicitly addressed in other existing natural resources management policies such as for water, forest, land or others. In this regard, Wondafrash (2003) claimed that wetlands and their management are poorly addressed issues in Ethiopia. Moreover, the mandates of stakeholders to address wetland issues are not clearly defined, and so there is no entry point for one to initiate any effective wetland undertakings.

In view of the above contentious arguments and given the existing degradation of wetland resources of the CRV of Ethiopia, it is imperative to examine stakeholders' perspective about the capacity and functionality of existing institutional arrangements in responding to the ongoing degradation because it provides clues for areas that require improvement in the institutional arrangements. As the present study finding revealed stakeholders unanimously asserted that the capacity and functionality of existing institutional arrangements is not satisfactory to respond to the ongoing degradation of wetland resources of Ethiopia in general and CRV areas in particular. In their overall evaluation stakeholders identified various limitations of available institutional frameworks. Contradictions and inconsistencies between and within institutional frameworks are among the prominent limitations that stakeholders have recognized. A case in point could be the provisions given in different institutional frameworks regarding water use. Endorsed by Proclamation No. 180/2013 the Oromia National Regional

State (ONRS) issued the establishment of the Oromia Irrigation Development Authority; and in Article 29 of the proclamation the authority is legally assigned with the power to use water for the sake of small scale irrigation without any permission (ONRS, 2013b). Conversely, the Ethiopian Water Resource Management Proclamation No 197/2000 emphasizes on the permit system for water resources use and management. However, the water resource proclamation itself is apparently inconsistent because in Article 12(1b) it plainly declared that "*any person shall utilize water resources for traditional irrigation without holding a permit issued by the supervising body*" (FDRE, 2000). Although such provision ensures utilization of water for the highest social and economic benefit of the people, it could also intensify abuse of the resource by free-riders, such as the unregulated expansion of smallholder private irrigation farms in Lake Ziway area as well as the limitless water extraction from both Lakes Ziway and Abijata that could challenge their sustainability.

Similarly stakeholders underscored the contradiction of the policy statements of EWRMP and the Ethiopian water sector strategy (EWSS). The EWRMP stipulates conservation, protection and enhancement of water resources and the overall aquatic environment on a sustainable basis (MoWR, 1999); whereas the EWSS targets on draining the country's wetlands and converting them into fields that serve for other purposes (MoWR, 2001). Many stakeholders blamed the EWSS for the fact that the policy statements that are stated in relation to wetlands merely focused on sacrificing wetlands for human's socio-economic values with complete disregard of their ecological functions in the hydrology as well as supporting range of biodiversity. Concurrent with this finding, Damtie (2011) referred the EWSS as an extreme example where the anthropocentric view[81] on wetlands is highly reflected. The provisions given, in the EWSS, in relation to wetlands are: reclaim existing wetlands, and prevent the formation of new wetlands using appropriate mechanisms; develop mechanisms to preventive or avoid formation of waterlogged areas; develop and enforce guidelines to reclaim wetlands; and build appropriate drainage works on all wetlands. The overall objective of the EWSS is poverty alleviation and ensuring sustainable socio-economic development though efficient, equitable and optimum utilization of the available water resources of the nation. This objective by itself

[81] The mindset that we human being are master of nature and the center of everything and that everything is created to meet human interest (Damtie, 2011).

is not poor, yet the difficulty is on how to ensure sustainable socio-economic development by degrading one of the most valuable life supporting ecosystems, i.e. wetlands. Hence, the strategy in itself stated contradictory and conflicting issues that make enforcement very challenging.

The other pitfall that the stakeholders have highlighted is the presence of vague provisions and controversial issues stated in different institutional frameworks regarding the management of wetland resources. Stakeholders have boldly proclaimed that these vague provisions are big challenges for proper execution of duties and responsibilities in the management of wetland resources. For example, informants from RLALUIB and offices at the lower tiers commonly mention the provision in Article 20(3) of the Oromia Rural Land Administration and Use Proclamation No. 130/2007 that proclaimed wetlands shall be used for agriculture purposes with the consent of the community and technical support of professionals (ONRS, 2007). Herein, stakeholders asserted that such kind of provisions are open for interpretation, hence the use of the lake retreat areas for farming and animal grazing purposes may continue because the concern of the local communities is livelihood security. Regarding this an expert from WRLEPO vividly explained that:

> *It has been stated that 'people can use wetlands by conserving the resources'; however, there are no details and preconditions on how to use and conserve these resources. Because of this it has been difficult to enforce the regulation. So, there should be clear statements that don't confuse and bias people. I think there is also a need to design tradeoff mechanism between wetland sustainability and economic gain.* (Male, interview, Ziway Dugda *Woreda*)

Moreover, stakeholders argued that the CPRs notion that is reflected in different statutory laws is controversial, and so has great implication for the management of wetland resources. The constitution of the Federal Democratic Republic of Ethiopia's (FDRE), for example, in its Article 40(3) stated that all natural resources, including land, are common properties of the Nations, Nationalities and Peoples of Ethiopia (FDRE, 1995). Although some stakeholders affirmed that this provision is aimed at ensuring equity in resource access and use among citizens; others strongly argue that it might egg on land grabbing, which is being manifested in

recession farming in the lake retreat areas around Lake Ziway. Correspondingly Wagayehu (2003) documented that, the existing government's arrangement of resource (land) tenure whereby land and other natural resources remained under state ownership; granting farmers only the right to usufruct has been debatable topic among scholars and politicians on whether the arrangement provides incentive or disincentive for natural resource management and conservation.

The Ethiopian Water Resource Management Proclamation No. 197/2000 has similar provision in Article 5 that states all water resources of the country are the common properties of the Ethiopian people and the state (FDRE, 2000). Albeit the proclamation is meant for proper management of water resources of the nation with a principle of permit system, stakeholders asserted that this provision could mislead people, thereby abuse lakes' water by free riders who claim the right to use the resources as a citizen. Moreover, local stakeholders argued that the mechanism of putting resources (such as water or land) under the common property favors economic actors as they have the power to exploit the resources to their best interest opposed to other economically poor groups. Concurrent with our finding Beckh *et al.* (2016) documented that usually, governments statutorily declare land, water, fisheries and forests as public goods, on the argument that these resources are open, free or un-owned and they just provide environmental services. However, with such judgment in the context of weak collective action or no action by different user groups, and all of them hold tenure rights to the same publicly owned common resources, the tendency to act based on individual self-interest increases and may lead to overuse, degradation and loss of resources. This view was originally initiated by Hardin (1968) in his well-known article 'The tragedy of the commons', with a central argument that nobody will be concerned to improve and protect 'common resources', since each individual tries to maximize economic benefit from it.

Implementation ineffectiveness (loose/weak enforcement) of available institutional frameworks is the other big gap that stakeholders have identified. Despite the presence of different institutional arrangements (policies, strategies, proclamations and regulations) which directly or indirectly address the different aspects of wetland resources (land, water, fish), there are limitations in their enforcement. Informants from ZRLALUIOs and WRLEPOs, for example,

underscore that the existing farming practices in lakes areas are utterly against the provisions in different institutional frameworks. Among the frequently mentioned rules-in-use that proscribe such activities are the ONRS Rural Land Administration and Use Proclamation No. 130/2007 and the Oromia Region Rural Land Administration and Use Regulation No. 151/2012. The proclamation in it Article 20 (2) and (3) stipulated that rural land users should not perform activities that are damaging to the wetlands and springs and ban on mismanagement and improper utilization of wetland (ONRS, 2007). Likewise the regulation in its Article 21(3) decreed that "*Any land user whose holding is adjacent to water points, ponds, streams, and marshy lands is obliged to keep away the distance of 25 meters, and similarly 100 meters from the big ponds and water points*" (ONRS, 2012). Despite such provisions, from the field observation the researcher was able to realize that such institutional arrangements are lacking enforcement. Cultivation in wetlands is a common practice in almost all visited sites of the study *woredas*. It was found out that local people are increasingly using lake retreat areas for farming against the existing institutional arrangements. Over and indiscriminate fishing activity in Lake Ziway is also another manifestation for the gap in enforcement of institutional frameworks. Acquisition of legal fishing permit for undertaking commercial fishing from natural and manmade water bodies is decreed in the Fisheries Development and Utilization Proclamation No. 315/2003 (FDRE, 2003) and the Fishery Resource Development, Preservation and Utilization of ONRS Proclamation No. 178/2013 (ONRS, 2013a). The findings from stakeholders' view particularly the informants from ZLFDOs and WLPPAs affirmed that although most fishermen cooperatives have permit for fishing from Lake Ziway, there are also many private fishers who have no legal permit but practice commercial fishing; even by using illegal fishing seine.

Likewise, stakeholders confirmed that the waste management and disposal system of private commercial farms/sectors and public enterprises infringe Environmental Pollution Control Proclamation No. 300/2002. The proclamation in its Article 3 sub article 1, 3 and 4 states that "*(i) no person shall pollute the environment by violating environmental standards; (ii) if engaged in any field of activity that is likely to cause pollution or any other environmental hazard, shall install a sound technology that avoids or reduce the generation of waste; and (iii) if causes any pollution, shall be required to clean up or pay the cost of cleaning up the polluted*

environment" (FDRE, 2002b). However, accounts of informants mainly from *woreda* level stakeholders and evidences from field observation revealed that these provisions lack enforcement in the study area. The large scale flower farms directly release their wastes to the water system of Lake Ziway intensifying the threat to the lake's and associated wetland ecosystems and the biodiversity there. The municipal solid waste management and disposal system of Batu town is also accused of being against prescribed laws. The Environmental Pollution Control Proclamation No. 300/2002 Article 5(1) states that '*All urban administration shall ensure the collection, transportation, and, as appropriate, the recycling, treatment or safe disposal of municipal waste through the institution of an integrated municipal waste management system*' (FDRE, 2002b). However, as an informant from BTAEFCCA explained this is not down-to-earth and properly enforced in Batu town, hence the effluents and solid wastes aggravate the pollution of Lake Ziway. Such gap in implementation effectiveness of institutional arrangements definitely increases the transaction costs in the process of pollution abatement.

Many stakeholders contend that one of the reasons behind the gaps in enforcements of existing institutional frameworks is the absence of subsidiary governing documents such as directives, standards and guidelines that make conservation and wise use of wetland resources legally binding. Government enacts laws, such as policies, strategies and proclamations, in the absence of instruments or guidelines to control or monitor the enforcement and assure compliance at the local level. As Mesfin (2003) noted at federal level although there are wetland related policies and strategies, the problem with many of these policies and strategies is the failure for adequate implementation mainly because they are not based on an understanding of the problems and difficulties facing wetlands at local level. In the study area, farming of the lakes' retreat area, illegal fishing practices as well as improper management and disposal of wastes are illustrations of the gaps in proper enforcement of existing institutional frameworks that have ramification on the sustainability of wetland resources. Correspondingly, Hailu *et al.* (2017) have noted that the limited enforcement of environmental standards can intensify the resource crises. We therefore contend that proper enforcement of existing institutional arrangements (rules-in-use) is not a matter of choice rather imperative for sustainability of these resources.

Apart from proper enforcement of available policies and legal frameworks, stakeholders stressed on the need to strengthen the existing efforts and formulate a wetland-specific national and/or regional policies and strategies that suit local situations and address wetland problems. As the accounts of key informants from MoEFCC, RVLBA and EWNRA revealed over the past decade there has been attempt to formulate national wetland policy, although it has not yet been endorsed. According to Fisseha (2003), because wetlands have a critical role in the water cycle and in Ethiopia's hydrology, it makes sense to consider a separate policy, which exclusively deal with these important resources and ensure that the whole landscape into which wetlands are integrated is managed. Consistently, in the present study key informants particularly from research institutions and universities, and the wider public/or external bodies strongly advocate the catch phrase of Ramsar Convention: *'A unique wetland policy provides a clear opportunity to recognize wetlands as ecosystems requiring different approaches to their management and conservation, and not being masked under other sectorial management objectives '*(Ramsar Convention Secretariat, 2010b:17). Cognizant of the significances of the Ramsar Conventions to the management and conservation of wetland resources, stakeholders have also reiteratively claimed and underscored that Ethiopia need to sign the convention as it better capacitate the nation for conservation and wise use of all aspects of wetland resources. At international level although Ethiopia has showed commitment towards environmental management which is signaled through various key international environmental conventions[82], Ethiopia's stand to wetlands seems indifferent as the country is not yet a signatory of the Ramsar Convention.

In general, the findings on stakeholders' action and involvement revealed that there are several stakeholders in the management of wetland resources of the study area with diverse roles, responsibilities, interests and influences. The stakeholders have some endeavor to work collaboratively in the management of these resources, yet range of factors challenge their collaborative engagement in the management activities. Moreover, the inconsistencies of existing institutional arrangements coupled with inadequate and vague provisions crimped the proper management of wetland resources of the study area.

[82] Ethiopia is signatory to, for example, the Convention on Biological Diversity (CBD), the UN Convention to Combat Desertification (UNCCD), the UN Framework Convention on Climate Change (UNFCCC) and the Convention on International Trade in Endangered Species (CITES).

CHAPTER 5: SYNTHESIS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the major findings and synthesis of the study, conclusions drawn, recommendation, as well as some major contributions of the study and future research areas.

