EVALUATION OF RURAL WATER SUPPLY SCHEMES SERVICE LEVEL IN GOMBORA WOREDA, HADIYA ZONE, SOUTHERN ETHIOPIA

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Lists of ABBREVIATIONS and ACRONYMS

CSA	Central Statics Authority
FGDs	Focus Group Desiccations
GLAAS	Global Analysis and Assessment of Sanitation
GO	Governmental Organization
GTP-1	Growth and Transformation Plan-I
GTP-2	Growth and Transformation Plan-II
HDW	Hand Dug Well
IRC	International Reference Center for community water
MDG	Millennium Development Goal
MoWIE	Ministry of Water, Irrigation and Electricity
NAP	National Accesses plan
NGOs	Non- Governmental Organizations
O & M	Operation and Maintenance
RWS	Rural Water Supply
SPSS	Statistical Packages for Social Science
SW	Shallow Well
UAP	Universal Accesses Plane
UN	United Nation
UNICEF	United Nation Café the Children
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WSSC	Water Supply and Sanitation Collaboration Council

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ABSTRACT

All reports confirm that the rural water supply coverage of Ethiopia have been in strong upward trajectory since 1990. Different project has been implementing rural water supply schemes using community management program approach in Southern nation nationality and people of Ethiopia since 2003. The project has achieved significant result on rural water supply schemes; functionality, implementation rate and community empowerment. using community management program related researches confirm that the approach has achieved more than 98% of rural water supply scheme functionality. However, the level of service delivered by those functional water supply schemes had not been studied so far. Therefore, focusing on functioning rural water supply schemes in Gombora woreda, the presentstudy evaluated the service level using **water quantity, quality, accessibility and reliability indicators,** identify determinant factors affecting rural water supply schemes functionality and service level. The study is both qualitative and quantitative in its design. Questionnaire, focused group discussion, key informantinterview, observation, and document analysis are the main data gathering tools used in thisstudy. The quantitative data collected were analysed using SPSS (Statistical Package forSocial Science) and presented through tables, graphs and charts where as the qualitative information were precisely narrated. To come up with valid conclusion rural water supply schemes were selected using representative sampling technique. The household survey found water quantity is the worst to meet the national target, only 1/4th of beneficiaries met the water quantity set by the UAP. Design problems, lack of community cohesion during construction, monitoring and supervision and environmental problems were found as important factors affecting water supply service level beneficiaries get from functioning rural water supply schemes.

Key words: rural water supply, water quantity, water quality, accessibility, reliability, functionality , service level/quality

CHAPTER ONE

1. INTRODUCTION

1.1. Background

It is well known that water is a natural resource and natural requirement for all living things .without it all living things cannot exist. Access to clean water and sanitation has been declared as a human right by the United Nations in 2010 (UN, 2014). It is also a prerequisite for the realization of many human rights, including those relating to people's survival, education and standard of living. Moreover, it recognized as a main pillar in economic development and reduction of poverty. This is why, the provision of safe and adequate water contributes to better health and increased individual productivity. Achieving universal access to safely managed water and sanitation services is a priority in global development policy, reflected in Goal six of the Sustainable Development Goals (SDGs) (UNICEF, 2015).

Close to a billion people most living in the developing world do not have access to safe and adequate water, especially, many are in sub-Saharan Africa which represents one quarter of the global population that faces water scarcity live as stated in (UNDP, 2017). In accordance with WHO/UNICEF estimates (2010), sizable proportion of the population in many Sub-Saharan Africa countries, devotes more than 30 minutes round trip to fetch water from communal collection points, to be used for house hold consumption.Most of them use unsafewater for drinking and other domestic uses (drinking,cooking, washing, cleaning, etc) (WHO, 2018).

Water supply coverage for rural areas by the standards of GTP I was 15 liter consumption per a day and per person (lpcd) with in 1.5 km radius. However, these figures go down considerably through GTP II standards (25 l/c/d within 1 km radius for rural areas and 40–100 l/c/d for urban areas); where rural, urban and national water supply coverage stood at 59%, 51% and 58%, respectively (Adank et al., 2016). Cognizant of this low coverage, due emphasis was given under GTP II to the expansion of potable water supply with a target to achieve 85%, 75% and 83% potable water coverage, respectively in rural areas, urbanareas and the country as a whole by the end of GTP II (2019/20). Towards achieving the plan in rural areas, a great deal of investment was put into the construction of potable water schemes. The mid-term review of GTP II shows that potable water coverage has increased to 68.5% in rural areas, 54.7% in urban areas and overall coverage of 65.7% (Adank et al., 2016).

Moreover, country's water supply sector is characterized by poor performance due to a number of reasons including non-sustainability and unreliability of water supply service (Domínguez et al., 2019). These factors, together with extensive service failures, challenged the realization of the Millennium development goals (MDGs) and now the sustainable development goals, particularly in sub-Saharan Africa. Majority of the countries in the region were unable to achieve the targets by 2015 (Lomazzi et al., 2014).

.For these very reasons, the prevalence of water born diseases caused by accessing to unsafe drinking water sources has increased at alarming rate. The low level of economic growth, coupled with soaring population growth, high level of illiteracy rate and low level of education/awareness have also contributed to the burden of ill health country wide (UNESCO, 2016). The World Health Organization (WHO) estimated that around 94% of the global diarrheal burden and 10% of the total disease burden are due to unsafe drinking water, inadequate sanitation, and poor hygienic practices (WHO, 2018).

To tackle these problems, around the world the governments in collaborating with various international and local development partners has launched a large number of water supply schemes. As for the case of Ethiopia, the Government has issued a number of policy and strategy framework to increase and sustain the water supply services in both rural and urban areas and ultimately to ensure that every Ethiopian citizen has access to water of acceptable quality and sufficient quantity. For example, The National Growth and Transformation Plan II'sWater and Sanitation targets 83% of the total population using safely managed, adequate, and resilient water supply services by2020.In this respect, Ethiopia has made an encouraging progress as rural safe drinking water access has increased from 35% in 2004/05 to 65.8% in 2009/10,(CSA, 2016 and (MoWIE,2017).

Despite this progress, stated by Anthonj et.al (2018) million people national wide, out of which more than 37% living in Ethiopia, especially southern part of Ethiopia, are still utilize drinking water from unsafe supply spots. Many rural water systems in Ethiopia are not functioning, or are performing below expected levels. A number of research reports have shown that 33% of the rural water supply schemes in Ethiopia are estimated to be non-functional at any time (i.g. Anthonj, et.al, 2018). It also confirmed by Harvey and Reed (2006) that meanwhile rural water projects, cially those using handpumps to extract water, face a high degree of operational failure. It can be observed that there are large gaps in the service level of water supply schemes in different rural settings provided by different suppliers.Therefore, these approaches followed by different rural water supply and sanitation service providers in different areas need to be evaluated so that those approaches resulting in sustainable services can be identified and scaled up evaluation of rural water supply schemes service level in gomberaworeda, Hadiya zone, southern Ethiopia

1.2. Statement of the problem

Provision of reliable water supply system is important to achieve the intended targets on different aspects of human life including their social, economic, health, education and dignity. In recognizing this, the Government has been working for the development of rural water supply and sanitation along with other international agencies like UNICEF, World Bank, international and local NGOs.

Recent data suggest that although 78 % of water point schemes are functional at one time, almost 15 percent of water points fail after one year and 25 % of water points are non-functional by their fourth year (Banks et al. 2016). In a similar vein, Improve International, an NGO, maintains a list of links to studies on water system failure with examples from around the world (Improve International, 2012): all show similar rates of failure.

There is, therefore, a broad consensus that non-functionality of rural water supplies is a problem. Yet this consensus is not uniform.There has no adequate studies has been conducted to examine the service level delivered by functioning water supply schemes in Ethiopia general, South Nation Nationality People Region state context.

Schemes are designed and implemented to meet specific goals and achieve desired change (Al-hajri, 2017), describes a project as a set of coordinated activities with a specific start and finish time, pursuing a specific goal with constraints on time, scope and resources. Implementation of most projects may be successful but their service level may remain a challenge. Large numbers of projects implemented at huge costs often tend to have trouble with service level. Furthermore, the RWSS identify several responses for the high failures rate, including inappropriate technology selection; poor construction and lack of quality material, lack of community participation and subsequent sense of ownership, poor community organization or cohesion; lack of spare parts and professional support (DWWO RI, 2020).

Although, very few studies has been conducted at national level and the research findings have shown that numerous water and sanitation supply schemes have been planned and implemented, however, only a proportion of these schemes continue to provide water to the communities that they were intended to serve. These studies also point out that the reason for the failure of water supply service (non functionality) its stated including poor technology selection, insufficient maintenance, malfunctioning equipment, inadequate community planning or participation among others. The report by African Development Fund (2005) also revealed that 33% of water services in rural areas of Ethiopia are non-functional because of poor operation and maintenance due to funds unavailability, and lack of hardware and software issues for water structures. However, they lack depth and breadth of detail in the analysis of the actual nature of the problem or determinants factors. It is almost non-existent evidence of studies that focus on the evaluation of the level of service delivered by functionality rural water supply schemes in Hadiaya Zone context especially at the Gomberaworeda-level and a limiting factor to the improvement of water supply and sanitation.Gomberaworeda hadmany problems of water supply schemes accessibility due to geographically still some kebeles like setera, wogano and tutufaare not chances to implementation water projects and non-sustainability due to non-functionality of constructed water supply schemes .

1.3. Objective of the study

1.3.1. General objective

The main aim of the study was to evaluate functionality of rural water supply schemes service level in GomberaWoreda of SNNPRS.

1.3.2. Specific objectives

The specific objectives of this study were the following:

- To examine the detail nature on(quantity, quality , accessibility and reliability) service level of rural water supply schemes in GomberaWoreda of SNNPRS
- To identify the depth of determinant factors that can affect the service level of rural water supply schemes in GomberaWoreda of SNNPRS

1.4. Research questions

The following questions were researched:-

1. How was the functionality and service level of rural water supply schemes in GomberaWoreda of SNNPRS?
2. What were the major factors that affect the level of service delivered by functioning rural water supply schemes in GomberaWoreda of SNNPRS?

1.5. Significance of the study

As noted in the previous sections that there is no adequate evidence found aboutlevel of service delivered by functioning rural water supply schemes. Thus, this study is important because it is an original empirical research output concerning performance of different ruralwater supply schemes;

level of service rendered and users' satisfaction with the servicegained from functioning water supply schemes in the study area. This study also will be identify different factors that determinants water supply schemes functionality;current interventionsdone by different rural water supply actors and recommended on further interventions thatshould be done to ensure safe water supply for the rural dwellers. The findings of the study will serve as an input to rural water supply actors to intervene and take effective approach to sustain the water schemes service level and contribute in the rural water supplyframework.

Conducting this study will be greatly informative and educational to the researchers involved from the institute of technology and this knowledge will be easily transferred to graduate and undergraduate programs. Furthermore, the junior staff members of the institute and the university and decision makers in the WaSH sector have gained important experience in the scientific methods of research and project management, including documentation and implementation.

1.6. Scope of the study

The scope of rural water supply project service evaluation encompasses various inter-sector issues. This study focuses on the level of service delivered by functioning rural water supply in a particular area in which small sample was used that could not cover the entire Gombera Wereda due to financial constraints and many other setbacks. Therefore, the study was more of in the level of service delivered by functioning rural water supply aspects of the sample water points for selected kebeles and selected water schemes.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. An overview of water

Water is a precious natural resource and one of themost essential requirements of all living being. Safe and readily available water is important for public health, whether it is used for drinking, domestic use, food production or recreational purposes. As water is a key resource and we can never produce more water, water running deserves priority in the development and preservation of any area (Jethoo et al, 2011).

All people, whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs (United Nations, 1977). According to the guidelines for Drinking Water Quality, WHO defines residential water as beingwater used for all usual domestic purposes including consumption, bathing and food preparation (WHO, 1993). Standards for residential water use vary with climatic conditions, life style, culture, technology and economy. There is no fixed data to estimate the amount of water needed to maintain acceptable of minimum living standard (Zhang, 1999).