5.1. Major Findings and Synthesis of the Study

5.1.1. Major Findings of the Study

Knowledge, Attitude and Intention to Wetlands and their Management

Local communities' participation in the management of wetlands has a great role for the sustainability of these ecosystems. The findings presented in Chapter 4 reveal that the majority of the household respondents had a good level of knowledge, favorable attitude, and participation intention of wetlands. The finding further informed that the majority of the households just know about 'what wetlands are', yet low level of knowledge about the services of the wetlands. In the absence of knowledge about the ecosystem services of wetlands, it is unlikely for people to act pro-environmentally. A closer look at the households' attitude and participation intention has also evidenced that a considerable number of households were neither favoring nor willing to accept restrictions and/or bans on unsustainable use of wetlands. Unfavorable attitude and intention among the households could be related to the dependence of their livelihood systems on the wetlands ecosystem.

The study has also evidenced the presence of significant variation among households in their level of KAI, which is attributed to different demographic, socioeconomic, and physical factors. One key finding is that household respondents of different education levels did not reveal significant differences in their level of KAI. On the other hand, the respondents revealed significant variation in their attitude and participation intention based on their level of knowledge. This partly suggests that the knowledge that they possess could be 'indigenous'. Local people could acquire ample knowledge of local resources by virtue of their long stay in the area. Such indigenous knowledge is essential in that it can be integrated with scientific knowledge to introduce better conservation and management strategies.

Wetland Resources Management Behavior and its Determinants

The study findings showed that the majority of household respondents felt the deteriorating status of the wetland resources of the study area. Yet a fairly large proportion (45.9%) of the households revealed a low level of PEB to the management of wetland resources. Mere awareness of the degradation of the wetland resources is futile in the absence of a PEB. The finding on the determinants of PEB documented that age of the household head, household size, income, benefit from wetlands, number of livestock, farmland size, knowledge, attitude, participation intention, participation in the off-farm job, and distance to wetlands are major determinants of household's PEB. One important finding from the Sobel mediator test analysis is that household participation intention is a significant mediator in explaining the relationship of both knowledge and attitude with PEB. This finding implies that the influence of knowledge or attitude on the PEB of a household is determined by the level of participation intention to the management of wetland resources. The finding tells that a household with a high level of knowledge or a favorable attitude will possess a high PEB provided that the household's level of intention is high. This finding concurs with what the TPB posits: intention is the most immediate determinant of behavior.

Economic Value of Wetlands Ecosystem Services

The study findings revealed that the economic benefits associated with the wetland resources of the study area are significant. The overwhelming majority (89.6%) of the households have opted for wetland improvement plans over the status quo. The MWTP estimates have shown the positive and significant economic values of improvement in wetland attributes, particularly for biodiversity and water availability. However, households have significant heterogeneity in their preferences for wetland management alternatives. Age, education, income, location, and distance were significant predictors of households' preference. The results of the CS estimates have shown that all wetland improvement scenarios have positive values. The average and aggregate WTP values for a change from the status quo to the high impact improvement scenario are 202.45 ETB (the U.S. $ 7.5) and 18,741,809 ETB (the U.S. $ 694,141) respectively. Wetland improvement programs will, therefore, increase the ecological and socio-economic utility from these resources.

Stakeholders' Actions and Involvement in Management of Wetlands

The stakeholder analysis evidenced that the management of wetlands of the study area is in the realm of multiple stakeholders that are categorized into local stakeholders, government institutions, economic actors, research institutions and universities, and external bodies. The stakeholders have varied roles and responsibilities in the management of wetland resources, yet most of the roles and responsibilities are not adequately implemented. The stakeholders recognized the mounting degradation of wetlands induced mainly by human factors. The existing land-use practices around the lakes and associated wetlands are calamitous that highly contribute to the degradation of the wetland ecosystems. Stakeholders underscored that the sustainability of the wetland ecosystems is alarming, and thus an urgent need for local-level land-use plans. The stakeholders' arena in wetland resources management is characterized by weak collaboration as well as conflicting and/or overlapping actions, interests, roles, responsibilities, and power asymmetry. Stakeholders' major areas of collaboration are watershed management and ecosystem restoration; capacity building; and research activities. Among the government institutions, the collaboration looks good within a sector (vertical collaboration) than among sectors (horizontal collaboration). The partnership between economic actors (business) and other groups of stakeholders, however, is very poor. Stakeholders' collaboration and engagement seem to be challenged by the prevailing institutional arrangements typified by inconsistency, vague provisions, and weak enforcement. The common property notion and the lack of clear property rights regime for wetland resources exacerbated the improper management of wetland resources.

5.1.2. Synthesis of the Main Findings

This study attempted to draw our understanding of households' level of KAI of wetlands, wetland resources management behavior and its determinants, economic values of wetlands, and stakeholders' actions and involvement in wetlands management in the CRV of Ethiopia. These themes all together helped us to understand the existing management of wetlands in the study area. Proper and effective management of wetlands is indispensable as it influences wetlands sustainability. Proper and effective management entails PEB of the local communities. In this study, it has been revealed that although most households possess a high level of PEB, the number of households with a low level of PEB is also considerable. This has

implications on the outcome of the current management of wetland resources. Among the factors considered, the 'psychological factors', viz. knowledge, attitude, and intention (KAI) are of great interest. The locals' PEB is directly or indirectly shaped by these aspects of human behavior. The study results showed the significant effect of these factors on households' PEB.
In the study area, wetlands appear to be in a condition that needs an exigent management and conservation actions. It is also paramount important to assess the economic value that the local communities ascribe to these resources. The valuation of wetlands is imperative to justify spending for management actions that need to be taken in the future. Since local communities' WTP and CS values tell their support or opposition to the future management plans, the researcher had a strong conviction that the communities' ascribed values to wetland resources can implicitly imply what will, the communities' PEB be in the future. As the study finding revealed despite preference heterogeneity, which is attributed to different demographic and socioeconomic factors, the households have high MWTP for wetland attributes, particularly for biodiversity and water availability. The estimates of the CS have also shown positive values implying households support for wetland improvement plans, as these improve their welfare.

Although the valuation of wetlands is among the critical aspects of effective and sustainable management of wetland resources, it cannot be an end by itself. Sustainable management of wetlands equally entails an effective involvement of different groups of stakeholders in the management of wetland resources and institutional arrangements that support the action and involvement of the stakeholders. From the study, it has been documented that the management of wetlands of the study area is in the realm of many stakeholders that are categorized into local stakeholders, economic actors, government institutions, research institutions, and external bodies. The stakeholder arena was characterized by weak coordination, conflicting and/or overlapping actions, interests, roles, responsibilities, and power asymmetry. Stakeholders have also reflected that weak institutional arrangements typified by inconsistency, vague provisions on wetlands, and weak enforcement pose challenges for effective engagement of stakeholders in the management of wetlands. All these are in one way or another have contributed to the lag in the management of wetland resources of the area which possibly will lead to unsustainable resources outcomes.

5.2. Conclusions

The present study revealed that considerable proportions of the household respondents have a low level of knowledge of wetlands and their ecosystem services, unfavorable attitude, and low participation intention to wetland management. This signifies a lag in households' level of KAI of sustainable management of wetlands. The household respondents also possess a low level of knowledge of wetland ecosystem services. A meager knowledge of wetlands and their services is futile for successful management action. Considerable proportions of household respondents refused any ban and/or restriction of wetland exploitation. The prevalence of such unfavorable attitude and intention may hamper any pro-environmental action for the management of wetlands - as it is also posited in the TPB the behavior of an individual is shaped by the impact of attitude towards that behavior. Overall, the KAI of the households does not appear to the level that guarantees sustainable management of wetland resources. The households' limited knowledge of the wetlands ecosystem services can also be considered as a hurdle for wetland management. Cognizant of these findings, it is therefore pivotal to design and implement strategies by which the locals' KAI can be fostered and enhanced.

The study findings further revealed that a large proportion of households had a low level of PEB. Thus, there is a need to enhance the PEB of the households, or the local communities at large, for better pro-environmental action. Several factors have significantly influenced the PEB of the households; and, from the mediator test analysis, it has been observed that the influence of knowledge and attitude on PEB is significantly mediated by intention. On account of this, it can be said that in designing strategies to enhance the PEB of the local communities, it is good to look for measures that enhance the participation intention of the communities. However, a mere focus on intention may not bring success in enhancing the PEB, and thus it is highly recommended to design measures that enhance the communities' knowledge as well as attitude.

The majority of the households favor a policy change for wetland resources management. However, the heterogeneity in the households' preference needs to be considered while designing policy for wetland management plans. The CS estimates showed that the utility derived from improved wetland management scenarios is enormous that can highly contribute

not only to the welfare of the local community but also to the national economy. This implies that the loss of benefits owing to the absence of conservation and improved management of these resources is great. This finding has policy relevance that aimed at a plea for policy and decision-makers' attention to design programs that gear towards proper management of wetlands of the area. Given that the majority of the households are willing to contribute for wetland management and conservation programs, planners and practitioners can involve the local community, to their best capacity, while designing and implementing strategies in conservation and management of wetland resources.

Analysis of stakeholders' actions and involvement has discovered the varied roles and responsibilities of stakeholders in wetland management. However, the practice of once own roles and responsibilities in wetland management was found to be minimal among the stakeholders. It is also quite evident from the study findings that uncoordinated and fragmented activities of wetland resources management among different stakeholders of varied interests and priorities were very common. Such a conventional resources management scenario, whereby stakeholders planning and implementation of activities are being done in isolation cannot ensure proper and sustainable wetland resources management outcomes. On top of this, the study findings revealed that the existing institutional frameworks that are presumed to guide the management of wetland resources are characterized by contradictory and conflicting provisions, poor regulatory performance, and weak enforcement that pose challenges to management of wetland resources. Hence, it is plausible to deduce that available institutional frameworks are not practically rules-in-use to adequately address issues pertinent to wetland resources and ensure sustainable management.

5.3. Recommendations

The present study findings revealed that despite the huge socio-economic and ecological benefits they have, wetlands are highly threatened due to many human induced factors in the study area. Thus, it is imperative to design skillful tradeoff strategies to ensure the sustainability of wetlands while addressing the requirements for economic activities. To this end, based on the findings of the study the following recommendations are forwarded.

1) Given the low level of knowledge, unfavorable attitude and low participation intention (KAI) of the studied households, there is a need to build up and maximize positive attitude and strong intention that optimize management of wetlands. Thus, there is a need to create awareness and environmental education programs that promote locals' KAI thereby strengthen their PEB in management of wetlands. A proactive measure can create a system by which natural resource experts or DAs provide training and have frequent contact with local people to build rapport on the values of wetlands and the need for their management. The action of primary, secondary and higher education institutions and research centers is equally important in building the knowledge and overall capacity of the local communities. This may be through training, technical support, action research works or any other programs that sensitize local community for a more pro-environmental actions.
2) A more PEB in management of wetlands is evidenced with an increase in the age of the household head. Hence, importantly, policy measures for sustainability of wetland resources need to target younger group of the community to develop responsibility thereby act pro-environmentally in management of wetlands. Owing to relatively longer life horizon, younger people are presumed to have greater role for sustainability of wetlands. Efforts, therefore, need to be made particularly to reach this group of the community through specifically designed awareness and education programs. Accordingly, government intervention is needed to incorporate wetland issues in schools' programs and curriculums thereby build communities' knowledge and reinforce attitude and intention to wetland management endeavors.
3) Through the use of different incentive mechanisms such as tax subsidy or tax holiday and payment for environmental/ecosystem/ services (PES), there is a need to promote locals for an individual and collective pro-environmental action in the management of wetlands. A PES scheme is a plausible measure as it works on the principle that economic incentives are provided for those who manage the ecosystem to improve the flow of ecosystem services whereas those who benefit from the ecosystem services pay for the service they are provided. The excessive extraction of wetland resources (such as water from Lake Abijata mainly for commercial soda ash exploitation; and from Lake Ziway for large and small scale irrigation) jeopardizes the lakes' ecosystems. Hence, using PES

is an indispensable measure towards effective management and wise use of the wetland resources of the area.

4) In many cases decisions are simply made based on value judgment; hence it is usual to see most decisions favoring conversion or alternative uses of wetland resources. However, prior to any decision on the alternative use of wetland resources the benefits forgone from the protection and sustainable management of wetland resources needs to be considered. Given this, to justify decisions on the uses of wetland resources decision-makers should conduct cost-benefit analysis of estimating the marginal cost of providing the different attributes of wetlands.
5) It has been found out that the existing land-use practices around the lakes and associated wetlands of the study area are calamitous. Hence, designing local level land use plans is crucial to address many challenges related to wetland sustainability; thereby ensure sound management and wise use of these ecosystems.
6) An integrated perspective among different actors is needed to ensure the sustainability of wetlands of the study area. It is therefore sensible to recommend that the management of wetlands needs to target on designing multi-stakeholder platforms, such as public-private partnerships, in the action situation for proactive engagement of all stakeholders for joint planning, implementation, monitoring and evaluation of activities of wetland resources management.
7) The study results indicated that there are few endeavors in conservation and management of wetland resources, yet these activities are being done in a fragmented and uncoordinated manner, which in most cases activities are overlapping and conflicting with one another. It is therefore advisable to establish an institution with legal authority and mandate to administer these resources or provide the authority and the mandate to an existing institution (for example the Rift Valley Lakes Basin Authority).
8) It has been discovered that existing institutional arrangements are inadequate for wetland management, thus it is an exigent and reasonable to call for institutional options: either strengthening available institutional arrangements with adequate and clear provisions on management of wetland resources or enacting wetland-specific institutional frameworks. This could be helpful to clearly define the property situation of wetland resources, to ensure wise and lawful use of resources thereby local community and other stakeholders

are incentivized for wetland conservation and wise use, whereas penalized for any practice that threatens the sustainability of wetland ecosystems.

5.4. Future Research Areas

This dissertation has assessed different issues, which directly or indirectly are at interplay with wetland management, ranging from households' KAI, PEB, and economic valuation to stakeholders' actions and involvement in wetland management. In so doing, the study will have significant contributions conceptually, empirically, and theoretically.

Conceptually: the study tried to give broad information on the prevailing management of wetland resources in the CRV of Ethiopia. As Cohen-Shacham (2014) noted sustainable wetland management is hampered by a lack of coherent and holistic approaches since decision-making in wetland management required adequate information from different dimensions. In view of this, the present study tries to holistically approach and deal with wetland management by focusing on three major areas that have a significant role in resource management: the behavioral aspect of resource management (environmental education- KAI and PEB), the economic aspect of resource management (environmental or resource valuation) and stakeholders aspect (which is part of the broader institutional aspect).

Empirically: although the literature on wetlands is vast and varied, empirical works in the area of wetland management from a human behavior point of view (i.e. the KAI and PEB issues) and from a resource economics point of view (i.e. wetland valuation) are negligible, in Ethiopia. The KAI and PEB, in particular, are the least studied issues with regard to wetland management, at least in Ethiopia. Thus, the empirical contribution of this particular study can be viewed from its attempt to address these issues and add to the available literature on wetlands thereby.

Theoretically: the study is underpinned by a blend of theories and framework, viz. the Theory of Planned Behavior (TPB), Theory of Rational Choice (TRC), Random Utility Theory (RUT) and Institutional Analysis and Development (IAD) framework that helped to see the convergences and divergences between theories and observation. Although these theories and frameworks have been used in different previous scholarly works that deal with environmental or resource issues, the TPB has hardly been applied in research works in Ethiopia that deal with

resource management; and hitherto virtually no study on wetland issues, in particular, has applied it. For this reason, the application of this theory (i.e. the TPB) in this particular study and testing its practicality in the Ethiopian context, or at least in the context of the study area, can be regarded as a unique contribution of the study.

Despite all the aforementioned contributions, the researcher believed that there are areas or issues that need investigation in the future including:

- This study had limited scope of addressing the wetland management situation in the CRV of Ethiopia, particularly around Lake Ziway and Abijata areas. Recognizing that peoples' KAI and PEB, as well as the economic values people ascribe to wetland resources, could vary among communities living in different locations and resource contexts, planning and implementing sustainable management for wetlands in other parts of the country need further location-specific studies.
- The nexus between wetland resources and livelihood security will be critical issues of the future wetland management and it may take different forms and thereby result in different resource outcomes over time. This demands thorough research, in the future, to capture the interrelationship between these issues and forward the best way(s) whereby their linkage operates in a win-win scenario of wetland and livelihood sustainability.
- The results of this study provide useful insight into the need for more research on the possible contribution of tourism, eco-tourism, and other livelihood strategies that are non-agricultural, for the sustainability of wetland resources.
- Research should also be done on the environmental impacts of agrochemicals associated with the increased intensification of agriculture particularly irrigation farming in the Central Rift Valley of Ethiopia.
- Psychological factors, i.e knowledge, attitude and intention (KAI) could in some way influence individual's WTP and preference for wetland management. It is also expected that some sort of linkage might exist between the valuation of wetlands and the stakeholders' action since valuation of utility has a strong cultural component that can influence the objective involvement of different stakeholders and their perception of how they could be affected by policies. Thus in the future research works on these aspects are also imperative to capture these relationships.

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APPENDICES

Appendix I: Inter –Item Correlation Matrix for Knowledge Construct

		K1	K2	K3 -	K4	K5	K6	K7	K8	K9 -	K10	K11	K12	K15	K16	K17	K18	K19
K1	Pearson Correlation	**1**	**.443****	**0.074**	**.521****	**.363****	**.471****	**.425****	**.439****	**0.085**	**.428****	**.555****	**.444****	**.226****	**.468****	**.435****	**.482****	**.466****
	Sig. (2-tailed)		0.000	0.139	0.000	0.000	0.000	0.000	0.000	0.088	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N		405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
K2	Pearson Correlation		**1**	**.135****	**.427****	**.407****	**.489****	**.531****	**.369****	**0.097**	**.359****	**.343****	**.322****	**.257****	**.395****	**.361****	**.416****	**.395****
	Sig. (2-tailed)			0.007	0.000	0.000	0.000	0.000	0.000	0.051	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N			405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
K3 -	Pearson Correlation			**1**	**.115***	**0.090**	**.136****	**.194****	**.110***	**.300****	**.187****	**.138****	**.160****	**.163****	**.172****	**.198****	**.191****	**.214****
	Sig. (2-tailed)				0.021	0.072	0.006	0.000	0.026	0.000	0.000	0.005	0.001	0.001	0.001	0.000	0.000	0.000
	N				405	405	405	405	405	405	405	405	405	405	405	405	405	405
K4	Pearson Correlation				**1**	**.425****	**.417****	**.387****	**.369****	**.137****	**.358****	**.520****	**.422****	**.243****	**.440****	**.335****	**.463****	**.460****
	Sig. (2-tailed)					0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N					405	405	405	405	405	405	405	405	405	405	405	405	405
K5	Pearson Correlation					**1**	**.344****	**.499****	**.378****	**.186****	**.408****	**.411****	**.366****	**.271****	**.379****	**.352****	**.380****	**.401****
	Sig. (2-tailed)						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N						405	405	405	405	405	405	405	405	405	405	405	405
K6	Pearson Correlation						**1**	**.418****	**.579****	**.135****	**.358****	**.419****	**.402****	**.361****	**.431****	**.386****	**.381****	**.421****
	Sig. (2-tailed)							0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N							405	405	405	405	405	405	405	405	405	405	405
K7	Pearson Correlation							**1**	**.431****	**.158****	**.421****	**.484****	**.480****	**.291****	**.452****	**.404****	**.518****	**.473****
	Sig. (2-tailed)								0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N								405	405	405	405	405	405	405	405	405	405
K8	Pearson Correlation								**1**	**.196****	**.493****	**.412****	**.503****	**.335****	**.444****	**.385****	**.412****	**.487****
	Sig. (2-tailed)									0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N									405	405	405	405	405	405	405	405	405
K9 -	Pearson Correlation									**1**	**.207****	**.257****	**.210****	**.247****	**.209****	**.193****	**.168****	**.311****
	Sig. (2-tailed)										0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	N										405	405	405	405	405	405	405	405
K10	Pearson Correlation										**1**	**.433****	**.534****	**.408****	**.498****	**.467****	**.456****	**.530****
	Sig. (2-tailed)											0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N											405	405	405	405	405	405	405
K11	Pearson Correlation											**1**	**.553****	**.374****	**.530****	**.434****	**.582****	**.506****
	Sig. (2-tailed)												0.000	0.000	0.000	0.000	0.000	0.000
	N												405	405	405	405	405	405
K12	Pearson Correlation												**1**	**.434****	**.561****	**.478****	**.548****	**.605****
	Sig. (2-tailed)													0.000	0.000	0.000	0.000	0.000
	N													405	405	405	405	405
K15	Pearson Correlation													**1**	**.380****	**.497****	**.385****	**.434****
	Sig. (2-tailed)														0.000	0.000	0.000	0.000
	N														405	405	405	405
K16	Pearson Correlation														**1**	**.453****	**.494****	**.568****
	Sig. (2-tailed)															0.000	0.000	0.000
	N															405	405	405
K17	Pearson Correlation															**1**	**.506****	**.529****
	Sig. (2-tailed)																0.000	0.000
	N																405	405
K18	Pearson Correlation																**1**	**.607****
	Sig. (2-tailed)																	0.000
	N																	405
K19	Pearson Correlation																	**1**
	Sig. (2-tailed)																	
	N																	

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Appendix II: Inter –Item Correlation Matrix for Attitude Construct

		A1	A2	A3	A4*	A5	A6 -	A7-	A8	A9	A10	A11 -	A12	A13 -	A14	A15	A16	A17	A18	A19
A1	Pearson Correlation	1	**.609****	**.549****	**.183****	**.602****	**.331****	**.355****	**.521****	**.346****	**.479****	**.369****	**.616****	**.345****	**.514****	**.526****	**.551****	**.523****	**.519****	**.505****
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N		405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
A2	Pearson Correlation		**1**	**.540****	**.206****	**.613****	**.311****	**.272****	**.543****	**.411****	**.487****	**.305****	**.557****	**.310****	**.525****	**.545****	**.514****	**.603****	**.471****	**.602****
	Sig. (2-tailed)			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N			405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
A3	Pearson Correlation			**1**	**.148****	**.529****	**.324****	**.344****	**.631****	**.306****	**.492****	**.332****	**.648****	**.325****	**.539****	**.543****	**.625****	**.629****	**.547****	**.638****
	Sig. (2-tailed)				0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N				405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
A4-	Pearson Correlation				**1**	**.107***	**.378****	**.440****	**.196****	**.202****	**.249****	**.233****	**.172****	**.340****	**.100***	**.245****	**.140****	**.205****	**.190****	**.183****
	Sig. (2-tailed)					0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.044	0.000	0.005	0.000	0.000	0.000
	N					405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
A5	Pearson Correlation					**1**	**.180****	**.304****	**.566****	**.258****	**.367****	**.347****	**.624****	**.385****	**.527****	**.526****	**.561****	**.509****	**.549****	**.549****
	Sig. (2-tailed)						0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N						405	405	405	405	405	405	405	405	405	405	405	405	405	405
A6-	Pearson Correlation						**1**	**.258****	**.267****	**.256****	**.337****	**.304****	**.239****	**.303****	**.221****	**.301****	**.271****	**.304****	**.242****	**.299****
	Sig. (2-tailed)							0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N							405	405	405	405	405	405	405	405	405	405	405	405	405
A7*	Pearson Correlation							**1**	**.386****	**0.062**	**.254****	**.387****	**.383****	**.532****	**.286****	**.391****	**.343****	**.314****	**.166****	**.338****
	Sig. (2-tailed)								0.000	0.210	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
	N								405	405	405	405	405	405	405	405	405	405	405	405
A8	Pearson Correlation								**1**	**.407****	**.477****	**.261****	**.559****	**.322****	**.554****	**.575****	**.553****	**.527****	**.485****	**.539****
	Sig. (2-tailed)									0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N									405	405	405	405	405	405	405	405	405	405	405
A9	Pearson Correlation									**1**	**.496****	**-0.061**	**.277****	**0.018**	**.277****	**.323****	**.214****	**.368****	**.397****	**.286****
	Sig. (2-tailed)										0.000	0.220	0.000	0.722	0.000	0.000	0.000	0.000	0.000	0.000
	N										405	405	405	405	405	405	405	405	405	405
A10	Pearson Correlation										**1**	**.132****	**.403****	**.181****	**.452****	**.479****	**.398****	**.535****	**.420****	**.414****
	Sig. (2-tailed)											0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N											405	405	405	405	405	405	405	405	405
A11 -	Pearson Correlation											**1**	**.297****	**.414****	**.426****	**.257****	**.413****	**.378****	**.266****	**.413****
	Sig. (2-tailed)												0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N												405	405	405	405	405	405	405	405
A12	Pearson Correlation												**1**	**.360****	**.522****	**.533****	**.564****	**.551****	**.537****	**.601****
	Sig. (2-tailed)													0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N													405	405	405	405	405	405	405
A13-	Pearson Correlation													**1**	**.327****	**.397****	**.340****	**.256****	**.188****	**.286****
	Sig. (2-tailed)														0.000	0.000	0.000	0.000	0.000	0.000
	N														405	405	405	405	405	405
A14	Pearson Correlation														**1**	**.621****	**.736****	**.603****	**.500****	**.524****
	Sig. (2-tailed)															0.000	0.000	0.000	0.000	0.000
	N															405	405	405	405	405
A15	Pearson Correlation															**1**	**.527****	**.588****	**.536****	**.607****
	Sig. (2-tailed)																0.000	0.000	0.000	0.000
	N																405	405	405	405
A16	Pearson Correlation																**1**	**.531****	**.604****	**.538****
	Sig. (2-tailed)																	0.000	0.000	0.000
	N																	405	405	405
A17	Pearson Correlation																	**1**	**.604****	**.610****
	Sig. (2-tailed)																		0.000	0.000
	N																		405	405
A18	Pearson Correlation																		**1**	**.511****
	Sig. (2-tailed)																			0.000
	N																			405
A19	Pearson Correlation																			**1**
	Sig. (2-tailed)																			
	N																			

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Appendix III: Inter –Item Correlation Matrix for Intention Construct