Everyone has the right to sufficient, continuous, safe, acceptable, physically accessible, and affordable water for personal and domestic use.The UN explicitly recognized the human right to water and sanitation. Improved water supply and sanitation, and better management of water resources, can boost countries' economic growth and can contribute greatly to poverty reduction. In 2015, the 2030 Agenda for Sustainable Development adopted the Sustainable DevelopmentGoals (SDGs) to end poverty, protect the planet, and ensure prosperity for all. Goal 6 seeks to ensurethe availability and sustainable management of water and sanitation for all (UN, 2015).Although by 2015over 90% of the world’s population used improved drinking water sources, those living in rural areastypically experience much lower levels of access to improved water (WHO, 2017). Around the world, an estimated 780 million people still live with water scarcity of these many are in sub-Sahara Africa which represents one quarter of the global population that faces water scarcity live in developing countries. The access to water supply and sanitation in Ethiopia is amongst the lowest in Sub-Sahara Africa and the entire world (Carmen et al., 2018and Tim et al., 2019).

Therefore, realizing the critical importance of supplying portable water, national and regional governments, local and international NGOs invest many millions of capitals every year in developing countries to tackle the problem through the implementation of water supply scheme service level. Thus, this study was intended to evaluate the levels of services of rural water supply projects in the study area. Moreover, the study was intended to assess factors that affect rural water supply schemes service level and functionality.

2. 2. Water supply schemes and systems

Water supply is the provision of water by public utilities, commercial organizations, community endeavors or by individuals, usually via a system of pumps and pipes. Public water supply systems are crucial to properly functioning societies. These systems are what supply drinking water to populations around the globe. Aspects of service quality include continuity of supply, water quality and water pressure. A water supply schemes is a system for the collection, transmission, treatment, storage and distribution of water from source to consumers, for example, homes, commercial establishments, industry, irrigation facilities and public agencies for water—related activities fire—fighting, street flushing and so forth.Water supply systems obtain water from a variety of sources such as groundwater (aquifers), surface water (lakes and rivers), and the sea through desalination(Carmen et al., 2018).

Objective of water supply scheme is to supply safe and wholesome water to consumer, to supply water in sufficient quantities, to supply water at convenient point and timings, and to supply water at reasonable cost to the users(UN, 2017; Carmen et al., 2018and Tim et al.,2019). The institutional responsibility for water supply is arranged differently in different countries and regions (urban versus rural). It usually includes issues surrounding policy and regulation, service provision and standardization.The water utilization and consumption pattern is different in urban and rural areas. The water utilization in urban areas is more than the rural areas. In rural area people depend on pool, tube well, bore well etc but people live in urban areas fully depend on the municipality supply water.This study was focused on rural water supply schemes service level.

2.3. Rural water supply schemes service level

Why focus on rural water supply scheme service level ?Global urban and rural drinking water coverage 2020, by water source, in 2020, 86 percent of the world's urban population had access to safely managed drinking water services. In comparison, just 60 percent of the rural population had access to safely managed drinking water. 90 percent of the global population had access to at least basic drinking water services in the 2020 (Statista, 2021). However, rural water supply schemes, especially those in developing countries,millions people still lack access to an improved water source.In terms of rural Ethiopian context, residents in rural areas used to have travel more than an hour away from their homes in order to fetch insecure and irregular water from unprotected springs, rivers and other unsafe sources. According to MICS and DHS surveys conducted at 45 developing countries (Ibid,.), it was discovered that households whose premises are not connected to piped drinking water are supposed to place major burden upon women (64%) to collect drinking water from sources followed by men (24%), girls (8%) and boys (4%).

Drinking water supply in the context of rural communities of developing countries is quite unsatisfactory. First, the need to develop water supply systems that serve all the citizens has not yet been addressed adequately. Second, built systems are not operating at full capacity (Carter, Tyrrel, &Howsam, 1999). Third, rural water supply schemes, especially those in developing countries, are characterized by their infrastructure and technology deficit and a lack of knowledge or experience among those operating or managing the systems. Research in this field indicates that a large percentage of water projects end in premature failure. A leading cause of these failures is that organizations tend to misunderstand or ignore the concept of service level and community opinions are notalways considered with regards to system design and management both before and after the system'sconstruction.While many organisations are working to address this gap, too often, longer-term scheme service level is forgotten in the drive to provide access - meaning more than 30% of people registered as beneficiaries of water services in fact lack access to safe, useable water sources.

Currently, many rural water supply projects and programs focus on the goal of increasing service coverage through the implementation of new water systems and facilities. It is essential that this is accompanied by adequate attention to the crucial aspect of water scheme service level, if any gains are not to be short-lived.This fact, coupled with high poverty levels in many rural areas and depressed levels of service sustainability, indicates a critical need for focused attention to the provision of potable water to rural communities in Africa. This study, therefore, addresses domestic water supply in the rural context only and many of the issues explored may not be appropriate for urban or peri-urban areas.It will explore these different aspects in detail and present a range of options to make existing and future water systems more sustainable in service level.

2.4. Water supply service levels and ladders

2.4.1.Water supply service

Water services focus on the delivery of water to people. It can be defined as the quantity of water of a given quality and accessible by users (service) and the system used to deliver water. Inpractice, the two (service and system) are often closely related. Water coverage is often calculated by counting the number of systems implemented withoutconsidering whether they are in fact providing the planned level of service (Moriarty *et al*,2011).Moriarty etal (2011), a water service is assessed based on qualitative methods of datagathering. Some questions asked include:

- Do the systems provide the designed amount of water.
- Do they do so every day?
- Does everyone in the community have access to them?

- Do they meet national norms for quality?

The water service accessed by an individual can only be said to meet a certain standard orlevel when the answers to all these questions are considered together and meet normativestandards (Moriarty *et al*, 2011). A water service therefore refers to the provision of access towater in a way that meets a set of key indicators (or norms). Taken together these keyindicators define the water supply scheme service.

2.4.2. Service level

Service level describes and differentiates between qualities of service. It is a ladder in whicheach level or rung is a step up from the previous. Service level is a collection of differentindicators some dependent and some independent of the other. Its definition varies acrosscountries. It may be set through a combination of engineering factors (what is easy/ possible)and social and political factors (what is politically acceptable, the cost, the desire andcapacity of a community to press for improvements, and historical norms) (Moriarty *et al*,2011). For example, a rural community may live with a level of service, in terms of distancetravelled and quality of water that would be regarded as unacceptable in a town. In an idealworld, the level of service would perhaps be set through agreements made between theproviders and the users (Moriarty *et al*, 2011).

2.4.3.Servicedelivery indicators

A set of Service Delivery Indicators for the Water User Committee model, based on national policies, guidelines and strategies was therefore first developed. These were then used for assessing the levels of services received by the water users. The developed Service Delivery Indicators are summarized below.(Moriarty et al, 2011).

Table 1. Parameters monitored by Golden Indicators and SDIs for rural water services

Level	**Golden Indicators**	**Service Delivery Indicators** (incl. sub-indicators feeding into these indicators; (sub)indicators specifc to WSSBs)
deliver ed	**Water quality**	**Water quality** (E. Coli; TDS; Turbidity)
		Water quantity (Water quantity delivered; Water quantity

		accessed)
	Access (distance to improved water facility	**Accessibility** (Number of users; Distance to water facility; Walking time)
	Functionality water facility	**Reliability** (Uptime water facility)
		Quality of water source (Non exposure to pollution; No seasonal variations water quality; No seasonal variations of yield)
Users' level		**Users' satisfaction with the service delivered** (Users' satisfaction with water quality;Users' satisfaction with water quantity; Users' satisfaction with accessibility; Users' satisfaction with reliability)
		Users' sense of ownership of water facility (Users' financial contribution to O&M; Cleanliness water facility surroundings)
Service manage ment level	**Management** (actively functioning WSC/WSSB) **Gender** (women in key positions in the WSC/WSSB)	**Service manager and operator composition and activeness** (Activeness service manager; Gender; Viability of scheme operator)
		Service manager's and operator's performance of tasks (Financial records; Collection user fees; Cost recovery; Meetings with users; Preventive maintenance; Scheme operator's reports; Meetings with tap committees; Relationships with service authorityand support)
		Service manager and operator internal governance (Records on decision points;Transparency on O&M fund; *Transfer water fees to WSSB*)
Service authority and support mechanisms		**District Water Offce (DWO) staffng** (No staff DWO)
	Equity (Deviation from the District average no. of persons per water point)	**District planning** (Planned investment based on equity)
	Per Capita Investment Cost	
		Community mobilization pre-construction (Signed Memorandum of Understanding;Community capital cash contribution; Land agreement)
		Support and supervision to service managers by service authority and Hand pump Mechanics / HPMs (Reactivation of service managers; Responsiveness DWO to major breakdowns; Responsiveness HPMs to breakdowns)
		Support and supervision to service managers by Umbrella Organisation(Support visits;Responsiveness to major breakdowns)
		Construction supervision (Quality construction supervision)
		Monitoring (Use of water facilities' functionality data;

		Monitoring of service managers'activities)
		District coordination (Functionality of District Water and Sanitation Coordinating Committee)
		Responsiveness of TSU (Responsiveness of TSU to request for support from DWO)

Moreover, the most common indicators against which the quality of water services can be assessedinclude: **quantity**, measured in litres per capita per day (lpcd); **quality**, typically composedof one or more separate indicatorslooking at **chemical** and **biological** quality; and **distance**,from a household or the centre of a community to a water point (Moriarty *et al*, 2011).Acceptable water quality shows the safety of drinking water in terms of its physical, chemical and biological parameters(WHO,2004).Inaddition, countries may also use other national or international norms, such as the **numberof people** sharing a point source (also known as 'crowding'), and the **reliability** of theservice, typically defined as the proportion of the time that it functions to its prescribed level.Lloyd and Bartram's (1991) cited in (Moriarty *et al*, 2011) identifies five key indicators forassessing access to water services, namely: **coverage**, **continuity**, **quantity**, **cost** and **quality**(analytical plus sanitary inspection). Subsequently the service level concept was furtherendorsed by the World Health Organization (WHO) in 1997 and 2003. Despite this, theapproach has been slow to be adopted at scale, probably falling victim to the broader problemof poor monitoring of access to rural water supplies. Indeed, it is telling that beyondendorsing it in its publications, WHO itself has limited its Joint Monitoring Programme(JMP) of global water coverage primarily to the type of technology used. However, this maychange in the future with more recent discussions on post-MDG monitoring.

2.4.4.Service delivery ladder

Service ladder is incremental progression between service levels of different quality startingfrom bottom rung and climbing to the top (Moriarty et al, 2011). They are highly technologydriven, in that each rung of the ladder is related to specific technical choices and whilesometimes they can be completely new systems. Some rungs of the ladder can be climbed byindividual household or through the community's effort, while others heavily rely onsubstantial funding, engineering capacity and professional management. Moriarty et al (2011)argued the concept of service level ladder is about service levels, not infrastructure, thoughsome service levels, in some settings, can never be achieved without substantial infrastructuredevelopment and associated running costs.In Ethiopia, the basic service level for rural communities is defined as the access to safewater supply of 15 liters per capita per day within 1.5 km radius (MoWE, 2011). Regardingthe number of households accessing a water point it was determined to be 50 households and60 to 70 households per water point for hand pump and spring development respectively(OWNP, 2013).

In order to estimate the Service Delivery Indicators described above, a Service Delivery Ladder was designed as presented in the below table. An indicator would therefor be assigned any of the levels; excellent, good, fair, low or very low depending on the score of the water service received.

Scenario	Score Water Service	Level Water Service
Good quality water supply of at least 40 lppd within a distance of 0.5 km from a water source that is reliable 95% of the time	1	Excellent
Good quality water supply of at least 30 lppd within a distance of 0.75 km from a water source that is reliable 95% of the time	0.75	Good
Good quality water supply of at least 20 lppd within a distance of 1 km from a water source that is reliable 95% of the time	0.5	Fair
Users access a service that doesn't meet one or more of the following standards: quality, quantity and reliability	0.25	Low
Community doesn't have an improved water source within a walking distance of 1 km.	0	Very low

Figure 1.Water service Delivery Ladder

2.4.5.Existing water service ladder

Developing water service ladder has great advantage to provide cost effective WASH serviceto people on a sustainable basis. In addition service ladders are important for monitoring andevaluation of the service level delivered by water sectors.The WHO and UNICEF's JMP adopted a simple ladder for water supply in which servicelevel is explicitly linked with technology types. Based on JMP definitions to improved andunimproved sources JMP developed service ladder categories as unimproved, improved, and piped water on household premises (Figure 2). According to Moriarty et al (2011), JMPsdecision on limited indicators may probably be due to its global level MDGs WASHmonitoring. In addition JMP gives no recommendations at all for either the quantity orquality required of water for domestic use besides the WHO drinking water guideline link.

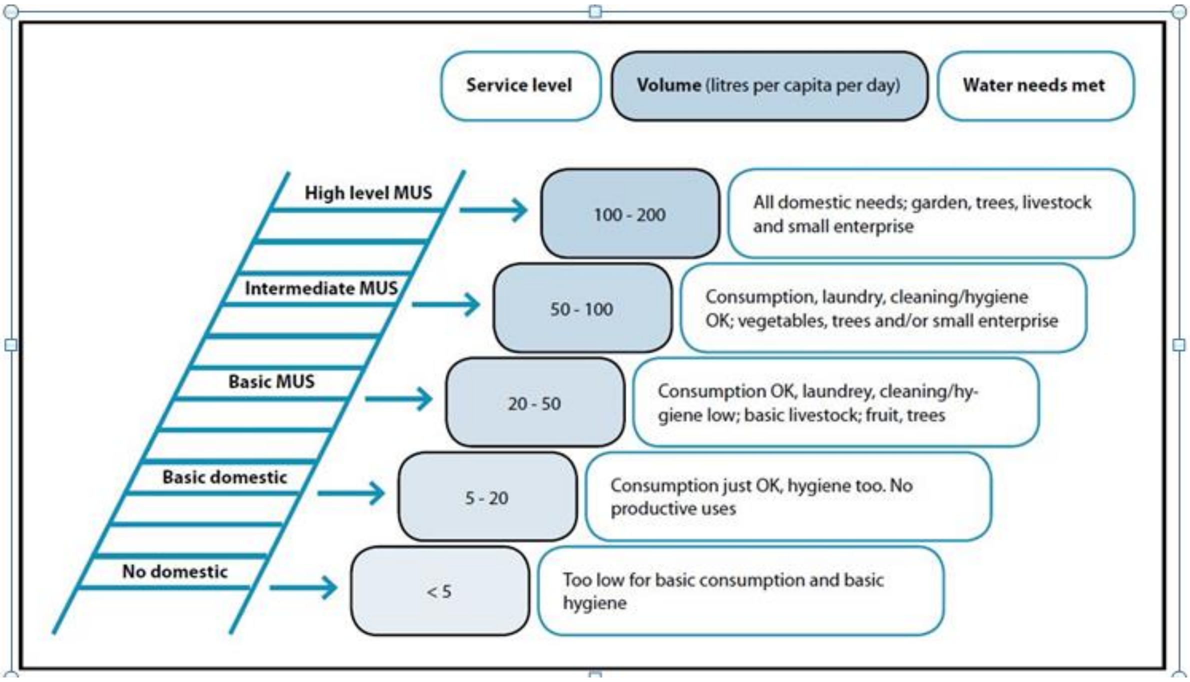

Figure 2JMP's water service ladder (JMP, 2008)

A second service ladder for water was proposed by Van Koppen et al (2009) (cited inMoriarty et al, 2011) as part of their work on multiple use water services. A multiple useservice (MUS) is one in which water is provided for homestead based productiveencouraging activities such as livestock rearing, small businesses or horticulture, in additionto domestic consumption (Moriarty et al, 2011). The MUS ladder has as its primaryindicators the quantity and ease of access (measured through time to collect water). Itqualifies each level of access according to the type of domestic and productive activities that such a level of service can support (Figure 3). Like the JMP ladder, the MUS ladder attempts to link typical service delivery options to different service levels, putting household tapconnections as the highest level. The MUS ladder maps relatively easily onto the JMP ladder,with the bottom two tiers corresponding to 'no accesses' on the JMP ladder, and the top three to improved access. The MUS ladder does not differentiate locations and assumes that all households everywhere have a demand for non-basic water consumption.

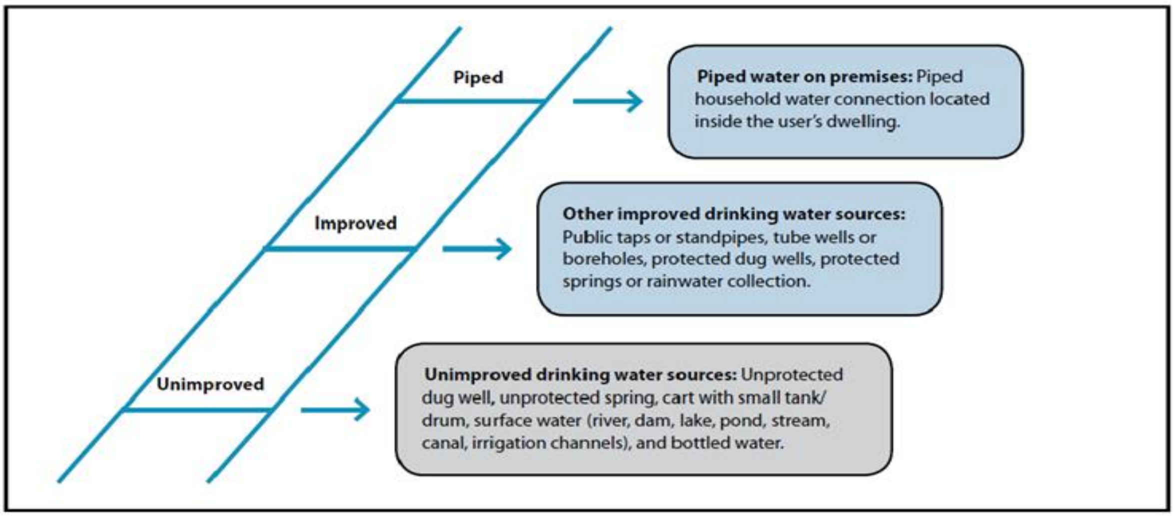

Figure 3.Multiple Use Services ladder (Moriarty etal, 2011)

Using the WASHCost objective of understanding the cost of provision of water supply,sanitation and hygiene services and enable the cost effective and equitable service delivery;Moriarty et al (2011), proposed service level ladder to be used by water sectors. They presenta set of core indicators for a WASH service, grouping them together with service deliverytechnologies, into different service levels (typology). For both exercises, a pragmaticapproach was taken: only those indicators that can realistically be identified and relativelyneasily assessed are chosen; while the groupings of service levels was informed by what theyfeel to be service differences that are recognisable to most service users and serviceproviders.WASHCost researchers proposed water quantity, quality, accessibility, and reliability as mainindicators. These indicators were proposed based on the desired outcome of providing waterservices is a reduction inmorbidity and mortality related to water-borne diseases and poorhygiene, coupled with a reduction in the burden particularly on women and girls of fetchingwater for use in the homestead. With a MUS perspective, an additional outcome is reducedpoverty through economic activity related to access to water. Yet none of these outcomes canbe achieved if there is not sufficient water of acceptable quality or if the water system is toofar or is chronically unreliable. Based on these four key indicators, and looking at the realityof services currently being provided to be able to relate levels to the JMP ladder, Moriartyetal (2011) propose a service ladder comprising of five steps.There is also a service level ladder used by SNV (2013), which include measurable reliabilityindicator in terms of the number of months that the water supply scheme provide service in ayear. SNV's service level ladder also provides better utilization of other indicators. It looks simple and can be applicable.Generally, to ensure the basic water supply scheme service level, users should access **20** liters per capital per day of potable water, within **1000** meter of collection distance or 30 minutes timefor round trip per capita per day. And this service should be reliable (serve at least 7 - 8months per year).

2.5. Management models

Like most other public services, under Ethiopia's decentralized structures, rural water supply is the direct responsibility of district (woreda) (MoWIE, 2017) governments. Districts independently determine the allocation of their budget to water and other sectors. District water offices are supported as service authorities by regional and national levels of government, although some also get support from designated zones.

Water service providers in rural areas are typically water, sanitation and hygiene committees (WASHCOs) or Water User Associations (WUA). WASHCO members are composed of elected people from the community and serve voluntarily. Their focus is on water supply (e.g., a well or borehole with hand pump). In more populated rural areas there can be Town Water Utilities (TWUs), in the case of small-town piped systems, and WaterBoards, in the case of multi-village piped water supplies. It should be noted that a professional, rural waterutility approach is now being rolled out for the multi-village piped systems(One WASH National Program, 2013).

Although WASHCOs are responsible for both operations and maintenance (O&M), they typically only manageoperations, with little emphasis on ongoing and preventative maintenance. Where maintenance lacks, failures are frequent and most WASHCOs are unable to perform anything beyond simple repairs. Government entitiesmay step in to provide support, but generally focus on major maintenance and rehabilitation. This meanspreventative and other minor maintenance issues are perpetually neglected. Provision of government supportcomes from kebele, district, zone (where relevantcapacities exist), and regional level offices. Typically, requests are prioritized and coordinated by districts andthen passed upwards. Due to limited capacity, budget, and the low priority of maintenance, maintenanceresponses are frequently delayed(MoWIE, 2017).

There are innovations being developed and piloted to strengthen the support given to WASHCOs. MoWIE, forexample, is piloting the development of small and medium-sized enterprises and spare part shops under thepreferred association model to create jobs for the youth and unemployed.In some places, hand-pump maintenance service responsibilities have been outsourced to town utilities. Thisincludes the rural areas around Harar, where the Harar Water and Sewerage Company provides hand-pumpmaintenance services, and the rural areas around the town of Gobesa, where the Town Water Utility providessimilar services and is linked to water sources sharing in rural areas(MoWIE, 2017).

2.6. Community Water Supply Schemes Management

The concept of community participation implies that beneficiaries are involved in the development projects concerning them. However, the concept of community management refers to the capabilities and willingness of the community to be in control and determine the nature of development activities affecting them. In water supply and sanitation projects, community management refers to the fact that community exercises its responsibility of decision making and becomes in charge of controlling the subsequent execution of these decisions during project development (Cavill, 2010). Management refers to using expertise in coordinating the efforts of people to accomplish desired goals and objectives using available resources efficiently and effectively. It comprises planning, organizing, staffing, leading and controlling of the rural water supply schemes to meet the needs of its community and embraces the concept of doing this beyond the expected time(Ison *et al*., 2007)

2.7. Factors of rural water supply schemes service level

The community management has a pivotal role in providing drinking water to communities where public and private interests are minimal.

Nevertheless, this management model has exhibited several weaknesses which have been exploredin scientific literature for several decades. Some authors observed that the **lack** of **institutional** supportand **political** planning are major contributors to systems' failures, as seen in Ghana (Braimah, Amponsah, Asibey, 2016) and Nigeria (Chukwuma, O.M, 2018).Insufficient **financial** resources and **weak** tariff schemes also have been recognized as leading causes of **failure** of rural water **services** (Kativhu, Mazvimavi, Tevera, Nhapi, 2018). Additionally, several studies identified maintenance issuesas critical to the functionality of community-managed systems, such as the execution of insufficient preventive repairs (Etongo, Fagan, Kabonesa, Asaba, 2018), **difficulties** to obtain **spare** parts (Chukwuma, O.M, 2018) and lack of **technical** support from external entities (Behailu, Hukka, Katko, 2017). Therefore, community management models of water supply require further commitment from multiple stakeholders in order to achieve better results and benefit a larger number of people (Barnes, Ashbolt, Roser, Brown, 2014).

Through this study,researcher assessed the perceptions of Gombera woreda government officer workers with professional backgrounds in the rural water sector and community. Their practical experience provided a valuable interpretation of the daily difficulties of ruralWater Supply scheme, and allowed for a constructive assessment of the key elements associated with the success of community management. The Ethiopian scenario regarding Rural Water Supply scheme service is currently in the imminence of major modifications as a result of the elaboration of a national plan, which will be use as a theoretical framework in this study.