		I1 -	I2.	I3	I4 -	I5	I6	I7	I8	I9 -	I10	I11 -	I12	I13 -	I14	I15	I16	I17	I18
I1 -	Pearson Correlation	1	.425**	.482**	.263**	.509**	.515**	.504**	.325**	.334**	.477**	.322**	.387**	.153**	.414**	.422**	.417**	.403**	.386**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
	N		405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
I2-	Pearson Correlation		**1**	.524**	.507**	.600**	.376**	.429**	.380**	.224**	.540**	-0.017	.615**	.417**	.580**	.629**	.323**	.259**	.492**
	Sig. (2-tailed)			0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.727	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N			405	405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
I3	Pearson Correlation			**1**	.369**	.541**	.485**	.547**	.412**	.172**	.568**	**0.015**	.578**	.269**	.625**	.692**	.407**	.304**	.519**
	Sig. (2-tailed)				0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.765	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N				405	405	405	405	405	405	405	405	405	405	405	405	405	405	405
I4 -	Pearson Correlation				**1**	.381**	**0.044**	-0.019	**0.050**	.282**	.415**	.124*	.399**	.556**	.451**	.441**	**0.068**	.110*	.292**
	Sig. (2-tailed)					0.000	0.381	0.698	0.311	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.170	0.027	0.000
	N					405	405	405	405	405	405	405	405	405	405	405	405	405	405
I5-	Pearson Correlation					**1**	.514**	.495**	.463**	.249**	.702**	.158**	.593**	.329**	.576**	.689**	.483**	.352**	.499**
	Sig. (2-tailed)						0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N						405	405	405	405	405	405	405	405	405	405	405	405	405
I6	Pearson Correlation						**1**	.751**	.618**	.279**	.487**	.350**	.419**	-0.069	.441**	.548**	.602**	.609**	.326**
	Sig. (2-tailed)							0.000	0.000	0.000	0.000	0.000	0.000	0.163	0.000	0.000	0.000	0.000	0.000
	N							405	405	405	405	405	405	405	405	405	405	405	405
I7	Pearson Correlation							**1**	.663**	.217**	.524**	.254**	.425**	-0.084	.435**	.529**	.664**	.576**	.322**
	Sig. (2-tailed)								0.000	0.000	0.000	0.000	0.000	0.090	0.000	0.000	0.000	0.000	0.000
	N								405	405	405	405	405	405	405	405	405	405	405
I8-	Pearson Correlation								**1**	.308**	.409**	.226**	.316**	**0.075**	.380**	.515**	.679**	.632**	.328**
	Sig. (2-tailed)									0.000	0.000	0.000	0.000	0.132	0.000	0.000	0.000	0.000	0.000
	N									405	405	405	405	405	405	405	405	405	405
I9 -	Pearson Correlation									**1**	.235**	.372**	.330**	.290**	.299**	.265**	.217**	.206**	.140**
	Sig. (2-tailed)										0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
	N										405	405	405	405	405	405	405	405	405
I10	Pearson Correlation										**1**	**0.058**	.574**	.318**	.640**	.603**	.438**	.394**	.493**
	Sig. (2-tailed)											0.245	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N											405	405	405	405	405	405	405	405
I11 -	Pearson Correlation											**1**	**0.082**	.123*	**0.080**	**0.090**	.344**	.309**	**0.032**
	Sig. (2-tailed)												0.098	0.013	0.109	0.070	0.000	0.000	0.521
	N												405	405	405	405	405	405	405
I12	Pearson Correlation												**1**	.281**	.633**	.617**	.338**	.269**	.461**
	Sig. (2-tailed)													0.000	0.000	0.000	0.000	0.000	0.000
	N													405	405	405	405	405	405
I13 -	Pearson Correlation													**1**	.327**	.388**	**0.010**	**0.025**	.288**
	Sig. (2-tailed)														0.000	0.000	0.839	0.617	0.000
	N														405	405	405	405	405
I14	Pearson Correlation														**1**	.767**	.379**	.349**	.508**
	Sig. (2-tailed)															0.000	0.000	0.000	0.000
	N															405	405	405	405
I15	Pearson Correlation															**1**	.496**	.442**	.580**
	Sig. (2-tailed)																0.000	0.000	0.000
	N																405	405	405
I16	Pearson Correlation																**1**	.560**	.403**
	Sig. (2-tailed)																	0.000	0.000
	N																	405	405
I17	Pearson Correlation																	**1**	.486**
	Sig. (2-tailed)																		0.000
	N																		405
I18	Pearson Correlation																		**1**
	Sig. (2-tailed)																		
	N																		

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Appendix IV: Inter –Item Correlation Matrix for Behavior Construct

		B1	B2	B3-	B4	B5	B6-	B7	B8	B9-*	B10	B11	B12
B1	Pearson Correlation	**1**	**.589****	**.363****	**.567****	**.506****	**.371****	**.642****	**.617****	**.417****	**.553****	**.588****	**.602****
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N		405	405	405	405	405	405	405	405	405	405	405
B2	Pearson Correlation		**1**	**.417****	**.574****	**.588****	**.485****	**.538****	**.534****	**.486****	**.543****	**.522****	**.561****
	Sig. (2-tailed)			.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N			405	405	405	405	405	405	405	405	405	405
B3-	Pearson Correlation			**1**	**.409****	**.432****	**.569****	**.315****	**.421****	**.539****	**.380****	**.513****	**.458****
	Sig. (2-tailed)				.000	.000	.000	.000	.000	.000	.000	.000	.000
	N				405	405	405	405	405	405	405	405	405
B4	Pearson Correlation				**1**	**.524****	**.514****	**.545****	**.570****	**.484****	**.585****	**.508****	**.515****
	Sig. (2-tailed)					.000	.000	.000	.000	.000	.000	.000	.000
	N					405	405	405	405	405	405	405	405
B5	Pearson Correlation					**1**	**.418****	**.530****	**.545****	**.427****	**.523****	**.530****	**.561****
	Sig. (2-tailed)						.000	.000	.000	.000	.000	.000	.000
	N						405	405	405	405	405	405	405
B6-	Pearson Correlation						**1**	**.342****	**.462****	**.560****	**.460****	**.503****	**.510****
	Sig. (2-tailed)							.000	.000	.000	.000	.000	.000
	N							405	405	405	405	405	405
B7	Pearson Correlation							**1**	**.583****	**.420****	**.532****	**.524****	**.589****
	Sig. (2-tailed)								.000	.000	.000	.000	.000
	N								405	405	405	405	405
B8	Pearson Correlation								**1**	**.429****	**.572****	**.503****	**.587****
	Sig. (2-tailed)									.000	.000	.000	.000
	N									405	405	405	405
B9-	Pearson Correlation									**1**	**.414****	**.549****	**.513****
	Sig. (2-tailed)										.000	.000	.000
	N										405	405	405
B10	Pearson Correlation										**1**	**.595****	**.506****
	Sig. (2-tailed)											.000	.000
	N											405	405
B11	Pearson Correlation											**1**	**.550****
	Sig. (2-tailed)												.000
	N												405
B12	Pearson Correlation												**1**
	Sig. (2-tailed)												
	N												

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Appendix V: Multicolinarity test for the multiple linear regression (MLR) model

Variable	Collinearity Statistics	
	VIF	Tolerance (1/VIF)
Age of the household head	**2.126**	**.470**
Sex of the household head	1.083	.924
Grade Level	1.140	.877
Household Size	1.801	.555
GHI	1.336	.749
Benefit	1.450	.690
Off-farm Job	1.513	.661
TLU	1.716	.583
Farmland size	1.436	.696
Training	1.312	.762
Extension contact	1.206	.830
Distance to wetland	1.330	.752
Location	1.514	.660
Sum of Knowledge	1.651	.606
Sum of Attitude	1.367	.732
Sum of Intention	1.309	.764

Appendix VI: Conversion factor of various classes of livestock to TLU

Animal Category	Tropical Livestock Unit (TLU)
Calf	0.20
Heifer	0.50
Ox	0.70
Cow	0.70
Sheep	0.10
Goat	0.10
Camel	1.00
Horse	0.80
Mule	0.70
Donkey	0.50
Chicken	0.01

Source: Jahnke (1982)

Appendix VII: Household Survey Questionnaire

Addis Ababa University
College of Development Studies
Center for Environment and Development Studies
A survey questionnaire for a PhD study on "**Wetland Use and Management in the Central Rift Valley of Ethiopia: Economic Valuation, Stakeholders' and Institutional Analysis**

Survey Questionnaire Consent Form

Dear Participant,

Attached herewith is a survey questionnaire for a PhD study. The purpose of the study is to examine the use and management practices of wetland resources in the CRV lakes region of Ethiopia, mainly of Lakes Ziway and Abijata in view of resources' value, existing institutional arrangements and stakeholders' interaction and participation. Under this general objective, "*Assessing local communities' knowledge, attitude, behavioral intention and action towards Ziway and Abijata Lakes' wetland resources and their management as well as the economic values people place on these resources*" are among the different aspects to be dealt by the research. Accordingly this questionnaire helps to gather information on these, aforementioned, issues from residents of the study area.

You are selected to receive this survey and participate in this study as part of 403 (randomly) selected sample respondent household heads. Your participation in this survey is completely voluntary. Although you have the right not to participate in the survey, since your participation is highly valuable, you are kindly requested to participate in the study. You do not need to have any special knowledge to participate in this survey and there are no wrong or right answers; most importantly genuine and honest responses are useful. There are no expected risks to you from participating in this study. I would like to strongly affirm you that the information you provide will remain completely anonymous and so your confidentiality is strictly guaranteed. Your name will not be written and the responses from different households will be aggregated thereby no individual's responses can be identified. Your responses will not be used for any purpose other than the research. The data may be used in future research, but the same confidentiality guarantees given here will apply to future use of the data. The survey questionnaire is filled by enumerators based on your response. This consent form is, therefore, written to kindly ask you to participate and help in completing the survey questionnaire.

Do you consent to participate in this survey? Yes ☐ No ☐

Thank you in advance for your time and kind cooperation to participate in the survey!

Fitsum Dechasa Kibret (PhD Student, AAU)

General Information

Zone Name	*Woreda* Name	*Kebele* Name	Code of the respondent	Name of the enumerator	Date of the interview (DD/M/Y)

PART I: Demographic and socio-economic characteristics of the respondent (Put a check mark √ or write the required answer in the space provided)

1.1. Sex of household head?	1= Male ☐	2= Female ☐
1.2. Age of the household head?	_____ Years	
1.3. Marital Status of the household head?	1= Single ☐ 2= Currently Married ☐ 3=Divorced/Separated ☐	4= Widowed ☐ 5= If other, please specify _____

1.4. How many members does your household have, including yourself?	Male	Female
1.4.1. How many Children (14 years and less)?		
1.4.2. How many adults (15-64 years, inclusive)?		
1.4.3. How many elders (65 years and above)?		

1.5. Have you attended formal education?	1= Yes ☐ 2= No ☐ (If 'No" skip to Q. No 1.7)
1.6. If your answer for Q. No 1.5 is 'Yes', what is the highest grade level you attended?	_____ grade

1.7. What is the educational level of members of your household? How many of them:	Number
1.7.1. Can't read and write?	
1.7.2. Can read and write but with no formal education?	
1.7.3. At preschool age?	
1.7.4. Have primary education (Grade 1-8)?	
1.7.5. Have secondary education (Grade 9-12)?	
1.7.6. Have vocational education or Diploma?	
1.7.7. Have Bachelor Degree or above Bachelor degree?	

1.8. Where did you born in?	1 = In this *Kebele* ☐	2= In other place ☐
1.9. If you born in other place, how long have you lived here?	_____ Years	
1.10. What is your **main** occupation?	1= Farming ☐ 2=Animal husbandry ☐ 3= Trading ☐ 4= Daily/Casual Labor ☐	5= Fishing ☐ 6= Civil servant ☐ 7= House wife ☐ 8= If other, please specify _____

1.11. If your **main** occupation is 'Farming', for how long have you engaged in this activity?	_____ Years

1.12. Does your household own the following items?			If yes, how many does your household own?	Estimated current market value of the item (in Birr)?
Radio	1=Yes ☐	2=No ☐		
Television	1=Yes ☐	2=No ☐		
Cell phone	1=Yes ☐	2=No ☐		
1.13. From what type of material the roof of your house is made?			1= Thatch ☐ 2= Corrugated iron ☐ 3= If other, please specify _____	

1.14. Does your household have farmland?	1= Yes ☐ 2= No ☐ (If 'No" skip to Q. No 1.20)	
1.15. If your answer for Q. No 1.14 is 'Yes', which type is your farmland? (More than one choice is possible) Specify the size.		How much is the size in *Timad*?
1= Private	1=Yes ☐ 2=No ☐	
2= Inherited	1=Yes ☐ 2=No ☐	
3= Gifted	1=Yes ☐ 2=No ☐	
4= Rented in	1=Yes ☐ 2=No ☐	
5= Sharecropped in	1=Yes ☐ 2=No ☐	
6= If other, please specify _____		
1.16. If your household has rented farmland, how much is the annual rental price per *Timad*?		_____ Birr
1.17. If your household has farmland, do you use water from Lake Ziway[83] for irrigation?		1= Yes ☐ 2= No ☐
1.18. If your answer for Q. No 1.17 is 'Yes', how much *Timad* of the farmland do you irrigate using the Lake's water?		_____*Timad*
1.19. If your household has farmland, how much *Timad* of the farmland is converted from wetlands?		_____*Timad*

1.20. Does your household own any livestock for food, for sale or other purpose?	1= Yes ☐ 2= No ☐ If 'No" skip to Q. No 1.26)	
1.21. If your answer for Q.No 1.20 is 'Yes', which livestock do you own? (More than one choice is possible) Specify their number?		How many are they?
1= Oxen	☐	
2= Cows	☐	
3= Goats	☐	
4= Sheep	☐	
5= Chickens	☐	
6= Horses (H), Donkeys (D), Mules (M)	☐	H ____ D ____ M ___
7= If other, specify _____		

[83] This is substituted by 'Lake Abijata' for questionnaire used to collect data from households living in Lake Abijata bordering *Kebeles*

1.22. If your household have livestock, where do you **usually** feed your livestock?	1= At home ☐ 2= Private grazing lands ☐ 3= Lakeside/wetlands ☐ 4= Communal grazing lands except wetlands ☐ 5= If other, please specify_____
1.23. Does your household collect fodder from the wetland areas of Lake Ziway?	1= Yes ☐ 2= No ☐ (If 'No" skip to Q. No 1.26)
1.24. If your answer for Q. No 1.23 is 'Yes', how frequent do you **usually** collect the fodder?	1= Daily ☐ 4= Once in two weeks ☐ 2= Once a week ☐ 5= Once in a month ☐ 3= Twice a week ☐ 6= If other, please specify _____
1.25. How much do you collect at one time?	_____(own measurement)

1.26. Which one represents the sources of income for your household for the past year (2008E.C)? Please specify the income from each?		Total annual Income (in Birr)
Sale of farm produce	Maize	
	Haricot Bean	
	Horse Bean	
	Teff	
	Wheat	
	Sorghum/Millet	
	Horticulture (fruits and/or vegetables)	
	If other, please specify _____	
Sale of livestock production	Cattle (oxen, cows and milk products)	
	Goat	
	Sheep	
	Chicken	
	If other, please specify _____	
Other income sources	Land rented out	
	Small business or Trade	
	Fishing (Fish farming)	
	Beekeeping (Honey and/or beeswax)	
	Sale of firewood and/or charcoal	
	Mining (Sand, Salt soil, White Rock '*Bole*', Soda)	
	Paid Labor (Construction or Farm wage)	
	Pension and/or Remittance	
	If other, please specify _____	

1.27. How long does it take to go from your home to the nearest market? __ Minutes or Hour

1.28. Do you or your household members used credit service in the last production year?	1= Yes ☐ 2= No ☐ (If 'No" skip to Q. No 1.30)
1.29. If your answer for question no 1.28 is 'Yes', for what purpose the credit was given for? (More than one choice is possible)	1= To purchase farm inputs ☐ 2= To work on irrigation farming ☐ 3= To purchase livestock ☐ 4= To construct house ☐ 5= If other, please specify _____

1.30. How long does it take to go from your home to Lake Ziway or the lake's associated wetland area? ____ Minutes or Hour

1.31. Does your household use Lake Ziway and associated wetland areas for:	1=Yes 2=No	**1.32.** If 'Yes' for Q. No 1.31, how frequent do you **usually** use it? (write the no of your choice) 1= Daily 2= Once a week 3= Twice a week 4= Once in two weeks 5= Once in a month 6= If other, specify _____	**1.33.** From your household who do **usually** engage in this activity or in collecting these goods and services? (write the no of your choice) 1= Boys 2= Girls 3= Adult male 4= Adult Females 5= If other, specify_____	**1.34.** Does your household face any restriction over the use? 1=Yes 2=No	**1.35.** If 'Yes' for Q. No 1.34, who imposes the restriction? (write the no of your choice) 1= Local community leaders 2= *Kebele* administrative 3= *Woreda* administrative 4= If other, specify _____
Animals grazing and watering?					
Fishing?					
Water for drinking and other domestic purposes?					
Water for irrigation?					
Water for transportation?					
Wood or grass for house construction?					
Fuelwood from the trees?					
Wood for charcoal making?					
Farmland?					
Recreational purpose?					
Cultural or religious practices?					
If others, please specify_____					

1.36. Have you attended training(s) or meeting about conservation and management of wetland resources of Lake Ziway in the **past 3 years**?	1= Yes ☐ 2= No ☐ (If 'No" skip to Q. No 1.38)
1.37. If your answer for Q. No 1.36 is 'Yes', how many days have you attended during **last year** (2008EC)?	_____ Days
1.38. Do extension workers contact you or your household members in the **past 3 years**?	1= Yes ☐ 2= No ☐ (If 'No" skip to Q. No 1.40)
1.39. If your answer for Q. No 1.38 is 'Yes', on what issues did they contact you/your household members during **last year** (2008EC)? (More than one choice is possible)	How many days did they contact you during **last year** (2008EC)?
1= Farming ☐	
2= Conservation of wetland resources ☐	
3= Conservation of resources other than wetlands' ☐	
4= Health ☐	
5= If other, please specify_____	
1.40. On average how long does it take to go from your home to the office of extension workers?	___ Minute or ___ Hour

1.41. How do you see the status of Lake Ziway and associated wetland ecosystems as well as the plant and animal species of the area over the past 10 years?

1= Deteriorating ☐ 2= Improving ☐ 3= No change observed ☐

1.42. If your answer for Q. No 1.41 is "Deteriorating", what do you think are the major causes? (More than one choice is possible)

1= Expansion of farmland ☐ 4= Overgrazing ☐

2= Expansion of settlements ☐ 5 = Excessive water extraction for business or farming ☐

3= Climate change ☐ 6= Other factors, please specify _____

1.43. What is your preference about the wetland areas of Lake Ziway?

1= To sustain/exist ☐ 2= Not to sustain/ not to exist ☐

1.44. If your choice for Q. No 1.43 is "To sustain/exist", for what purpose do you prefer **most** the wetland areas to be used in the future?

1= Farming ☐ 4= Protected area (from human and animal) ☐

2= Grazing ☐ 5= If other, please specify_____

3= Forested area ☐

1.45. If your choice for Q. No 1.43 is "Not to sustain/exist", what is the reason for your response? (More than one choice is possible)

1= Scarcity of farmland ☐ 3= Because they are wastelands ☐

2= Scarcity of grazing area ☐ 4= If other, please specify_____

PART II

2.1.knowledge about wetland resource and their ecosystem services

Hereunder are statements which relate to wetlands and their ecosystem services. After reading each statement please specify your response by choosing either 'Yes' (Y), 'No' (N) or 'don't know' (DK).

	Statements	**Y**	**N**	**DK**
1	Wetlands are lands periodically or permanently covered by water.			
2	Wetlands provide fertile soils for the cultivation of crops during dry season.			
3	Wetlands are wastelands. *			
4	Wetlands provide habitats for a wide variety of animal and plant species.			
5	Draining wetlands speed up the drying of the ecosystems.			
6	Wetlands retain sediments and thus protect siltation in the lakes or dams.			
7	Wetlands have residual moisture that can support production of crops.			
8	Wetlands filter pollutants from the water and help us to get clean water.			
9	Conserving and preserving wetlands offer no advantage or benefit. *			
10	Wetlands control flooding by collecting and holding floodwaters back and keep rivers at normal levels.			
11	Wetlands serve as sources of water and fodder to both domestic and wild animals.			
12	Wetlands play a great role in regulating the local climatic condition.			
13	Wetlands are among the most environmentally sensitive ecosystems.			
14	Release of domestic wastes into the wetland areas has nothing to do with the water quality. *			
15	Wetland ecosystems can easily be degraded and loss their natural characteristics due to overstocking or year-round grazing in the wetlands.			
16	Restoring wetlands around lakes would help to improve water quality of the lakes.			
17	Unlimited access to a lake and associated wetland ecosystems will lead to disappearance of these ecosystems.			
18	Improving wetland management has recreational and scientific values.			
19	Release of fertilizers, herbicides and pesticides from agricultural land to wetland areas could reduce the water quality and affect aquatic lives.			

2.2. Conservation Attitude

Hereunder are statements that relate to your personal outlook to the management and conservation of wetland resources of Lake Ziway. After reading each statement, please specify whether you: 'strongly agree' (5), 'agree' (4), 'don't know' (3)'disagree' (2), or 'strongly disagree' (1) with the statement. (Put a check mark √)

	Statements	**5**	**4**	**3**	**2**	**1**
1	Contribution should be made in some way (eg. money or labor) to improve the water quality of Lake Ziway.					
2	Indiscriminate and over fishing from Lake Ziway should be restricted.					
3	Investment in wetlands' conservation practices is important to prevent the loss of bird species around Lake Ziway.					
4	People should be allowed to farm in any of the areas of wetlands.*					
5	We have to improve the water quality of Lake Ziway to enhance local tourism.					
6	A person has every right and be allowed to extract any amount of fodder from the trees and grasses around the lakes. *					
7	Conservation of wetland resources of Lake Ziway is a waste of money and resources.*					
8	Trees should be planted to prevent erosion and siltation on the lake's front					
9	Uncontrolled livestock grazing around Lake Ziway should be prohibited.					
10	There should be restriction on the use of fuelwood from the trees/forests around the lake.					
11	Since wetlands of Lake Ziway have no value, they have to be drained and converted to farming and/or grazing land. *					
12	Plants which grow in Lake Ziway and shoreline area should be conserved.					
13	There is little or no benefit from conserving the Lake's water and associated wetland resources. *					
14	Lake Ziway and associated wetland ecosystems should be protected to sustain the life of many bird species.					
15	Improving water quality of Lake Ziway is essential to enhance fish resources in this area.					
16	Wetlands of Lake Ziway should be conserved since they are important sites for recreation (eg. bird watching, boating).					
17	Penalties should be imposed on people who cut trees since it cause damage to the habitats of bird species.					
18	Extensive drainage or withdrawal of water from Lake Ziway for irrigation and other purposes should be restricted.					
19	Release of agricultural chemical and nutrient runoff into the lake's waterway should be restricted to protect the lake's water quality.					

2.3. Intention towards conservation of wetland resources

Hereunder are statements that relate to your personal intention to the management and conservation of wetland resources of Lake Ziway. After reading each statement, please specify whether you: 'strongly agree' (5), 'agree' (4), 'don't know' (3)'disagree' (2), or 'strongly disagree' (1) with the statement. (Put a check mark √)

	Statements	**5**	**4**	**3**	**2**	**1**
1	Because wetlands are wastelands I am not willing to participate in any conservation activities of these ecosystems. *					
2	I am ready to conserve plants which grow in Lake Ziway and lake's shoreline.					
3	I have the motivation to support preservation and restoration of bird's habitat around Lake Ziway.					
4	I am not willing to accept any limitation imposed on the use of the lake's water. *					
5	I am interested to contribute for the costs to be incurred so as to improve the water quality of Lake Ziway.					
6	I am ready to use other sources of energy than fuelwood.					
7	I am volunteer not to release agricultural chemicals or nutrient runoff as well as other waste products into the Lake's waterways.					
8	I am willing to accept restriction on the use of fuelwood from the trees/forests around Lake Ziway.					
9	I am not willing to accept penalties imposed on indiscriminate and over fishing from Lake Ziway.*					
10	I am ready to obey any local law that enhance the tourism potential of Lake Ziway and associated wetland ecosystems.					
11	If I am allowed, I am happy to farm in any of the wetland areas of Lake Ziway.*					
12	I am willing to engage in any activity that target on increasing the fish stock of Lake Ziway.					
13	I am not willing to accept restriction on grazing of animals in wetland areas which are near Lake Ziway. *					
14	I am ready to participate in tree planting activities to prevent erosion and siltation on the lake's front.					
15	I am ready to participate in any conservation activities to prevent the loss of bird species of Lake Ziway and associated wetlands.					
16	I am ready to accept any restriction imposed on the amount of fodder extracted from the trees and grasses around the lake.					
17	I am ready to accept any restriction imposed on the use of wetland areas of Lake Ziway for farming purpose.					
18	I am willing to contribute money or labor to enhance the recreational values of Lake Ziway and associated wetlands.					

2.4. Participation Behavior towards conservation of wetland resources

Hereunder are statements that relate to your practice or participation with regard to the management and conservation of wetland resources of Lake Ziway. After reading each statement, please Select one form the choices 'Always' (4), 'most of the time' (3), Sometimes (2), or 'Rarely' (1) to the stated statement (Put a check mark √)

	Statements	**4**	**3**	**2**	**1**
1	I (my household) contributed labor and/or money to the conservation of resources of Lake Ziway and associated wetland ecosystems.				
2	I reduce use of agricultural chemicals/ I advise people to reduce use of agricultural chemicals/ because it affect the Lake's ecosystems.				
3	When there is a need, my family uses fuelwood by cutting trees/forests around the lake.*				
4	I respect (local) laws to protect resources of Lake Ziway and associated wetland ecosystems.				
5	I do not graze animals in wetland areas near Lake Ziway. /I advise people not to graze in wetland areas near Lake Ziway /.				
6	I oppose any limit imposed on the use of water from Lake Ziway for irrigation and other purposes.*				
7	I have participated in tree plantation to control erosion and siltation in the lake's front.				
8	I report to concerned body when I see any activity which threatens the life of bird species.				
9	I oppose any restriction imposed on the amount of fodder extracted from the trees and grasses around the lakes.*				
10	I oppose indiscriminate and over fishing from Lake Ziway./ I advise people not to catch fish which are small and immature.				
11	I do not farm wetland areas near Lake Ziway. /I advise people not to farm in wetland areas near Lake Ziway /.				
12	I (my family) don't release agricultural and/or domestic wastes in to the lake's water way. / I advise people not to release agricultural and domestic wastes in to the lake's waterways.				

PART III: Choice Experiment Scenario

Suppose the government has prepared a program to take various measures that could mitigate degradation and assure the conservation, improvement and sustainable use of resources of Lake Ziway and associated wetlands. Now assume that these resources will potentially be restored using the measures that the government planned to implement. Therefore, in this survey (experiment) we are investigating local communities' choice for the various government measures. Accordingly you shall decide if these resources is to be restored and its management options. There are fundamentally three areas where the government plans to improve the status and ensure the sustainability of resources (goods and services) of Lake Ziway and associated wetlands. These are improvement of the level of biodiversity, the availability of water (quality and volume), and recreational/tourism services of the area.