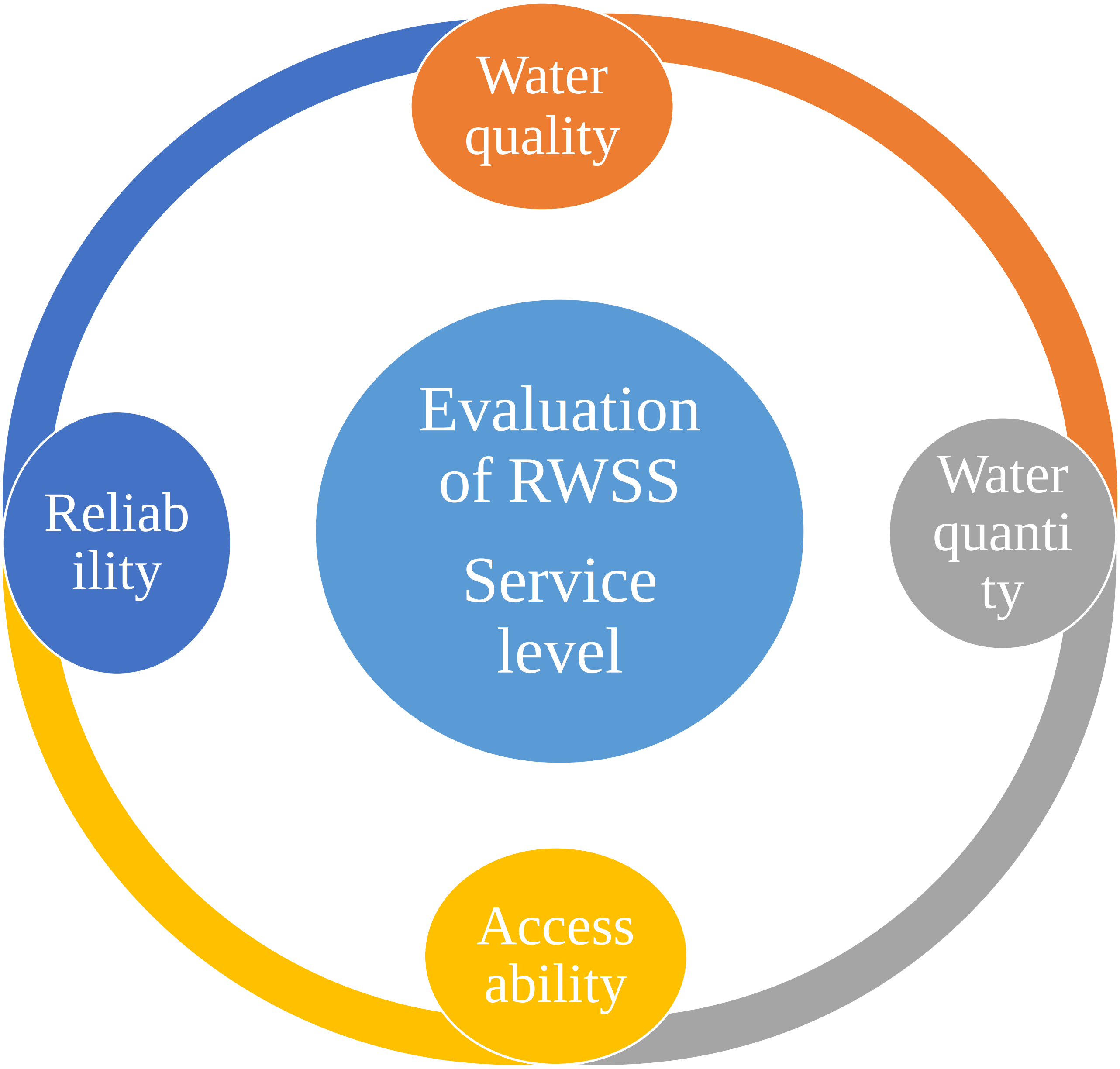

Figure 4.Conceptual frame works of evaluation of RWSS service level(Daemane, 2015).

CHAPTER THREE

3. MATERIALS AND METHODS

3.1. Description of the study area

3.1.1. Location

Thestudywasconductedinsouthern Ethiopia, Hadiyan zone,Gomboraworeda.Gomboraisgeographically located at$7^0$30'-7043'Northlatitudeand$37^0$35'-$38^0$05'Eastlongitudes.Gombora is bordered on the south by Soro woreda, on the west by the Yem special woreda, on the north by Gibe woreda, on the northeast by Misha woreda, and on the east by Lemo woreda. Thetotal landareaoftheworedais48,161hawhichcomprisesof27kebeles with22rural and 5 urbankebeles.Gombora woreda is located about 259kmin South of AddisAbebe (Nationalcapital)and about 27km from Hosanna, the capital town of Hadiya zone.

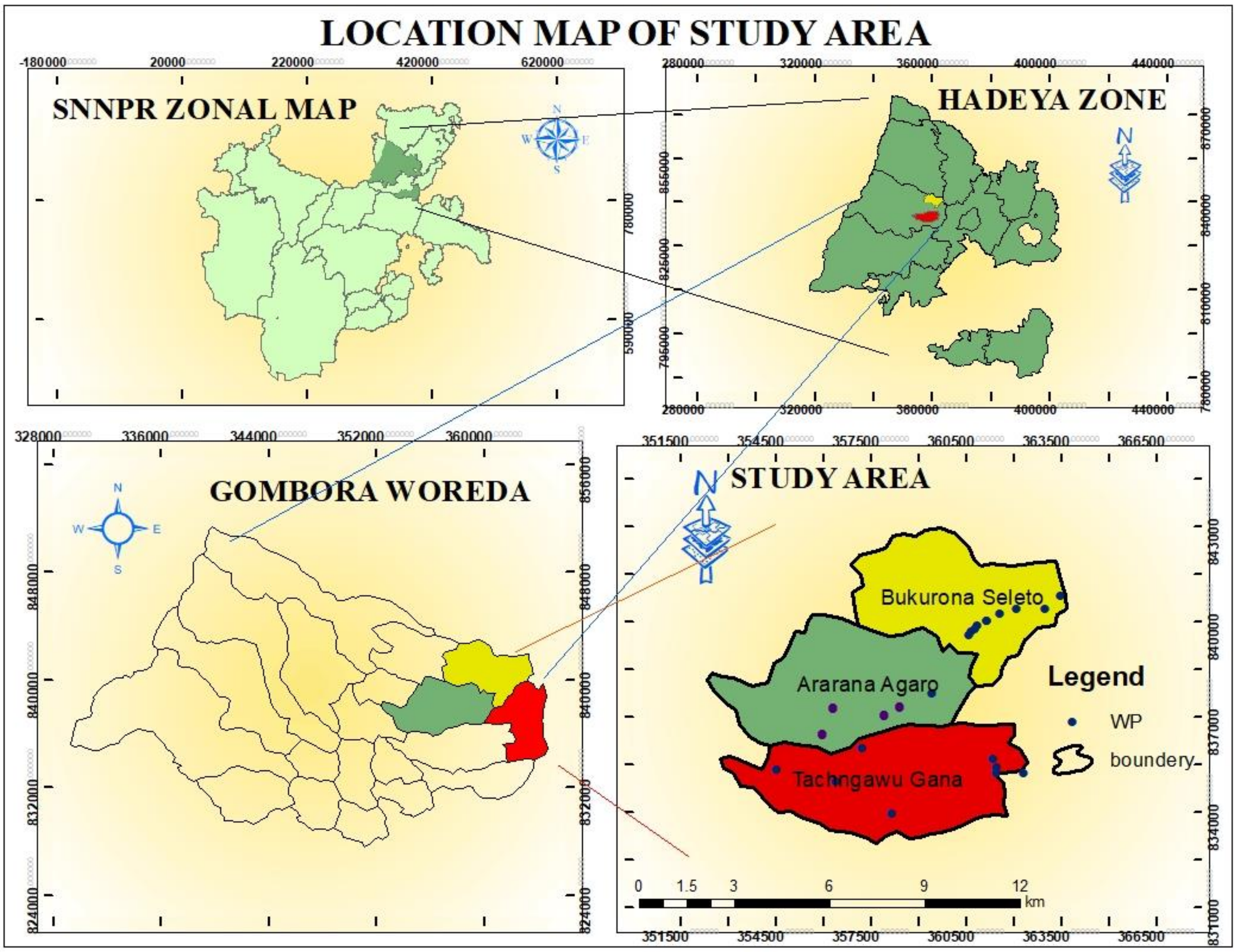

Figure 5.map of the study area.

3.1.2. Population

Gombora woreda has 27 kebeles with a total projected population for 2016 based on 2007 census of 110,877; with 55,533 males and 55,344 females (CSA, 2013).

3.1.3. Topography and climate

The topography of the study area is characterized by flat and moderately gentle lands in low altitude and some mountainous lands in upper altitude. The altitude of the Woreda ranges between 1400 meters to 2400 m.a.s.l. The woredahastypicalthreeagro-ecologicalzones (dega, weyinadega and kola).Weyinadega consists of 55%, kola 37% and dega consists only 8%. The mean annual precipitation and temperature varies between 1800 - 2200mm and 15 - 25°C respectively.

The study area has a bimodal rainfall distribution where the main rain fall season starts in June and continue up to end of September (meher rains) and the short rainy season occur beginning January to April (belg rains).Morethan75%ofthetotalrainfallsduringkiremetseasonandthehighestrainfalloccursinAugust.Rain thatoccursduringtheKiremtseasonisveryintensiveand,hence,theseverityofsoilerosionishighduring thesetwomonths. Mostof thecropproductionalsotakesplaceduringtheKiremtseason. Eventhoughtherewereso mevariationswithrespecttocessation,amountanddistribution,thebelgrains werebylargefavorableinmostareasofthedistrict.Forexample,onsetoftherainwas timelyinalmostallBelgproducingkebelesofthedistrictandmostdistrictsofthe Hadiya zone (kibemo, 2011).

3.1.4. Economic activities

The livelihood of the people in Gombora Woreda is mainly rain fed subsistence mixed crop and livestock production associated with trees grow either in wood lots or in farm plots. Some kebeles, especially Horuwa watershed areas uses irrigation water for agricultural activities. The most common cultivated cereal crops in the study sites include teff, wheat, maize, barley and bean and cash crops like enset, chat coffee, and Fruits such as banana, papaya, avocado and mango are cultivated for household consumption and income generation (GWARDO, 2020).

3.2. Research designs.

The research design chosen for this study is a cross sectional study so asto examine the level of service, users' satisfaction and various opportunities andchallenges/determinant factors affecting functionality and service provision by functioningrural water supply schemes in the woreda. Here, the study commands methodologicalpluralism (i.e., combination of different data collection techniques).Focus Group Discussions, Key Informant interviews and field observationwere held in order to augment and enhance the study.Such qualitative methods are helpful to find adequate information and to get individual,group and institutional views.

3.3. Sampling techniques

3.3.1. Selection of water points

According to Gombora Woreda water resources development office report, there are 67 public andinstitutional water points constructed by different WASH actors: RWSEP, IRC, MEAD Project, ONE WASH and KALEHIWOT CHURCH from 2003/04 to 2019.water supply schemesconstructed by the actorswas considered for the study asthese implementers are the major ones in the construction of water points in the woreda. Out of the total water points established in the study area,39arefunctional, 21 are non-functional and 7 will be under construction.The sample of water supply points from each type (functional, non-functional and under construction)wasused for this study to assess and evaluate the water schemeservice level, opportunity/challenges and factors affecting the scheme service level of water points.Among these functional water supply schemes,4 hand dug wells, 21 shallow wells with distribution, 11 springs and 3 boreholeare constructed by the above actors in the distinct area. For this study from the total of water points a sample of 25 water points was selected randomly from the targeted kebeles.

Table 2 Functional and non-functional water supply schemes

Implementing agencies	Status		
	Functional	Non functional	Under construction
K/HIWOT CHURCH	6	2	2
RWSEP	8	4	1
IRC	7	5	1
MEAD	5	6	1
ONE WASH	13	4	2
Total	39	21	7

3.3.2 Sample kebele selection

For this study kebeles where the water points have been constructed were selected for the study in consultation with the woreda water resources development office.Due to resource limitation threekebeles namely, Bukuro-salata, Arare-Ogaro and tachiignawuganakebeleswere purposively selected.Thisisbased on potential of water points (kebeles having more than five water points). This increases the opportunity of visiting more water points per day. After the implementation kebeles were selected the sample water points under each sample kebele were selected using **stratified** random sampling. Water points in a given kebele was also **stratified** by their years of **construction**.

3.3.3. Selection of households

The sample frame for household survey is user households of each sample water points . Sample size computation formula apply as it results large sample size. Since household number using a water point varies the samplenumber also varies from water point to water point. According to the Gombora woreda Agriculture and natural resource development office annual report, the total numbers of households of the three kebeles are **1631** .(GWAD,2012). Based on this, used Michael Taro, (1967) formula to figure out what sample size need to take as follows

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

n = Number of samples,

N = Total households and

e = Error tolerance (0.05 - 0.09.)

$$n = \frac{1631}{1+1631(0.087)^2} = 122$$

From the whole water users, sample of 122 households were selected by random method.

Proportion of sample in each kebele was computed using equation **3.3.**

$P_i = \frac{N\,i}{N}$..................................equation(**3.3**).

P_i = population index.

N_i =number of house holds in each kebele.

N = total number of households in the three kebeles.

Number of sample in each kebele was computed by using equation**3.4**

n_i= P i*n .... equation(**3.4**)

ni= sample size of each kebele.

P i= population index.

n= the total sample size of the 3 kebeles.

Moreover, threeadditional threeoffice experts used who works in government of zone& Woreda level were considered in the study key informants. These experts assumed to have better information on various aspects of water supply system such as, management, budget allocation,currentstates of water supply schemes service level and availability of spare parts.