Biodiversity: refers to the abundance of both familiar and endangered species of fish, bird and other animals together with their habitat; and surrounding vegetation- trees, bushes and grasses. In Lake Ziway and surrounding wetland ecosystems these species are under threat. The stock and species diversity of fish as well as terrestrial and aquatic birds are highly degrading because of habitat disturbance. The majority of mammal species of the area have also been reduced or disappeared because of habitat disturbance and severe competition with livestock for forage. There is also high vegetation degradation mainly that of Acacia trees. Taking this problem in to account the government planned to enhance the condition and level of abundance of biodiversity, restore endangered species and their habitat through various measures such as plantation of degraded areas, implementation of water and soil conservation techniques and prevention of pollution and introduction of species. This program therefore enhance the benefits, direct and indirect, which are obtained from these resources such as, collection of wood and grass (‘*Aware’*) for construction and animal feeding, recreational value, fuelwood consumption from Acacia trees, income from fishing, flood control, pleasant local climate etc.

Availability of water (quality and volume): improvement in the availability of water, both the volume and quality, is the second area that the government planned to take measures. Recent trends show a significant decline of the water level and shrinkage of the water surface area of Lake Ziway and associated wetlands. There is also high annual fluctuation in the water level of the lake. Especially during winter (*Bega*) seasons, the water volume of the lake is highly reduced. Consequently consumption of water for different purpose is becoming scarce and highly fluctuating in different parts of the area. The water quality has also changed with consequent impacts on biodiversity. Wetlands of Lake Ziway serve as an important nesting and feeding ground for fishes as well as aquatic and terrestrial birds (both migratory and resident), so the decline in the water amount and quality of these ecosystems is a threat for them. Because the temporal and spatial variability as well as the reduced quality of the water pose multi-dimensional environmental and socio-economic development challenges, the government has planned to

improve the availability (quality and volume) of the water resources of Lake Ziway and associated wetland ecosystems. For this the measures proposed by the government include restoring the ecological functions like covering the degraded area around the lake with trees, prevention of pollution, efficient water utilization and effective watershed approach to water and soil conservation. Therefore, the program will enhance and sustain the ecological and socio-economic benefits obtained from the water resources of Lake Ziway and associated wetlands like domestic use, human and animal drinking, farming/irrigation (large & small scale), fishing, recreational use.

Recreational/Tourism Services: refer to the satisfaction that natural scenery beauty gives and the potential of the area to be destination of many domestic and foreign tourists. Lake Ziway and associated wetland ecosystems have remarkable use in recreation and tourism because of the landscape views, variety of unique aquatic and terrestrial birds and other wildlife. However, the recreation value of the area is declining thus the local community in particular and the nation at large is not benefiting from tourism development of the area. Some of the reasons for this include decline of the flora and fauna due to degradation or disturbance of natural habitats, inadequate recreational/tourism facilities such as infrastructural development (eg. road, clean water) and resting facility (eg. lodges and hotels). Therefore, the government has also proposed plans to improve the recreational services that are deteriorating in their quality and that are not sufficiently provided. Moreover, the program will monitor and regulate waste disposal from business enterprises and the surrounding community to the lake's waterway and recreation sites. Such actions are important to maintain a good state of the lake and associated wetlands thereby enhance the recreational/tourism benefits obtained from these ecosystems including job opportunities.

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To enhance the condition and level of biodiversity the government program has **three** management alternatives. The first option is improving the level of familiar and endangered species of fish, bird and other animals together with their habitat at a small level (a 25% increase). The second option is improving these resources at medium level (a 50% increase) and the third option is improving these resources at high level (a 75% increase). To improve the availability of water the plan has **three** management alternatives. In the first alternative water will be available in two of the four seasons of the year and an increase in open water surface area of the lake by 5,000ha. In the second alternative water will be available in three of the four seasons of the year and an increase in open water surface area of the lake by 10,000ha. In the third option water will be available in all four seasons of the year and an increase in open water surface area of the lake by 15,000ha. To enhance recreational/tourism services of the area the plan has **two** alternatives. The first alternative is infrastructural development (eg. road, clean water) only. The second alternative includes infrastructural development (eg. road, clean water), provision of resting facilities (eg. hotels and lodges) and monitoring of waste disposal.

Consider that the program will be implemented; however, these management alternative cost money. Therefore, to partially finance the implementation of these management alternatives assume that the community is expected to contribute money which is a one-off payment in the

form of an environmental fund. Now I would like to ask you to think about the proposed management alternatives (for biodiversity, water availability and recreational/tourism services) and choose among the plans in the choice questions that follow. Remember that it is the two alternative management plans (plan 1 and plan 2) which costs money. For the status quo/baseline/ alternative there is no cost, but the level of biodiversity, availability of water, and recreational facilities/tourism development in the area would be low or deteriorate from the current status. There are no "correct" or "wrong" answers, but careful choice should be made. Understanding these choices may be difficult; please consider the attributes: biodiversity, availability of water and recreational/tourism services. Assume that the levels of these three attributes are independent of each other. Please mark the preferred alternative as if it is the only choice you make and feel free to go back and change your choice in a previous question.

Choice Set 1: Which plan would you choose (plan1, plan 2 or status quo) please put a tick mark?

Attributes	**Plan 1**	**Plan 2**	**Status quo**
Biodiversity	High: a 75% improvement in the level of plant and animal species and their habitat.	Medium: a 50% improvement in the level of plant and animal species and their habitat.	Biodiversity is deteriorating and no strict management
Availability of water	Four seasons of adequate water supply and a 15,000ha increase in open water surface area.	Two seasons of adequate water supply and a 5,000ha increase in open water surface area.	Water is adequately available once in a year and the size of the lake is decreasing.
Recreation /Tourism services	Improvement of infrastructures; provision of resting facilities and monitoring waste disposal.	Improvement of infrastructures; provision of resting facilities and monitoring waste disposal.	No improvement
Payment	40 ETB	20 ETB	Zero (no Payment)
I would prefer	☐	☐	☐

Choice Set 2: Which plan would you choose (plan1, plan 2 or status quo) please put a tick mark?

Attributes	Plan 1	Plan 2	Status quo
Biodiversity	Medium: a 50% improvement in the level of plant and animal species and their habitat.	Small: a 25% improvement in the level of plant and animal species and their habitat.	Biodiversity is deteriorating and no strict management
Availability of water	Three seasons of adequate water supply and a 10,000ha increase in open water surface area.	Two seasons of adequate water supply and a 5,000ha increase in open water surface area.	Water is adequately available once in a year and the size of the lake is decreasing.
Recreation /Tourism services	Improvement of infrastructures; provision of resting facilities and monitoring waste disposal.	Improvement of infrastructures; provision of resting facilities and monitoring waste disposal.	No improvement
Payment	20 ETB	40 ETB	Zero (no Payment)
I would prefer	☐	☐	☐

Choice Set 3: Which plan would you choose (plan1, plan 2 or status quo) please put a tick mark?

Attributes	Plan 1	Plan 2	Status quo
Biodiversity	Medium: a 50% improvement in the level of plant and animal species and their habitat.	High: a 75% improvement in the level of plant and animal species and their habitat.	Biodiversity is deteriorating and no strict management
Availability of water	Two seasons of adequate water supply and a 5,000ha increase in open water surface area.	Three seasons of adequate water supply and a 10,000ha increase in open water surface area.	Water is adequately available once in a year and the size of the lake is decreasing.
Recreation /Tourism services	Improvement of infrastructures only	Improvement of infrastructures; provision of resting facilities and monitoring waste disposal.	No improvement
Payment	40 ETB	60 ETB	Zero (no Payment)
I would prefer	☐	☐	☐

Choice Set 4: Which plan would you choose (plan1, plan 2 or status quo) please put a tick mark?

Attributes	Plan 1	Plan 2	Status quo
Biodiversity	Small: a 25% improvement in the level of biodiversity and their habitat	Small: a 25% improvement in the level of biodiversity and their habitat	Biodiversity is deteriorating and no strict management
Availability of water	Three seasons of adequate water supply and a 10,000ha increase in open water surface area.	Four seasons of adequate water supply and a 15,000ha increase in open water surface area.	Water is adequately available once in a year and the size of the lake is decreasing.
Recreation /Tourism services	Improvement of infrastructures only	Improvement of infrastructures; provision of resting facilities and monitoring waste disposal.	No improvement
Payment	40 ETB	20 ETB	Zero (no Payment)
I would prefer	☐	☐	☐

Choice Set 5: Which plan would you choose (plan1, plan 2 or status quo) please put a tick mark?

Attributes	Plan 1	Plan 2	Status quo
Biodiversity	High: a 75% improvement in the level of plant and animal species and their habitat.	Small: a 25% improvement in the level of plant and animal species and their habitat.	Biodiversity is deteriorating and no strict management
Availability of water	Two seasons of adequate water supply and a 5,000ha increase in open water surface area.	Four seasons of adequate water supply and a 15,000ha increase in open water surface area.	Water is adequately available once in a year and the size of the lake is decreasing.
Recreation /Tourism services	Improvement of infrastructures only	Improvement of infrastructures only	No improvement
Payment	20 ETB	20 ETB	Zero (no Payment)
I would prefer	☐	☐	☐

Choice Set 6: Which plan would you choose (plan1, plan 2 or status quo) please put a tick mark?

Attributes	Plan 1	Plan 2	Status quo
Biodiversity	Small: a 25% improvement in the level of biodiversity and their habitat	Medium: a 50% improvement in the level of biodiversity and their habitat	Biodiversity is deteriorating and no strict management
Availability of water	Three seasons of adequate water supply and a 10,000ha increase in open water surface area.	Four seasons of adequate water supply and a 15,000ha increase in open water surface area.	Water is adequately available once in a year and the size of the lake is decreasing.
Recreation /Tourism services	Improvement of infrastructures only	Improvement of infrastructures only	No improvement
Payment	60 ETB	60 ETB	Zero (no Payment)
I would prefer	☐	☐	☐

Part V: Follow up Questions

Which of the following statement can best describe the reason why you made your choices in answering the choice set questions above?

1.I choose the plan with the highest level of all attributes whatever the payment level.

2. I choose the status quo options whatever the levels of the attributes since I don't have the ability to pay for cost of improvement/ because I have an objection to the way the cost is imposed.
3. I choose the plan with highest level of biodiversity attribute because I found that the improvement in this attribute is relevant.
4. Whatever the levels of the attributes, I choose the cheapest plan.
5. I found that the attributes of availability of water is important and chose the plan with the highest Level of such attribute.
6. I gave priority to the plan with the highest level of the attribute of recreational/tourism services.

Thank you! that is all the questions for the survey, we appreciate your time and participation in the study.

Appendix VIII: Interview guide for stakeholders at Governmental and non-governmental organizations, private sectors, universities and others

Introduction

I am a PhD student at Addis Ababa University who is doing a research on "***Wetland Use and Management in the Central Rift Valley of Ethiopia: Economic Valuation, Stakeholders' and Institutional Analysis***". The purpose of the study is to examine the use and management practices of wetland resources in the CRV lakes region of Ethiopia, mainly of Lakes Ziway and Abijata in view of resources' value, existing institutional arrangements and stakeholders' interaction and participation. Under this general objective, ***assessing the current institutional arrangements in terms of rights and responsibilities; planning systems and coordination; capacity and motivation in the use and management system of wetland resources***, is one of the different aspects being dealt by the research. Accordingly, this interview will help to examine experts' view regarding institutional arrangements, policies and strategies which guide the use and management of wetland resources as well as stakeholders' perspectives, interests, actions and power reflected in the use and management of wetland resources of Lakes Ziway and Abijata. Since your view is highly valuable, I kindly request you to participate in the study. Thank you for giving your time and expertise!

Part I. Profile of the Organization and Interviewee

1. Name of the organization: _____
2. Type and Sector of the organization: _____

   NGO ☐ Business Enterprise ☐ CBO or other institution ☐
3. Levels of operation: Federal ☐ Regional ☐ Zonal ☐ *Woreda* ☐ *Kebele* ☐
4. Name of the interviewee (Optional): _____
5. Current position of the interviewee: _____
6. Qualification of the interviewee: _____
7. Service years of the interviewee in the current position: _____
8. Date of the interview: _____

Part II. General questions

9. Could you please explain the status of wetland resources of Central Rift valley lakes particularly Lakes Ziway and Abijata? If there are changes in these resources, could you explain the major changes that have been observed and the reasons behind?
10. How do you evaluate the compliance of the different development interventions around these lakes with national environmental and water policies, strategies and

proclamations?

11. Have buffer zones been designated along the lakefronts of these lakes?

- If yes, for what purpose are the buffer zones delineated? Who delineate it?
- If the buffer zones are not delineated, what do you think are the reasons?
- For the future, which habitats/ecosystems/areas, do you think, should be part of the buffer zone?

Part III. Rights and responsibilities of the organization in the use and management of wetland resources

12. What is the overall mandate(s) of your organization?

13. What are the specific rights, roles and responsibilities of your organization and the level at which these rights and responsibilities lay in the use and management of wetland resources (of Central Rift Valley Lakes region particularly of Lake Ziway and Abijata)?

14. What are the tasks/activities being done specifically by your organization to ensure conservation, sustainable use and management of wetland resources? Please list them all and describe how these activities target on ensuring sustainable use and management of wetland resources (of Lake Ziway and Abijata)?

15. At what levels are decisions made with regard to use and management of wetland resources (of Lakes Ziway and Abijata)? Whose right matter most in the management and decisions?

Part IV. Planning system and coordination among institutions

16. What programs, policies, strategies, legislations and regulations related to the use and management of wetland resources do you get from the federal [regional] government?

- Which one are you required to implement at this administrative level?
- How do government departments at the federal (regional) level involve you in the formulation (understanding) of these arrangements?

17. How does your organization carry out implementation of the programs, policies and strategies that you get from the government departments at federal (regional) level?

- What support and assistances do you receive from the federal (regional) government for the implementation?
- What mechanisms or approaches do you use to interact and communicate with the

local government and community around Lakes Ziway and Abijata in the implementation of the various arrangements related to wetland resources management?

- What problems and challenges do you face or experience in the implementation?

18. What institutions, mechanisms and programs related to use and management of wetland resources (of Lake Ziway and Abijata) does your office formulate on its own at this level of government to help you in the implementation of the programs and policies from the federal (regional) government?

19. How do these institutions and mechanisms help you in enforcing sound wetland resources conservation and management practices (at Lake Ziway and Abijata)?

20. How does your organization carry out progress monitoring and evaluation of wetland resources management activities? [Presence of performance measurement system]

21. Since the use, conservation and management of wetland resources involve different actors/stakeholder institutions/ and depends on inter-sectorial collaborations, with which stakeholder institutions and/or sectors do you collaborate? Could you please order them according to the level of partnership (frequency of contact)?

- In what ways does your organization collaborate with these stakeholder institutions and/or sectors? Could you please explain the type of partnerships you have in managing and enforcing sound wetland resources management practices?
- What arrangements exist for collaboration to ensure sustainable use and management of these resources?
- Could you please explain the strength and weakness of these partnerships?
- What main factors do you think enhance (positively affect) or hinder (negatively affect) these partnerships?
- Is there a joint forum for regular/patterned interactions[84] with these stakeholder institutions and/or sectors?
  - If yes, could you explain the nature of the forum and how frequent you meet?
  - If no, what do you think is the reason for the absence of a joint forum?

22. How do the various stakeholder institutions and/or sectors deal with or address the issue of wetland resources use and management (at Lakes Ziway and Abijata)?

23. How do you perceive the existence of common robust planning, implementation and

[84] Interaction implies the level of administrative (eg. planning, finance, monitoring, evaluation, decision making,), functional (eg. implementation and coordination of activities, ..) or information exchange (eg. data exchange,..) and resource sharing (eg. material, human,…).

common result framework for sustainable use and management of wetland resources? What constraints, if any, exist in relation to this?

24. Are there any conflicts, misunderstanding or contradictions and tensions among these stakeholder institutions and/or sectors with regard to use and management of wetland resources in the implementation of sectorial programs, policies and strategies? If yes, please mention them and describe the sources of these conflicts or contradictions?

- How do these conflicts and contradictions impact on sustainable use and management of wetland resources (of Lakes Ziway and Abijata)?
- What arrangements exist (at this government level) to ensure these conflicts are resolved?

Part V. Capabilities of existing institutions to address sustainable use and management of wetland resources

25. How do the policies, strategies, legislations and regulations that you get from the federal (regional) government help you in enforcing sound wetland resources management practices (at Lake Ziway and Abijata)?

- To what extent these policies, strategies, legislations and regulations respond to the ongoing degradation of wetland ecosystems (of Lakes Ziway and Abijata)? What achievements do you observe with regard to conservation of wetland resources? What are the missing points (if any)?

26. Do these arrangements have any (clearly stated) provisions for conserving wetland resources?

- If yes, what are these provisions and how do you see the adequacy of these provisions to ensure sustainable use and management of wetland resources?
- If these arrangements don't have any provision, what do you think are the reasons?

27. What contradictions or inconsistencies do you see in these policies, strategies, legislations and regulations related to the use and management of wetland resources?

- What are the impacts of these contradictions in sustainable use and management of these resources?

28. How do you evaluate the capacity of your organization in terms of human, financial and physical resources- for planning, implementing, monitoring and evaluating activities related to use and management of wetland resources?

29. How do you see the capacity of Branch Offices below your administrative levels (eg.

zones, *woredas*, *kebeles*) in terms of human, financial and physical resources for planning, implementing, monitoring and evaluating activities related to use and management of wetland resources?

30. How do you see the significance of community-based organization (CBOs) in the use and management of wetland resources? What is your view on the need for establishment of CBOs and/or strengthening the capacity of existing CBOs?

31. In your view, which governance elements (eg. Policy and strategy dimension; decision-making power; planning and implementation process; organizational and institutional structure etc) need to be improved to ensure sustainable use and management of wetland resources (of Lakes Ziway and Abijata)? How?

32. Do the current programs, policies and strategies favor conservation and preservation of wetland resources or conversion and exploitation of them to enhance economic gain? Why?

33. What is your view on reclaiming wetland areas into agricultural (farming or grazing) land or for other development activities?

34. What kind of strategy, do you think, is important to reconcile the tradeoffs between the ecosystem services of wetlands (of Lakes Ziway and Abijata) and the various uses of these resources to enhance economic gain?

35. What is your view on the need for independent national wetland policy?

Hereunder are statements that relate to the level of interest of your organization to the different aspects of management of wetland resources. Please specify your responses by choosing either of these: 'very low' (1), 'slightly low' (2), 'slightly high' (3), or 'very high' (4). (Put a check mark √)

	The level of concern or interest or involvement of your organization/sector towards/for/in	**1**	**2**	**3**	**4**
1	Payment or collection of fee for the use of wetland resources				
2	Control of the management of wetland resources				
3	Protection of wetland resources				
4	Capacity building or funding for management of wetland resources				
5	Formulation of rules for managements of wetland resources				
6	Resolving conflicts related to the management of wetland resources				
7	Coordinating resource management activities				
8	Conducting studies related to wetland resources				

Hereunder are statements that relate to the level of influence of your organization to the different aspects of management of wetland resources. Please specify your responses by choosing either of these: 'very low' (1), 'slightly low' (2), 'slightly high' (3), or 'very high' (4). (Put a check mark √)

	To what extent does your organization/sector influence or What is the level of power of your organization/ sector for	1	2	3	4
1	Collection of fee for the use of wetland resources				
2	Control of the management of wetland resources				
3	Protection of wetland resources				
4	Capacity building or funding for management of wetland resources				
5	Formulation of rules for managements of wetland resources				
6	Resolving conflicts related to the use of wetland resources				
7	Coordinating resource management activities				
8	Conducting studies related to wetland resources				

Appendix IX: Guides for Participatory Rural Appraisals

***Resource Map and Trend Analysis**:*

Purpose: To get idea about the broader landscape and resources/products/ generated from Lake Ziway [Lake Abijata] and associated wetland ecosystems, depict and get idea about the past and present situation in the uses and management of these resources (a historic perspective of land/wetland/ use pattern and dynamics), identify relevant communities/ stakeholders for further PRA sessions.

Discussion Points [and techniques]:

1. Could you please show your village and surroundings? [*Drawing of a map of the village*]
2. What are the major natural resources (e.g. vegetation, water bodies -rivers, lakes, and associated wetlands) and where are they to be found? [*Show major resources in the map*]
3. What are the (major) products (goods and services) generated from these resources [*List the resources and the goods and services on cards and arrange them in a matrix*]
4. In the past, how were resources of Lake Ziway [Lake Abijata] and associated wetland areas used (for farming or irrigated land, grazing, conserved areas, open water)? [*Drawing of map of the land (wetland) use*]
   - Who had the right to the access, use and management of these resources? Whose right matter most? [*Discussion on this issue*]
   - How were issues of equity and distribution addressed? [*Discussion on this issue*]
5. At the present time, how are these resources being used (for farming or irrigated land, grazing, conserved areas)? [*Drawing of map of the land (wetland) use*]
   - Who have the right to the access, use and management of these resources? Whose right matter most? [*Discussion on this issue*]
   - How are issues of equity and distribution addressed? Are there any conflicts in the way these resources are used and managed? [*Discussion on this issue*]
6. Do you think that resources of Lake Ziway [Lake Abijata] and associated wetland areas or the use of products from these resources will last for a long time?
   - If no, what do you think are the reasons behind/what hinder the sustainability? [*Discussion on this issue*]
   - What, do you think, should be done to ensure sustainable use and management of wetland resources? [*Discussion on this issue*]

***Impact Diagram**:*

Purpose: To get information about the benefits and the values of resources of Lake Ziway [Lake Abijata] and associated wetland ecosystems, perception on conservation of wetland

resources, management scenarios and the possible impact(s) of the different management scenarios.

Discussion Points [and techniques]:

1. What goods and services do you get from Lake Ziway [Lake Abijata] and associated wetland resources? [*List services/uses on cards*]
2. Which use is the most beneficial to you/you value most? Why? [*Discussion on this issue/ranking possible with heterogeneous group*]
3. Would life be possible for you without using Lake Ziway [Lake Abijata] and associated wetland resources? If yes, how? If no, why? [*Discussion on this issue*]
4. Now imagine, the lake and associated wetland would be closed or the use restricted. Would you still value the wetland? If yes, which one ('area closure', 'restricted use')? Why? [*Draw a card with 'area closure' and 'restricted use' and make a choice, followed by discussion*].
5. If the lake and associated wetland would be closed or the use restricted,
   - Would it still provide services to you? If yes, what services/use would you get? [*Link the cards of 'area closure' and 'restricted use' to the cards of the services/uses provided*]
   - Would it affect your activities? If yes, which activities of yours would be restricted and prohibited? [*List the activities that would be restricted and prohibited on cards and link the cards of 'area closure' and 'restricted use' to the cards of the activities*]
   - Which assets or goods and services that wetlands provide to you could not be obtained any longer? [*List the assets or goods and services that could not be obtained any longer on cards and link the cards of 'area closure' and 'restricted use' to the cards of the activities*]
6. What local organizations and regulations (bylaws) exist for the management of wetland resources of Lake Ziway [Lake Abijata]? What strength(s) and weakness(es) do these institutions have? [*Discussion on this issue*]
7. What types of management system need to be strengthened or established for effective management and the sustainability of ecosystem services of Lake Ziway [Lake Abijata] and associated wetland ecosystems? [*Discussion on this issue*]

Pair-wise ranking and Seasonal Diagram*:*

Purpose**:** Detect resource use conflicts, conflicts between wetland conservation and use; causes and consequences of these conflicts.

Discussion Points [and techniques]:

1. What goods and services do Lake Ziway [Lake Abijata] and associated wetland ecosystems provide to you/ people?/ For what purpose you/people make use of Lake Ziway [Lake Abijata] and associated wetland ecosystems?/ [*List the goods and services/uses/ on cards (2*X*). Arrange them in a matrix*]
2. Do the ways you/people make use of the wetland areas or resources of Lake Ziway [Lake Abijata] conflict with each other? [*Compare the various aspects in the matrix with one another*]
3. If yes, what are the causes of the conflicts? [*Discussion on this issue*]
   - During which months of the year do the conflicts arise? [*Prepare a time line with 13 months. Depict the conflicts and their durations*] why?
   - What traditional/customary ways are used in the resolution of the conflicts among the local resources users in this community? [*Discussion on this issue*]
   - If any, which way of conflict resolution is the most effective? Why? [*Discussion on this issue/ranking possible with heterogeneous group*]
   - Which particular cause(s), do you think, will continue to exist in the future? Why? What do you think is a lasting solution for this? [*Discussion on this issue*]
4. What do you think about conservation of Lake Ziway [Lake Abijata] and associated wetland resources? [*Discussion on this issue*]
5. What traditional/customary ways (bylaws) are used in the conservation and management of Lake Ziway [Lake Abijata] and associated wetland resources? Are there any conflicts in relation to this (the way these resources are managed)? [*List the management ways and the conflicts on cards and arrange them in a matrix*]
6. Would conflict arise if there would be agreed rules and regulations to use the resources in a restricted manner (e. g. seasonal area closure, restricted harvest of resources, using only certain wetland resources)? If so, what could be the conflict(s) and why? [*Discussion on this issue*].

Appendix X: Field observation guide

General Information:

1. Name of the lake area of observation _____
2. Name of *Kebele* of observation _____

Pertinent issues to be observed:

1. Resources available in the lakes and associated wetlands areas.
2. Pattern of resource use from the lakes and associated wetlands.
3. Current status of the lakes and associated wetland ecosystems.
4. Economic activities (irrigation, fishing, industries, recreation and tourism etc.) being practiced in the lakes' shore areas.
5. Resource conservation measures being taken (tree plantation, physical structure of soil conservation, pollution control etc.)
6. Resource use conflicts (if any) and the way of conflict resolution.
7. Overall landscape and geographical setting of the area.