Table 3 Distribution of sample households in study area.

Sample kebeles	Number of households	Number of water points	Sample households
Bukurosalata	925	11	69
Tachigana	450	8	34
Araraogaro	256	6	19
Total	1631	25	122

3.4. Data sources and data collection methods

For this study both qualitative and quantitative data sources has been used. Both primary and secondary data were used for this study. The primary data was collected by using afield observation, structured Questionnaires, Focus group discus\sion key informantinterview .Secondary sources of data was used for this study include published and unpublisheddocuments . Local communities using thefunctional improved water supply schemes was sample for participation on the householdsurvey.

Focus Group Discussions: A focus group discussion were held by random method and guided by the researcher. The aim is to collect available information through discussion by focusing on selected topics specially, on the functional and non functional water points, physical water quality, average distance from water point to the user communities, operation and maintenance costs , accessibility, reliability and management systems of the responsible bodies. the results are to indicate future achievement amendment direction of the water sector. The aim of the group discussion is to understand and interpret the feeling of the community. In order to make participants feel free to talk openly and give honest opinions. For this the discussion community was assigned in three groups elder, women and youth in each selected kebeles. From 5-8 members were participated from each group separately. The reason of selected those members was that their relevancy on water schemes.

Key informant interview: As mention above in this section, there are different methods to gather data including key informant interview. Then, three office expertswere interviewed, they were from GO & Woreda water sector who working in hadiya zone water ,mine and energy and gombora worede water supply sector . From key informant interviewer essential information's gathered, as they have better information regarding water supply administration and management, sanitation and availability of spare parts and coverage of rural water supply scheme service instead of beneficiaries.

Field Observation: During field visit, the researcher assessed all selected water schemes to learn the existing water schemes operations and activities, ,and relevant to the sustainability of water schemes to develop a holistic perspective, i.e. an understanding of the context to identify functional and non-functional schemes, physical water quality, year of construction,number of additional facilities ,schemes sanitary inspection, crowdedness, source of pollution, presence of fence and seasons behind. The data collection involved enumerators and voluntary water committees.

Household survey: A cross-sectional descriptive study was conducted in the three selected kebeles using prepared structural questionnaire to evaluate the existing water supply schemes their function and factors affecting the service level. The questionnaire is prepared in English language and translated to the Amharic language, as most community cannot understand English language. Thus, out of **1631** households a total **122** heads of households were interviewed for random selected households. The reason for this selected method is to in order to provide fair distribution and to give equal opportunities to participate for this survey analysis among the users.

3.5.Methods of data analysis

Once the relevant data were collected, the next step was analyzing it using different methods.The quantitative data collected from the sample households were be coded, and analysed usingSPSS version 20. MS Excel and Word.A quantitative data was analysed by descriptivestatistics like frequencies, percentages and means). The qualitative data collectedthrough the key informant interviews, focus group discussions, and observations wereused to triangulate the findings of the quantitative survey of water points and beneficiaryhouseholds. Some of the study findings were presented using figures, tables, andcharts.

3.6 Sub-Indicators of rural water supply scheme service level.

1. **Physical condition of system**: This measures the overall physical condition of the water system. It is based on factors such as construction quality, pressure level in the schemes, andleaks or defects in

the masonry or pipe these factors measured with FGD participants, KII and Hs respondents and also personal observation.

2. **Operation and maintenance**: This examines factors such as whether the community has a designated system operator, access to tools and spare parts, and information about follow-up support.

3. **Consumer satisfaction**: This measures overall consumer satisfaction with the water system. It is based on expressed opinions on factors such as satisfaction with quantity and quality of water received, taste and color, and continued use of alternative sources.

4. **Willingness and ownership**: This measures community support for sustaining the water system. It assesses the degree to which community members feel responsible for their maintenance of their system.

5. **Financial Management**: This assessment is based on a review of each community's financial records and interviews with the water committee and treasurer.

Scoring

Each sub-indicator score was based on a group of 10 related questions collected by the survey data collectors and researcher. Each question was scored on a scale of zero to two, and the total score for the sub-indicator was calculated by combining these scores and converting to a tenpoint scale. A community which performs poorly on 50 percent of the parameters receives a score of five also a community performing perfectly on all parameters receives a score of ten. A community which performs poorly in all areas receives a zero.

Scoring Methods

There were four types of questions in the survey. Most questions have maximum 2 points. Scores of the indicators were calculated to fit 10-scale that the sum of scores of the sub-indicators be divided by the number of sub-indicators and multiplied by five. Overall service level score was calculated by averaging the 5 service level indicators' scores.

Type I: Yes/No Questions

Scoring: If the answer given contributed positively towards that indicator category, it was given a score of +2. If the answer did not contribute positively, it was given a score of 0.

Type II: Ordinal (Ranking) Questions

Scoring: If the answer given indicated positive performance in that indicator category, it was given a score of +2. If the answer indicated neither positive nor negative performance, it was given a score of +1. If the answer did not contribute, it was given a score of zero.

Type III: Multiple Choice Questions

In some cases, multiple choice questions were used in place of multiple yes/no questions, but using the same scoring principle.

Type IV: Open Questions

Some questions ask numerical answers.

3.7 Measuring service level of rural water supply schemes.

Because water system service level depends on a number of factors which vary between Communities and change over time, measuring service level is a difficult task. This study bases its analysis on indicators that measure the key social, technical, institutional, environmental, and financial determinants of sustainability at the community level. The study employed different survey instruments to measure each of these factors. It collected information on the technical factors from technical assessments of the water systems like care taker and artesian, institutional factors from the technical assessment like water sector from head and stakeholders, financial factors from water committee, community and kebele WaSHCOs and interviews, social factors from local governments, kebele WaSHCOs with the water committee, and from households lastly environmental factors from stakeholders and field observation.

These categories were divided into five sub-indicators of service level: physical condition,operation and maintenance, consumer satisfaction, financial management and willingness andownership-to-increase service level the system.

Sub-indicators were scored on a ten-point scale for each community. Overall service level was calculated by taking a weighted average of the different sub-indicator scores and converting it to a ten-point scale. A low service level score indicates that the system is performing poorly in most of the social, institutional and technical aspects that are considered crucial to system service level.

A high score indicates that the system is performing well in most aspects.

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1. General information about respondents

Head of sampled households in each water point were used to answer the questions thatassess different aspects of their water point. As indicated in table 4 , from total sampled household heads 63.9% were male and 36.1% were female. Out of sampled respondents majority of the households age was fall under 36- 45 which was 52.45%, while 18.08%, 20.4% and 9.01% were 25-35, 46-55 and greater than 55 respectively. More of the sampled respondentswere Primary school(1-8) (40.16 %), no formal education were 15.57%, while 37.7% were Secondary school and only 6.56% are Diploma and above education (Table 4).

Table 4: Socio economic characteristics of households

Variables	Description	Frequency	Percentage
Sex of respondent	Male	78	63.9
	Female	44	36.1
	Total	**122**	**100**
Age of respondent	25 -35	22	18.08
	36-45	64	52.45
	46-55	25	20.4
	56 and above	11	9.01
	Total	**122**	**100**
Educational background	No formal education	19	15.57
	Primary school(1-8)	49	40.16
	Secondary school(9-12)	46	37.7
	Diploma and above	8	6.56
	Total	**122**	**100**
Source of income	Government employ	7	5.73
	Farming	74	60.65
	Trading	32	26.3
	Daily labour	9	7.4
	Total	**122**	**100**
Family size	1-4	28	22.95
	5 -7	52	**42.6**
	8 -10	25	20.5
	11 and above	17	13.93

	Total	122	100

As shown in table 4 , the main sourceof income for a total sampled household heads the majority (60.65%) was farming and 5.73%, 26.3% and 7.4% were government employee, trading and daily labour respectively. Since this was conducted in rural area of the district, households used different farming in order get income and home consumption, butmixed farming system is common in thestudy area. Size of the family of households is one of the factors that determine the amount of water offered and number ofwater points to be constructed. Based on the household survey, **42.6%** of the sample households had between 5 to 7 family members per household, 22.95% had between 1-4 family members per households, 20.5% were between 8-10 family members per households and 13.93 % of the households had 11 and above family members. The average family size per household was found 5.75 orapproximately **6** individuals per head.

4.2.Functionality of visited water supply schemes

Definition used during the inventory was that water points that were functioning for the lastone year were identified as functional. The result on the Table 5 is based on thedefinition that water points are defined as functional if communities used the water from thewater point for drinking purpose. As indicated in the methodology part and field observation, from 25 randomly selected water points 72% were functional and remaining 28% were not functional (table 5). According to focus group discussion most of the water points has not water power during winter time and also most of the water points were constructed before 10 years. Those water points need service and reconstruction. Those non- functional water points which does not providing service for the last four years on average were not get repairing due to lack of attention from the worede and zone responsible bodies. More over as the researcher stay on a field observation, out of the three kebele’s most of the water points were not fenced. As the result of that spare parts of them were broken and disappeared. This shows there were poor management of WASHCO,S and worede water supply sector.

Table 5: Functionality of water points visited

Status	No of water points	Percentage (%)
Functioning	18	72
Not functioning	7	28
Total	2 5	100

4.3. Water supply scheme service level

The water supply scheme service levels of rural water supply schemes were evaluated in accordance with national targets of indicators :- **quantity, quality, accessibility and reliability** of water supply system.

4.3.1. Water quantity

Amount of water beneficiary can collect from improved sources is one of the factors toachieve targeted health benefits through provision of improved water supply sources. As survey household respondents in table 7 show, 55.7% householdcollects 3 jerkins of water per a day,16.4% collects 4 jerkins per a day,12.3 % of respondents collect 5 jerkins per a day and 11.6% of household respondents collect 2 jerkins of water in a day. As the survey data shows most of the communities used only 55.7% (3) jerkins of water from the water point needs for the drinking and domestic purpose per a day. The maximum and minimum are 6 and 2 jerkins respectively. The average water quantity that the house hold needs from the water point is **4**jerkins per a day.

Table 6.Daily water collection of sampled households in jerkins.

No. jerkins	Unit(liters)	No. of respondent	Percentage
2	20	14	11.6
3	20	68	55.7
4	20	20	16.4
5	20	15	12.3
6	20	5	4
Total		122	100

Daily water collection of sampled households in each day of a week was collected and summed upthen average daily water collection per household was calculated as total water collected in a week divided by number of days per week. In Figure 8, shows the percentage distribution of beneficiary households with average amount of water collected per household per day when the data of table 6 converted in to the liters. Out of sampled respondents **55.7%**of the households collects water from water points **60** liter per day, 16.4% collects 80 liter per day and 12.3% collects 100 liter per day.Based on the household survey the mean average daily water collection from the water point per household was found to be **80** litres per a day, while the daily average maximum and minimum is **120** and **40** litres respectively.

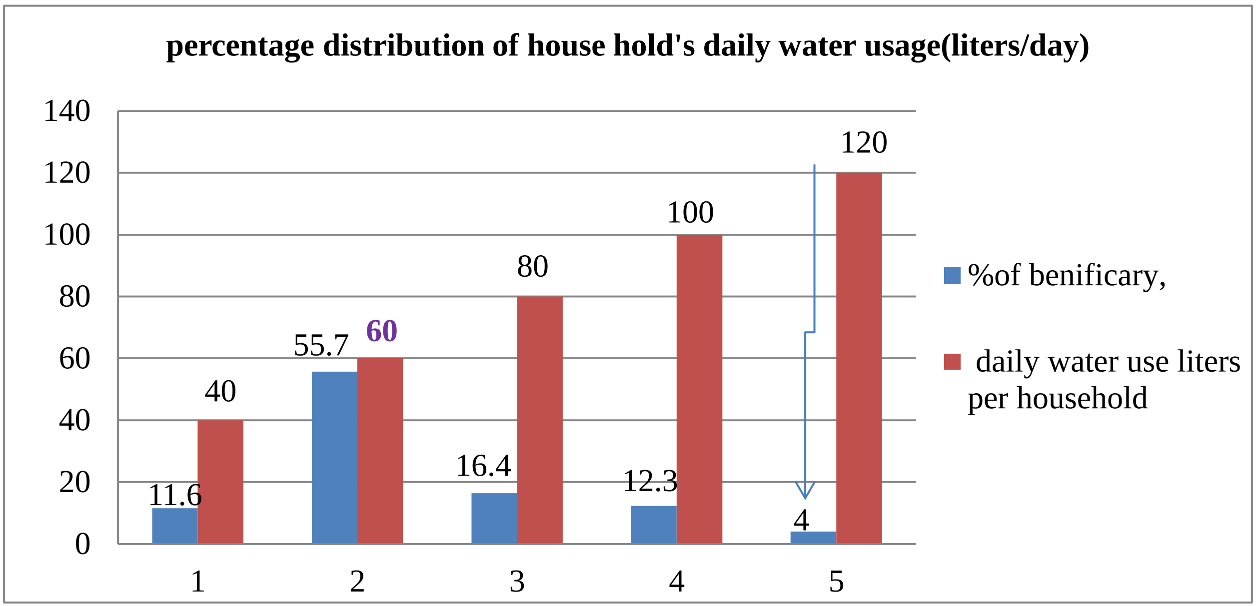

Figure 6.Percentage distribution household’s daily water usage.

Further computation was done to see the per capita water usage from improved water supply sources. The average daily per capita water usage is calculated as the average daily watercollection per household divided by number of individuals in a household.

The universal access plan targets to reach 15 lpcd of safe water supply for rural communities within 1.5 kilometre radius (MoWE, 2011). Result from household survey and socio-economic data show that the mean average per capital water collection from a water point was approximately **13** lpcdor(80/6)lpcd. Which was **below** the WHO access plan standards of 15 lpcd.The minimum and maximum per capital water collection was found 6.6 and 20 lpcd including additional water collection for animal watering and gardening .The higher per capita water usage indicates households have been using water from the water point for additional purposes mostly cloth washing, animal in house watering and gardening (Table 7). From table 7 it is possible to say that, communities need water for other purposes beyond domestic water requirement like animal watering (24.6%), cloth washing (41%) and gardening (2.5%). Therefore during the designing water required for other purposes particularly animals and cloth washingshould be considered unless alternative accessible sources are available. Though implementers inform users to apply the service level they need at the project inception (all key informant interviews) it did not become effective so far. The researcher experienced during his stay in the field except woi dabara and gonjoba spring on spot and gubucho borehole, almost all of the remaining water points had not number of additional facilities. This shows there is no consideration of such additional facilities during the designing. Additionally,that communities are not able to identify basic components of water requirement.

Table 7. Additional water use from the water point

Water use	No, of respondents			Percentage		
	Yes	No	Total	Yes	NO	Total
Animal watering	30	92	122	24.6	75.4	100
Gardening	3	119	122	2.5	97.5	100
Washing cloth	50	72	122	41	50	100

4.3.2. Water quality

Water quality test was done based on the chemical, bacteriological and physical water quality test as follows .

4.3.2.1 Chemical and bacteriological aspects

The chemical laboratory analysis was tested on the chemicals of iron(Fe),free chlorine(Cl),potassium(k),Calcium(Ca) and sulphate($SO4^{2-}$) in hadiya zone water, mine and energy laboratory room by taking the sample of water by icebox for three days. Taking 10ml of sampled water in a test tube and inserting a tablet of listed above on a photometric device according to its procedures, the result of each sampled water points, (n=18) were:-the level of **iron** (0.00 to 0.13 mg/l),**free chlorine** (0.0 to 2.5 mg/l),potassium (2.3 to 12 mg/l),calcium (6 to 16mg/l) and sulphate (0 to 8 mg/l).When the researcher compare the test results by the WHO standards of each, were **below** the WHO guidelines for drinking water quality (WHO, 2004).The chemical water quality test shows all are good for drinking and no any side effect on the human health.

The WHO guidelines for drinking-water quality (WHO, 2004) recommends that for all waters intended for drinking **no total and/or fecal coliform**bacteria should be detected in any 100 ml water sample. In this regard, the bacteriological test was done for three days in 24 hour intervals in a laboratory by the researcher him self using the testing procedure. The majority (75%) the water points had detectable levels of total coliform bacteria (4 to 41 cfu). 25% of the water points that **fecal coliform**bacteria were detected (0 to 30 cfu) (Table 8).None of them were free from both fecal and total coliform of bacteria.The mean average of total and fecal coliform of bacteria are23.1250 and 2.8333 respectively. 13 water points were found to be free from fecal type of coliform bacteria. The result indicated that **bacteriological water quality is a concern**in this study area. It should be clear that the provision of water services must result in health improvements to users as an ultimate goal. However, when this goal is com- promised and user's health is affected, they commonly resort to their traditional unsafe sources or travel longer distances to find

other Safe water source.

Table 8 shows results of chemical and bacteriological analyses.

Number of sample(n=18)	**Iron(Fe) Mg/l**	**Potassium(K)Mg/l**	**Calcium(Ca) Mg/l**	**Sulphate (S_{O4}^{2-}) mg/l**	**Free chlorine (Cl_2)mg/l**	**Number of fecal in 100ml**	**Total coliform**
Mean	0.05	6.03	11.25	2.54	.833	2.83	23.13
Std. Deviation	.05	4.18	3.69	2.81	1.18	6.61	10.68
Minimum	0.00	2.3	6	0.00	0.00	0	4
Maximum	0.13	12	16	8	2.5	30	41
Median	0.02	3.4	10.00	1.0	0.0	0.00	22.50
WHO guide line	0.3	200	200	400	250	0	0

4.3.2.2.Physical Water quality analysis of the three kebeles.

In the study area five ‘user perceived’ acceptable drinking water quality parameters (those are , conductivity, total dissolved solids (TDS), pH, turbidity and temperature), that were considered to have an effect on the Physical Water quality of water for use were determined for three days in a laboratory. Generally, the results showed that most of the measured values of these parameters were **within the WHO guidelines**for drinking water quality (WHO, 2004) based on aesthetic and taste considerations (Table 9).The pH values of 56% (n=12) of the water points (all on- spot springs with distribution) were between **7.8**and **9.6.**The maximum pH value was recorded 9.6 in ginjoba on spot spring which was above the WHO range. Although pH affects the taste of water (Hoko, 2008), no complaint regarding sourness (acidity) was reported by users during the sanitary survey. All the bore hole with distribution (depth range: 8 to 14 m) fitted with hand-pumps (n=6) had pH valuewithin the range of 7.6 to 8.2, which is within the WHO recommended limit for taste considerations. However the mean average pH value was **8.2313**. **Which was inWHO recommended**limits. Temperature in thesewater points ranged from 22.6 to 22.8°C. Although no guideline is set for it, higher temperatures are not recommended mainly because they make drinking difficult.

Eight (44%) water points (on-spot springs with distribution and bore hole) were indicated to have higher turbidity ranging from 5.33to 74 NTU above the WHO (2004) guideline. The maximum turbidity was recorded on gonjoba on spot spring. The minimum turbidity value was 0. The mean average turbidity was **6.3144**NTU which is also above the WHO guide line. As the focus group discussion and field observation ,the reason of the turbidity of some water points were the erosion due to the absence of surface water collection on up hill of the spring and source of pollution up hill of the spring. The TDS was found to be within the WHO recommended range based on taste considerations in all the cases. In this regard, a Spearman's rank correlation test also confirmed that there is no significant correlation between TDS and turbidity (P=0.08) changes across water points. It is worth noting that these values are deemed to vary based on seasonal changes. This is because of the fact that the study was conducted in a relatively dry season, thus in a wet season some values may be lower due to dilution while others higher as a result of dissolution, dissociation, infiltration and/or other physical and chemical processes.

Table 9. Physical Water quality analysis of the three kebeles

Number of sample(n=18)	Conductivity (µs/cm)	TDS (Mg/l)	$_{P}$H	Turbidity (FTU)	Temperature (0_c)
Maximum	164	82	9.6	74	22.8
Minimum	75.52	37.51	7.8	0	22.6
Mean	115.52	57.74	8.23	6.31	22.68
Median	108.35	54.18	8.18	0.50	22.70
Std. Deviation	23.26	11.645	0.47	17.16	0.09
WHO guide line(2004)	Not exceed 400 .	Less than 1200	6.5 -8.5	Less than 5	n.g.v

According to the interview with Hadiya zone water and energy development departmentmanager and Gomboraworede water development office technical expert there is no major chemical and physical water quality problem in Gombora Worede.

4.3.2.3 Communities perception on water quality

Through the water quality test had not been done,on color ,test and odor of the sampled assessment of community perception and sanitary inspection can say some thing about water quality(SNV,2013). During the inspection of water schemes the physical water quality(test, color, odor, temperature and turbidity) of visited water points were found most are good except gonjoba on spot spring water point has a problem of color. Besides the inspection , household survey were conducted on community's perception on the quality of water they fetchfrom the water point.It was found that about 59% and of households encountered seasonal water quality problems (Table 10). Out of the respondents 66.4% and25.4% answered the water quality problem occurs most of the time in winter and summer seasons due to surface water discharge and water shortage respectively.

Table 10 Community perception on the quality of water collected from the water point

Variable	Option	N_o respondent	percentage
Is there water quality problem	Yes	72	59
	No	50	41
	Total	122	100
Types of water quality problem	Turbidity	61	50
	Test	12	9.8
	Color	19	15.6
	Odor	14	11.5
	Temperature	16	13
	Total	122	100
Season of water quality problem occur	Summer	31	25.4
	Winter	81	66.4
	Year round	10	8.2
	Total	122	100
Causes of water quality problem	Water shortage	12	9.8
	Cracks	27	22.1
	Site selection	3	2.5
	Toilet up hill water point	48	39.3
	No periodic disinfection	32	26.2
	Total	122	100
Did the water problem reported to the GWWR (gombore worede water resource) office	Yes	42	34.4
	No	80	65.6
	Total	122	100

4.5.3. Accessibility

4.5.3.1 Distance from the source to the household

Ensuring improved sources of water supply within a reasonable radius of collection fromresidence area result reduction of the time spent to collect water and allow females toparticipate in productive activities including education. In addition the amount of water used by household is affected by accessibility (WHO, 2011). Based on FGD, there were in average ofapproximately 82 households used one water point. As the researcher stay in a field observation, there were a crowded condition and increasing the time of waiting. The household survey indicates in (table 11), 38.5% of respondents travels**1000m to 1500m** to get water from the point, 32.7% travels 500m to 1000m, 16.39% travels more than 1500m and 13.9% travels below 50m . The average distance from the water point to the household was **750**m. However ,as the survey data shows the distance from water point to the household was more or less related with UAP of 1.5 k.m.

Table 11.The distance from household to the water points.

Distance in meter	No of respondents	Percentage(%)
Less than 50 0m	17	13.9
500m to 1000m	40	32.7
1000m to 1500m	47	38.5
Greater than 1500m	20	16.39
Total	122	100

4.5.3.2. Time spent to collect water per capita per day

UAP targets 30 minutes round trip time to collect water from improved source for rural Statistical dwellers (WIF, 2011). Based on Statistical analysis users spent an average of 50 minutes per capita per day (mpcd) for round trip including time of queue, which was greater than the national target for rural water supply. Maximum and minimum time spent was **50**(24.6%) mpcd and **15**(2.5%) mpcd respectively. Only (18%) of households meet the target set for time spent to collect water (30 minute round trip). (Figure 9).Based on field observation the increased in time spent to collect water is more related with time of queue due to increasing number of users and water shortage. The times spent to collect water for additional use beyond domestic purpose also have significant effect on average time spent mpcd.