Appendix XI: List of stakeholders consulted

Stakeholders		Contact Information			
Type	**Level**	**Institution/Sector**	**Interviewed Person Pseudonym code* (and Position)**		
GOs	Federal	Ministry of Agriculture and Natural Resource (MoANR)- Natural Resource Development Conservation and Utilization Directorate	FGO1 (Senior Soil and Water Conservation Expert)		
		Ministry of Environment Forest and Climate Change (MoEFCC)	FGO2 (Director of State of the Environment Directorate)		
		Ministry of Water Irrigation and Electricity (MoWIE)- Basin Administration Directorate	FGO3 (Rift Valley Lakes Integrated Watershed Development and Management Project Coordinator)		
		Ministry of Livestock and Fishery Resource Development (MoLFRD)- Fishery Resource Development Directorate	FGO4 (Aqua Culture Development Senior Expert)		
		Ministry of Agriculture and Natural Resource (MoANR)- Rural Land Administration and Utilization Directorate	FGO5 (Monitoring and Evaluation Expert)		
		Ethiopian Investment Commission (EIC)	FGO6 (Leather and Leather Product Team Leader)		
	Regional	Oromia Rural Land Administration and Land Use Implementation Bureau (ORLALUIB)	RGO1 (Land Use and GIS Expert)		
		Oromia Investment Commission (OIC)	RGO2 (Investment Potential Study and Project Appraisal Core Process)		
		Oromia Environment Forest and Climate Change Authority (OEFCCA)	RGO3 (Environmental Pollution Monitoring and Control Expert)		
		Oromia Livestock and Fishery Development Bureau (OLFDB)	RGO4 (Fishery development higher expert)		
		Oromia Water Mine and Energy Bureau (OWMEB)	RGO5 (Water Resource Administration Head)		
		Oromia Irrigation Development Authority (OIDA)	RGO6 (Watershed Expert)		
		Oromia Agriculture and Natural Resource Management and Utilization Bureau (OANRMUB)	RGO7 (Watershed Expert)		
		Oromia Culture and Tourism Bureau (OCTB)	RGO8 (Tourism Development Higher Expert)		
	Zone		**East Shewa**	**West Arsi**	**Arsi**
		Zone Administration (ZA)	Not available	Not available	ZGO15 (Vice Head)
		Zone Environment Forest and Climate Change Office (ZEFCCO)	ZGO1 (EIA Expert)	ZGO8 (Env'tal Protection and Monitoring Team Leader)	ZGO16 (EIA Expert)

		Zone Irrigation Development Authority (ZIDA)	ZGO2 (Vice administrator)	ZGO9 (Watershed Expert)	ZGO17 (Head of Irrigation Design Works)
		Zone Culture and Tourism Office (ZCTO)	ZGO3 (Tourism Development Expert)	ZGO10 (Tourism Development Expert)	ZGO18 (Tourism Development Expert)
		Zone Livestock and Fishery Development Office- (ZLFDO) Fishery Department	ZGO4 (Fishery development team leader)	ZGO11 (Fishery Expert)	ZGO19 (Poultry and Fish Resource Expert)
		Zone Agriculture and Natural Resource Office (ZANRO) -Natural Resource Development Sector	ZGO5 (Soil and Water Conservation Higher Expert)	ZGO12 (Natural Resource Expert)	ZGO20(Soil and Water Conservation expert)
		Zone Investment Office (ZIO)	ZGO6(Investment monitoring officer)	Not available	ZGO21 (Investment monitoring expert)
		Zone Rural Land Administration and Land Use Implementation Office (ZRLALUIO)	ZGO7(Cadaster Expert)	ZGO13(Land Use Expert)	ZGO22 (Land use Expert)
		Zone Water, Mineral and Energy Office (ZWMEO)- Water sector	Not available	ZGO14 (Office Vice Administrator)	ZGO23 (Water Study Design Team Leader)
	Woreda		**ATJK *Woreda***	**Arsi Negelle**	**Ziway Dugda**
		Woreda Administration Office (WAO)	WGO1 (Vice head)	WGO9 (Head)	WGO16 (Head)
		Woreda Culture and Tourism Office (WCTO)	WGO2 (Tourism coordinator)	WGO10 (Office Head)	WGO17 (Heritage Management and Tourism expert)
		Woreda Irrigation Development Authority (WIDA)	WGO3 (Irrigation Expert)	WGO11 (Irrigation development extension coordinator)	WGO18 (Irrigation agronomist)
		Woreda Livestock Production and Protection Agency (WLPPA) –Fishery Department	WGO4 (Fishery production expert)	WGO12 (Fishery production expert)	WGO19 (Fishery Expert)
		Woreda Agriculture and Natural Resource Office (WANRO) -Natural Resource Development and Utilization Department	WGO5 (Natural resource development and utilization coordinator)	WGO13 (Natural resource development and utilization coordinator)	WGO20 (Natural Resource Management Expert)
		Woreda Rural Land and Environmental Protection Office (WRLEPO)- Environmental Protection sector	WGO6 (Land Use Team Leader)	WGO14 (Environmental protection team leader)	WGO21(Environmental protection team leader)
		Woreda Water, Mineral and Energy Office (WWMEO)- Water sector	WGO7 (Water resource coordinator)	WGO15 (Water Engineering coordinator)	WGO22 (Water and energy coordinator)
		Woreda Investment Office (WIO)	WGO8 (Investment monitoring officer)	Not available	WGO23 (Investment monitoring officer)
		Deka Dellu Harangama *Kebele*	KGO1 (*Kebele* Vice chairman)		
		Deka Dellu Harangama *Kebele*	KGO2 (Development Agent and Natural Resource Expert)		

	Kebele	Gallefi Qello *Kebele*	KGO3 (*Kebele's* Development Agent)
		Burqa Lemefo *Kebele*	KGO4 (Development Agent)
		Senbero *Kebele*	KGO5 (*Kebele* Chairman)
Other GOs	Town level GOs	Batu Town Administration Environment Forest and Climate Change Authority (BTAEFCCA)	OGO1 (Town solid and liquid waste control and monitoring expert)
		Batu Town Culture and Tourism Office (BTCTO)	OGO2(Culture and Tourism expert)
	Parks' Authority	Abijata-Shalla Lakes National Park (ASLNP)	OGO3 (Wild life and their habitat research monitoring)
	Main Office	Rift Valley Lakes Basin Authority (RVLBA)- Hawassa Main Office	OGO4 (Senior Meteorlogist)
	Branch Office	RVLBA- Batu Bracnh	OGO5 (Batu branch office coordinator)
	Semi-GO	Horn of Africa Regional Environment Center and Network (HoA-REC&N)- Rift Valley Branch Office Environmental Resources and Tourism and Information	OGO6 (Batu Branch office coordinator)
Research Institutes and Universities	University	Arsi University- College of Agriculture and Environmental Science	RI1 (Lecturer and researcher; MSC in Watershed Management)
	Research Institutes	Ethiopian Environment and Forest Research Institute (EEFRI)- Central Ethiopian Environment and Forest Research Center	RI2 (Researcher)
		Ethiopian Biodiversity Institute (EBI)	RI3 (Researcher)
Others	NGO	Ethio Wetland and Natural Resources Association (EWNRA)	NGO1 (Director)
		Catholic Relief Service (CRS)	NGO2 (Arsi Zone Branch Coordinator)
	Business Enterprise	Haile Resort Ziway Batu	BE1 (Customer relation officer)
		Abijata Soda Ash Plant (ASAP)	BE2 (Environmental Protection and Safety Officer)

*FGO- Federal level government organization (GO), RGO- Regional level GO, ZGO- Zonal level GO, WGO- *Woreda* level GO, KGO- *Kebele* level GO, RI- Research institution, NGO- non-governmental organization, OGO- Other-GO, BE- Business Enterprises

Appendix XII: Code book: Themes, Sub-themes and Codes

<table>
<tr>
<td rowspan="2">Primary theme (PT)-1: Stakeholders' view on the current status of wetlands

Sub theme (ST)- 1.1: Status of the lakes
Codes:
▪ C-1.1.1: Past status of the lakes and associated wetlands
▪ C-1.1.2: Current status of the lakes and associated wetlands

Sub-theme 1.2: Predicaments of wetland degradation
Codes:
▪ C-1.2.1: Wetland conversion
▪ C-1.2.2: Deforestation or clearing of vegetation
▪ C-1.2.3: Pollution- release of chemicals and wastes
▪ C-1.2.4: Absence of responsible body
▪ C-1.2.5: Absence of legal framework
▪ C-1.2.6: Absence of buffer zone
▪ C-1.2.7: Excessive and limitless water abstraction;
▪ C-1.2.8: Absence of EIA
▪ C-1.2.9: Lack of compliance with policy and legal framework
▪ C-1.2.10: Siltation/silt accumulation
▪ C-1.2.11: Lack of conservation and mitigation measures

Sub theme 1.3: Consequences of wetland degradation
Codes:
▪ C-1.3.1: Consequences-Decline of the water inflow to the lakes
▪ C-1.3.2: Decline in the quality, volume and depth of the lake
▪ C-1.3.3: Treat to or decline in number and variety of biodiversity</td>
<td>Primary theme (PT)-2: Stakeholders' mandate, roles, responsibilities and rights in management of wetland resources

Sub-theme (ST)- 2.1: Stakeholders' mandate in the use and management
Codes:
▪ C-2.1.1: Overall mandate of stakeholder sector institutions;
▪ C-2.1.2: Who or which sector institution has the mandate over wetlands?

Sub-theme (ST)- 2.2: Stakeholders' roles and responsibilities in wetland management
Codes:
C-2.2.1: Stakeholder's roles
C-2.2.2: Stakeholders' responsibilities
C-2.2.3: Stakeholder's level of decision-making or decision-making power</td>
<td>Primary theme (PT)-3: Stakeholders' capacity and collaboration/collective action/ in wetland resources management.

Sub-theme (ST)- 3.1: Stakeholders' Capacity
Codes:
C-3.1.1: Human resource capacity
C-3.1.2: Physical resource capacity
C-2.1.2: Financial resource capacity

Sub-theme (ST)- 3.2: Stakeholders' realm of collaboration/collective action
Codes:
▪ C-3.2.1: Watershed management and buffer zone delineation
▪ C-3.2.2: Capacity building
▪ C-3.2.3: Conducting studies and/or developing management plan.</td>
</tr>
<tr>
<td>Primary Theme (PT) 4: Challenges of collective actions in wetland management

Sub theme (ST)- 4.1: Challenges of collective actions in wetland management
Codes:
▪ C-4.1.1: Absence of or inadequate legal frameworks
▪ C-4.1.2: Implementation ineffectiveness of legal frameworks
▪ C-4.1.3: Absence of legally authorized body
▪ C-4.1.4: Lack of determination to engage in sustainable conservation activities
▪ C-4.1.5: Lack of clear/overlapping/ roles and responsibilities in management of wetlands
▪ C-4.1.6: Lack of awareness about wetlands</td>
<td>Primary Theme (PT) 5: Stakeholders' perspective on the capacity and functionality of institutional frameworks.

Sub theme (ST)- 5.1: Capacity of existing legal frameworks
Codes:
C-5.1.1: Provisions for conservation and sustainable use of wetlands;
C-5.1.1: Community bylaws

Sub theme (ST)- 5.2: Constraints and gaps of existing legal frameworks
Codes:
C-5.2.1: Absence of legal frameworks;</td>
</tr>
</table>

Sub theme 1.4: Proposed solutions/measures for sustainable management of wetlands **Code**: ▪ **C-1.4.1:** Designing alternative livelihood ▪ **C-1.4.2:** Using cut and carry method of fodder collection ▪ **C-1.4.3:** Delineation of buffer zone ▪ **C-1.4.4:** To assign a legally authorized institution to wetland management ▪ **C-1.4.5:** Capacity building of different stakeholder (sector) institutions ▪ **C-1.4.6:** Payment for ecosystem service (PES) ▪ **C-1.4.7:** Enact independent wetland policy and other legal frameworks	▪ **C-4.1.7:** Disobedience to legal frameworks	**C-5.2.2:** Inadequate provisions; **C-5.2.3:** Implementation ineffectiveness.

Appendix XIII: Photographs of PRA discussions

Deka Dellu Harengema *Kebele* (Women's' PRA- Impact Diagram)

Gallefi Qello *Kebele* (Farmers' PRA- Resource Map)

Abine Germama *Kebele* (Farmers', Fisher men's and DAs' PRA- Pairwise ranking and seasonal Diagram)

Gallefi Qello *Kebele* (Women's' PRA- Impact Diagram)

Desta Abijata *Kebele* (Elderly's/ local community leaders'/ and DAs' PRA- Resource map and Trend analysis)

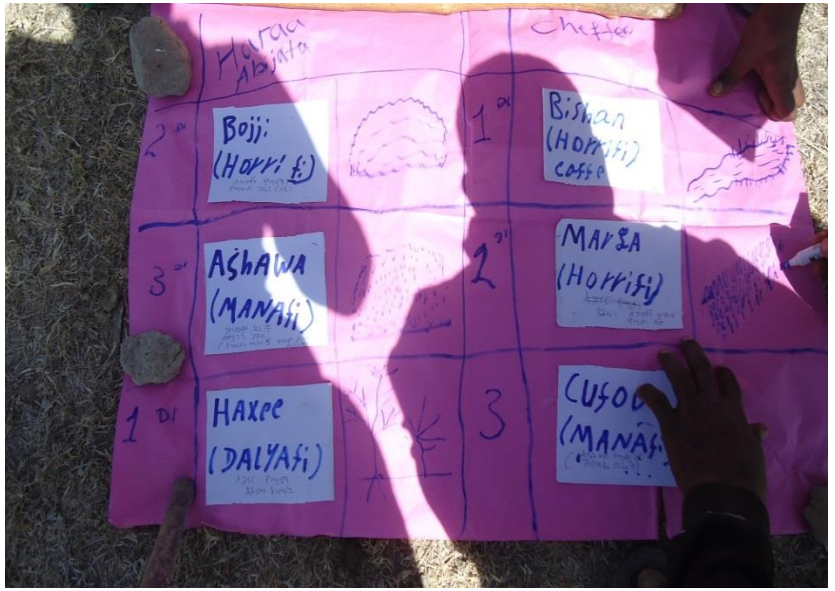
Desta Abijata *Kebele* (Youngsters' PRA- Pairwise ranking)

Burqa Lemefo *Kebele* (Elderly's, Fisher men's and DAs' PRA- Resource map and Pairwise ranking

An elderly sketching Resource map for PRA, Burqa Lemefo *Kebele*

Appendix XIIII: Some potographs of PRA discussion results and the field

Pairwise ranking (Burqa Lemefo *Kebele*: Elderly, Fisher men & DAs



Pairwise ranking (Desta Abijata *Kebele*: Youngsters)

Resource Mapping (Gallef Qello *Kebele:* Farmers)

A shot on researcher's way to Abine Germama *Kebele*