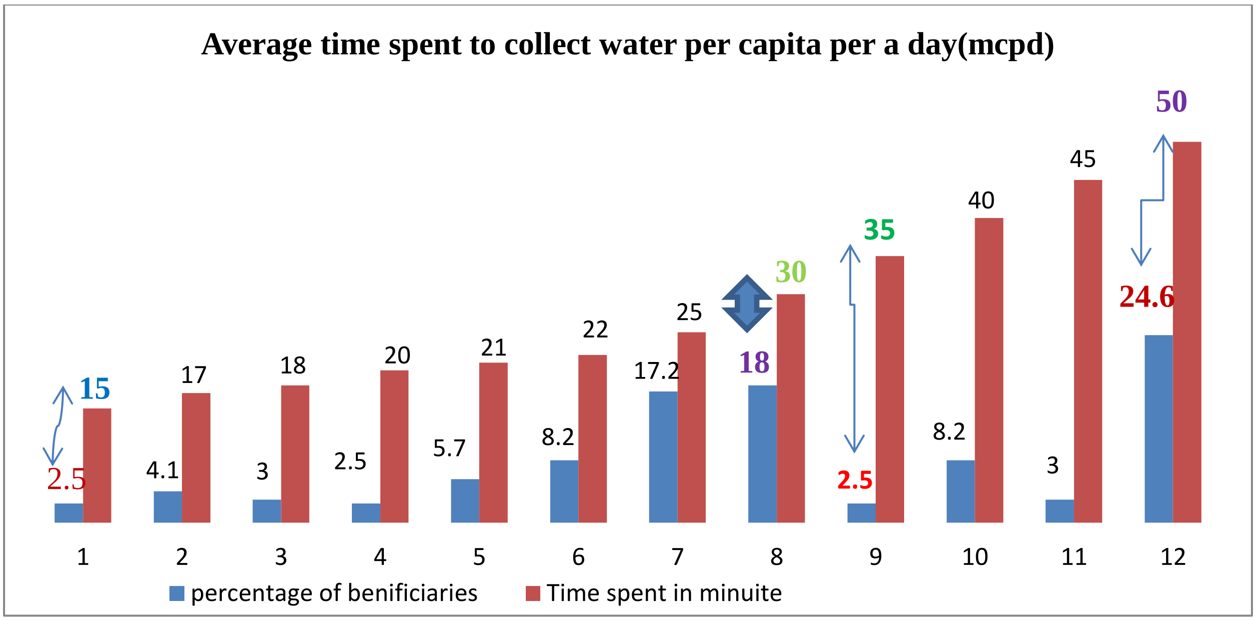

Figure 7.percentage distribution of average time spent to collect water per capita per day (round trip)

4.5.4. Service reliability

Water supply service reliability deals with the service provision in which beneficiary communities receive the designed service level without impairing of each indicator. According to SNV (2013), service reliability can be calculated as the number of months in a year the system serves the designed service level. For this study service reliability is measured using service interruption, water supply shortage and other proxies related with O& MM.

4.5.4.1. Service interruption

As indicated in the Table 12 , nearly 61percent of sampled beneficiaries answered there were service interruptions because of system failure (42.6%), drying of source (33.6%) or other reasons (23.7%). At the time of field visit most of on spot spring with some distribution line were not working because of break dawn of systems like (gonjoba, abo daje, and Maxine on spot springs) . Besides the problem with system failed, water service was interrupted due to lack of community cohesion. Some members of beneficiary households are willing to keep the water point during the night in rotation/shift and need to receive the service but part of beneficiary households do not agree.

Table 12: Water service interruption

Variables	Option	No,respondents	Percentage(%)
Service interruptions since the water point commissioned to the users.	Yes	74	60.6
	No	48	39.4
Average number of days in a year that the water supply interrupted	Less than 30 days	85	69.7
	30 to 90 days	27	22.13
	90 to 180 days	10	8.2
Cause for water service interruption	Drying of source	41	33.6
	System failure	52	42.6
	Others	29	23.7

4.5.4.2. Water shortage

The construction of water supply schemes were at the driest period March to May when the ground water table is low and thus, the well is supposed to yield enough water throughout the year. However, 54.1% of beneficiaries of most springs with distribution and borehole face serious water shortage problem during those periods (Table 13). In these periods beneficiaries face problems like, shortage of water for cattle watering (4.9%), limitation of domestic water consumption(46.72%) and travelling long distance(9.01 %) to collect water from unimproved source(4.10%), mostly a spring and/ or a river. 72.13 percent of beneficiaries having water shortage, access water from unimproved sources more than 30 minutes round trip time to collect water. This indicates that there are water potentials that can be possibly developed. As an intervention WASHCO members consulting with beneficiaries limit the amount of water to be offered for household during shortage. As per the information obtained from WASHCOs group discussion lack of cohesion between user communities and WASHCOs in CMP implementation kebeles, water points were completed before sufficient yield obtained. This indicates there is lack of appropriatesupervision by overseeing institution basically woreda water supply staffs.

.Interview with Gomberaworeda water supply coordinatorconfirm there are problems with supervisors who are responsible for supervision of sufficient well yield for targeted beneficiaries. The observation during the field work also showed that, staffs from the woreda water office were not fulfilling their responsibilities appropriately.

Woreda water supply staffs complain that the per dime rate given for woreda staff members by the government of Ethiopia and RWSEP/COWASH could not enable them to appropriatelyfulfill their duties. Besides the problem with supervision, population forecasting has not been done. According to COWASH project regional team leader population forecasting has not been done for currently implemented technologies (borehole and spring developments). On the other hand though the population forecasting has been done the population growth rate is over .

. WASHCO members informed in focused group discussions that water points were proving reliable service for the first 2 to 3 years after commissioned. But with time ground water table decreased which in turn affects the borehole yield and communities were forced to use unimproved sources for cooking and domestic hygiene and sanitation. Decrease in pressure, efficiency if fast moving items were not maintained on time, also decreases the yield of the borehole and drying of on spot spring.

Table -13.Water shortage from the source

Water shortage and its effect	Option	No, respondents	Percentage (%)
Water shortage from the water point	Yes	66	54.1
	No	56	45.9
Season then shortage of water from the water supply point encountered	Spring	122	100
	Other	0	0
Problems community face during water shortage from the water point	Shortage of water for cattle watering	6	4.92
	Limit their conception	57	46.72
	Travel long distance to collect water	11	9.01
	Forced to use unimproved Source	48	39.34

Alternative source of water supply during shortage of water	Improved source	3	2.45
	Unimproved source	5	4.10
	Spring	44	36.1
	River	70	57.3
Time spent for round trip to collect water from alternative source	Less than 30 minute	33	27.87
	More than 30 minute	88	72.13

According to interview Hadiya zone water, mine and energy technical manager, water shortage due to decrease in ground water table will be important factor until measurable impacts obtained from current watershed management activities. To improve problems of water shortage due seasonality, Zone and worede together, have been providing additional shallow wells and build up on spot spring development.

4.6 Determinant factors that affects the rural water supply scheme service level

The rural water supply schemeswas constrained by multiple factors related to socio-economic (community and financial), technical including (operation and maintenances), institutional and environmental factors.Each respondent of the KII from woredeWater resources development office pointed out those main problems of rural water supply schemes are multidimensional. They under lined the main problems as; "Weak coordination between different services delivery this is due to the current political crises of the country, weak capacity of the woreda in financial, in appropriate use of the existing schemes by the water committees, inappropriate technology, the water committees are weak and unable to operate the schemes. Gombora Woreda water resources development sectors are not equipped with adequate transportation equipment tool, lack of spare part

and official to provide and human resources the needed services and access majority of the population of rural area are very difficult due to weak infrastructure development such as road. Based on this the researcher conducted the survey to see the main problems that influence functionally of rural water supply schemes as follows.

4.6.1. Technical issue factors

Technical factors were related with technical skills needed operation and maintenance, selection of appropriate technology, accessibility and affordability of spare parts, design and construction quality of schemes. Use of Poor construction quality materials may lead to the failure of the water system before the end of its designed duration.

In table (14), 17.2% of beneficiary's responses the water supply scheme service level was affected by the lack of technical skill man power for operation and ,maintains . Approximately 24 % of respondents large number of households in one water points can also be came factors. A total of 2.5% the respondents indicated the main cause of non functionality of water supply schemes as poor construction, 33.6 % of the respondents mentioned that lack of adequate spare parts , 4.9 % Inappropriate technology/scheme type selection and 18 % Lack of support $ supervision from the WW offices.Spare parts and tools for community is also an important factor that contributes to the non- sustainability of rural water supply schemes, because the implication is a negative impact on sustainability of community water supply schemes.Thorsten II (2007) stated that without a reliable supply of spare parts and some qualified persons to repair and maintain the water supply, schemes will not be sustainable.In evaluating whether the local technicians were equipped with necessary materials to carryout repairs or not, from the total of 33.6 % of responses narrated that villager were unequipped with spare parts, to carryout repairs and maintenances. Due to that people forced to get water from unprotected water supply sources.

Table 14.technical factors of the rural water supply schemes service level.

No,	Technical issues(challenges)	No, respondents	Percentage(%)
1	Lack of technical skills for operation $ maintenance	21	17.2
2	In appropriate design or poor construction quality	3	2.5
3	Lack of support $ supervision from the WW offices	22	18.0
4	Large no of house hold using one water point	29	23.8

5	Lack of adequate spare parts of the schemes	**41**	**33.6**
6	Inappropriate technology/scheme type selection.	6	4.9
7	Total	122	100

4.6.2. Institutional issue factors

There is a great need to provide technical and managerial support by water implementing agencies to the rural communities specially, from the Woreda water sector to ensure the sustainability and continued the use of water supply scheme developed. Hence some of factors related to institutional support and management are described in detail as follows.One way of enhancing the sustainability of rural water supply schemes was the provision of institutional support to community management bodies by government staffs or NGOs and also problems that were beyond community level need to be addressed by supporting agencies. The presence of external support has to be in place once the water committee was formed and the provision of technical training and support for repairs has to be maintained in order to keep them encouraged and committed. In this case, the involvement of stakeholders that comprise NGOs and Governments would be very important (Jansz, 2011).

As for the kind of support given in table 15, from the implementing agencies; maintenance,spare part and technical assistance constitute 42%. Training, availability of spare part,maintenance and technical assistance represent 32 %, followed by 26 % of the total responses who have stated training, provision of spare parts, financial and technical assistance. The mean average support from the responsible institution in the study area was 33.3%. The survey data showed that 66.7% respondents of the household survey reported that the external support service given to the community from both government and NGOs to the effectively manage their water systems were inadequate.

Table 15.Governmental and non governmental supports of rural water supply schemes.

Response regarding to kind of support given to the RWSS	No, respondents	Percentage(%)
Maintenance, spare parts and other technical assistance	51	42
Training, spare parts, financial and technical assistance	32	26
Training, spare parts, maintenance and technical assistance	39	32
Total	122	100

4.6.3. The environmental issue factors of RWSS .

The yield of the rural water supply schemes have to be proportional to the number of beneficiaries and were an important thing for the reliability of water supply scheme service. Respondents reported that inadequacy of water in the community was also the result with non-functionality problems.Participants of **FGD** from the water committee and KII from the Woreda indicated that majority of the water supply schemes in the community were inadequate due to increase in the number of beneficiaries, shortage of water during dry season, inadequate depth excavation and pump failure but operation and maintenance lack of available spare part, lack of community ownership, and lack of good water committees are the major.Concerning on the water suitability and safety of the study in the table 16, 65.6 % of respondents have indicated that the water supply sources is insufficient to the beneficiary ,21.3 % beneficiaries reportedwater supply sources is sufficient to the beneficiary and the remaining 13.1 % they don't know the water supply sources is sufficient to the beneficiary.

Table 16. Evaluating existing water supply schemes were sufficient to the community or not.

Is the existed water source is sufficient ?	No, respondents	Percentage(%)
Yes	26	21.3
No	80	65.6
I do not know	16	13.1
Total	122	100

From table 16, 46.7% of respondents showed that there is existence of drainage which filled with mud, based on 32.8% of beneficiaries there were a drainage in good condition and 20.1% responses there is no existence of drainage. 30.3% respondents showed the surrounding of the water supply schemes were clean, 24.6 % showed the surrounding of the water source were not clean and 45.5% respondents showed there were somewhat surrounding of the water source were clean and some of them were not clean. 59.8% beneficiary response showed, there is no catchment rehabilitation. As a researcher stay in a field observation and discussion with WASHCOs the condition and existence of drainage facility half percent sampled schemes don't have drainage problems and other percentages are under the condition of drainage problems.

Table 17. Environmental condition for the rural water supply schemes

Conditions	Status	No, of respondents	Percentage (%)
Conditions and existence of drainage	Good	40	32.8
	Filled with mud	57	46.7
	Does not exist	25	20.1
	Total	122	100
Surrounding of water supply source	Clean	37	30.3
	Not clean	30	24.6
	Somewhat clean	55	45.1
	Total	122	100
Catchment rehabilitation	Yes	49	40.2
	No	73	59.8
	Total	122	60

4.6.4. Community issue factors of rural water supply scheme service.

The selection of type of technology should consider the availability of spare parts and the socio economic situation of the community. Communities should participate in the selection of the technology, in order to operate and maintain the technology at the village level by the communities themselves. Community's participation during and after project implementation is a keyfactors of sustainability and has a great role in the development of improved water schemes as it is believed to increase the sense of ownership. Community to make informed decision for the water supply scheme to be develops citation. Where this phase includes site selection, type of water supply technology, their role and responsibility in contribution and follows up.User's involvement in every phase of local water supply development and contribution to their power in the construction, operation, and maintenances is very important for to sustainability of the schemes. With regard to community participation in the water supply development , the findings shown only 6.6 % were actively participated in planning stages of schemes development, 41.8 % actively participated during the construction phase,that 29.5 % of the sample households had participated in post constructions,22.1 % respondents actively participated during and post construction managements aspects of the schemes.This survey data showed that there is high level of community participation during the construction. However, majority of the users did not participate adequately especially during planning phases which was the more important phase. Means local communities" knowledge through their experiences were not considered in the planning phases, which can have impact on sustainability.

Table 18.Distribution of community participants in scheme developing stages

Stages of community participation	No, respondents	Percentage(%)
Planning	8	6.6
During construction	51	41.8
Post –construction	36	29.5
In both during and post construction	27	22.1
Total	122	100

Survey results shown in figure 8, that9 % contributed projects development through contribution of labor, while 15 % indicated contributions in the supply of local materials (such as stone During & post constructionsupplying, sand, wood), 12 % contributions were though cost sharing by supply of cash (money). Only 10% respondents mentioned that community participation in the site selections ,35 % contributions were though Labor, money local material, and 40% contributions were though Labor, money local material and information.

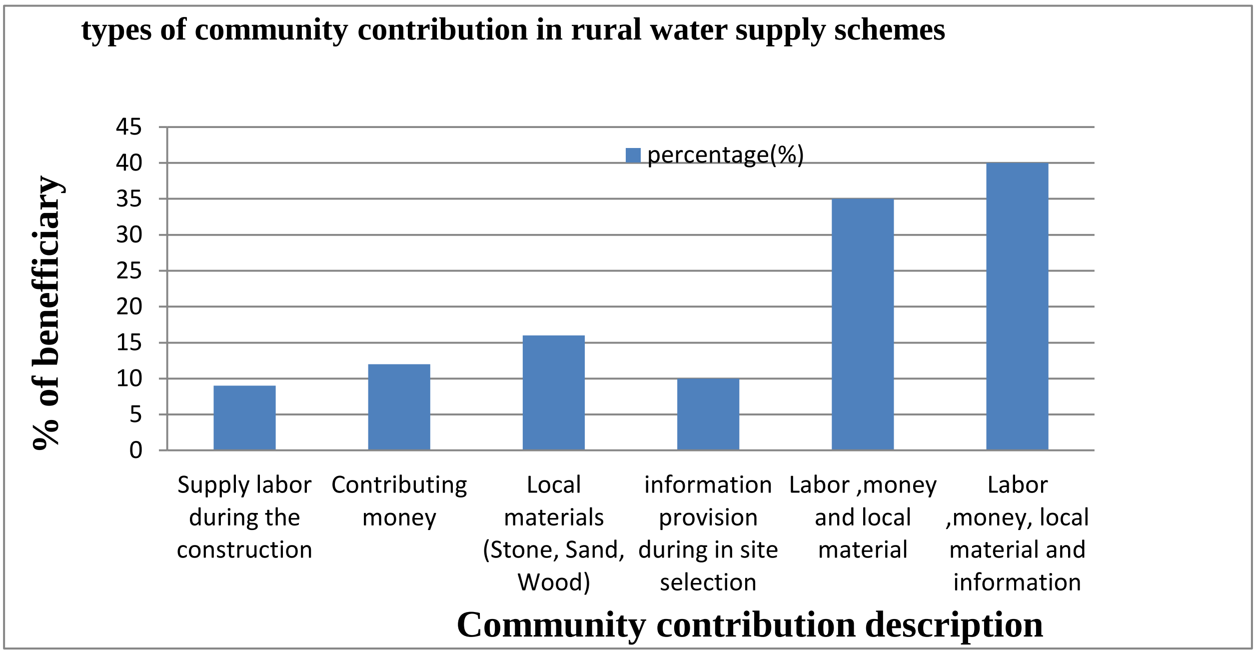

Figure 8. Types of community contribution in rural water supply scheme service.

From figure 9, it can be concluded that there is high level of community participation contributions during supply of Labor, money local material and information mostly during the construction phase.. The participants of KII reported user's contribution as unskilled labor, local malarial like:- stone, wood, sand, from the initial to the end of the construction but most of the time site is selection did not include none of the community parts. Water supply schemes will be more sustainable if they are managed by users themselves than by external agencies because communities arecloser to the schemes than external agencies especially female was closer than male. If the communities are not capable of managing the schemes there is need to strength their capacities and willingness to take ownership and responsibility of managing their water supply systems by taking adequate training on technical, financial and overall management of the systems as well as accessed to external supports. Rural water supply schemes were managed by the communities through elected water management committees or WaSHCOs, whose members were mainly of which about two or more women.

During households survey in figure 9, to evaluated the sense of ownership of the community17% of the households believe that developed water points belongs to the community, 25% reported that it belong to government and community, 48 % respondents indicated that the existing water supply schemes belongs to the government, while the remaining 10 % belongs to they don't know to whom the water point belongs (figure 9).

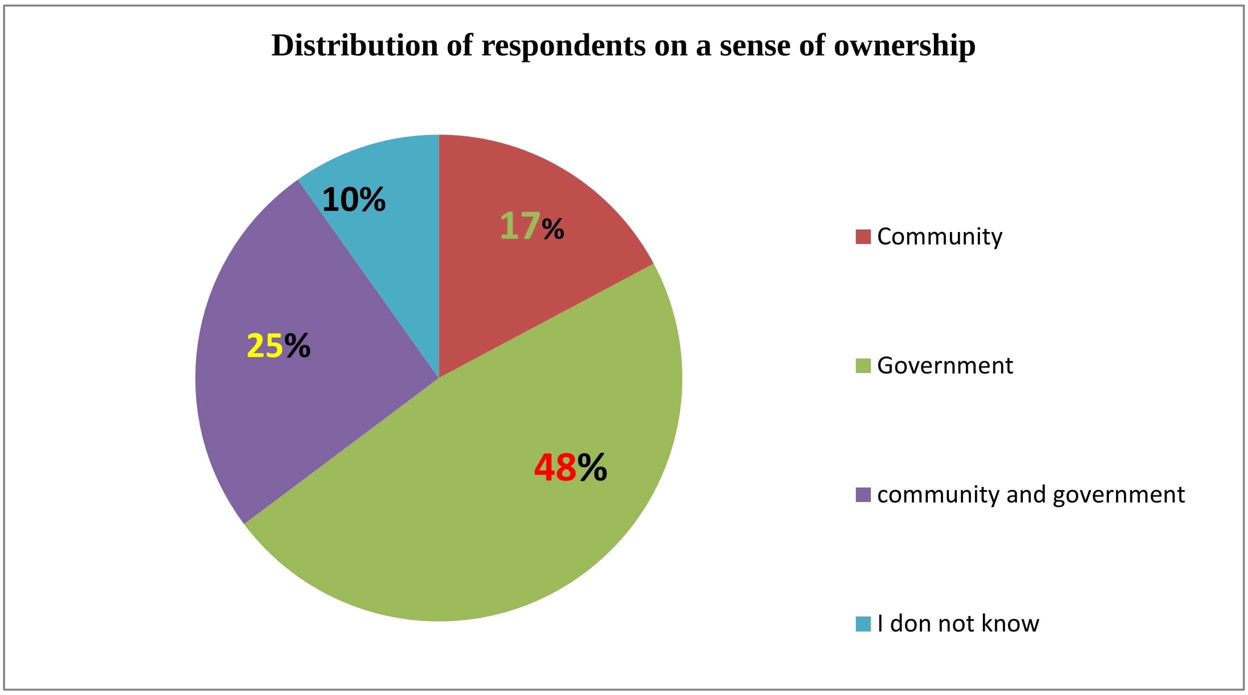

Figure 9. Distribution of respondents on the senses of ownership

4.6.5. Financial management issue factors.

Financial management is one of the many areas where issues relating to community participation and water supply system sustainability highly linked.Willingness to pay is essentially the maximum amount of money that beneficiaries are willing to pay for a service. According to Seraj (2008), in the design of a tariff structure, it is essential to match households willingness to pay with their ability to pay. Ability to pay is purely a financial phenomenon that is derived from income or expenditure information of households and helps in determining the optimal tariff structure of a service. Ability to pay is primarily a function of income and cost of living, which in turn is a function of employment(Brikkeet al., 2003).If improved water supply schemes were to be managed properly and make the benefits sustainable, beneficiaries are expected to cover at least cost of operation and maintenances. Tafesse (2008), clearly indicates that provision of drinking water supply in urban areas are based on the principle of total cost recovery programs while rural water supplies are based on the principles of covering costs of operation and maintenances .

A total of 58 % households did not pay any fee for the using water,12% household did pay fee of service in a monthly contribution and 30% households did pay fee at a time of fetching water (table 19). Among the total respondents 51 % reported that they were fair agreed by the water charges, 34% stated that the existing water fee is not fair and the remaining 15 % in difference. As a FGD result showed more than half of the user communities were used water without paying fee of service.

Table 19. Distribution of Respondents' on the perceive of water services fee

Situation of service fee		No, of respondents	percent
How do you perceive the existing schemes services fee	Fair	62	51
	Not fair	42	34
	I do not know	18	15
	Total	122	100
Interval of paying water services fee	Monthly contribution	15	12
	At a time of fetching	36	30
	Do not pay fee to the service	71	58
	Total	122	100

As indicated in figure 19, a total of 21% respondents have reasoned out the payment of water fee in line with covering operation and maintenance cost, 39 % of the total have associated their payment of water fee in terms of covering operation and maintenance cost and salary of guard. While those respondents which represent 18 % of the total sample used to have understood their payment of water fee in association to salary of guard and 23 % of the total respondent reported that service fee collected were used for cost of technician, water attendant and for minor repair.

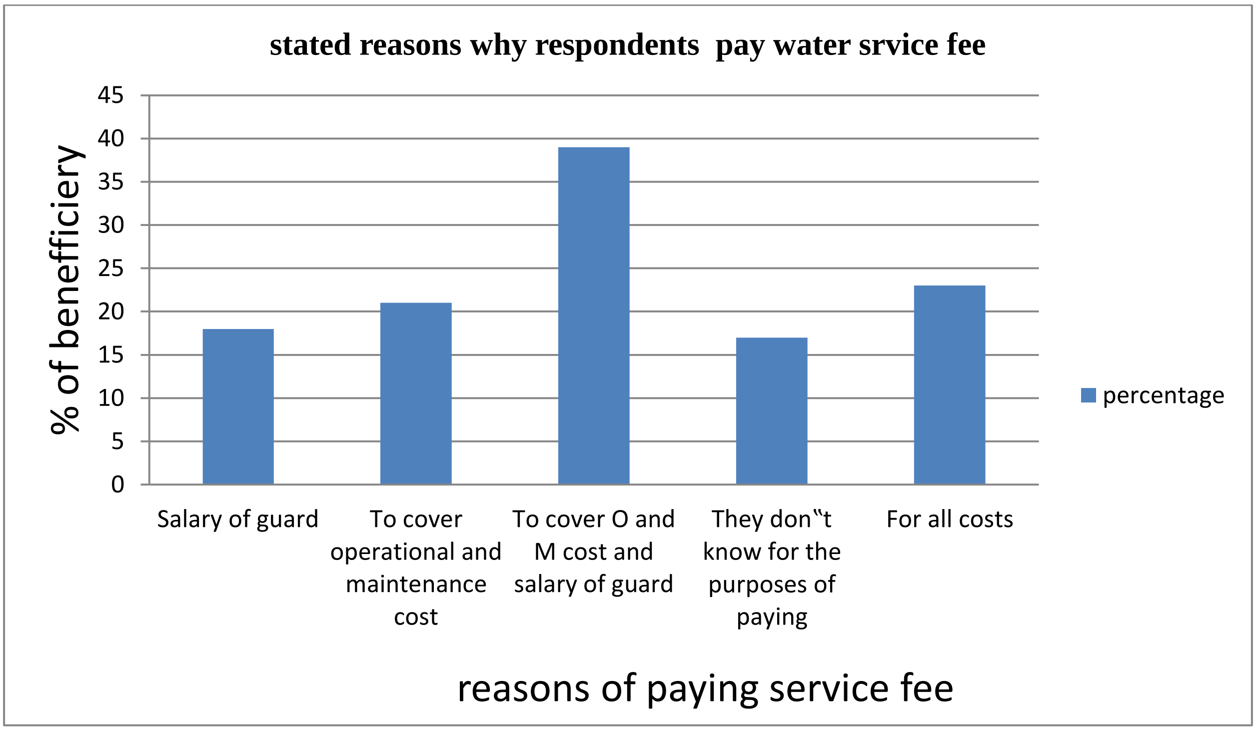

Figure10. Stated Reasons Why Respondents pay water fee.

A total of 35 % respondents informed that the service fee rate set by the community through water committee, 39% out of the total respondents were informed that water services fee was set by water committee, only15% of respondents belied that water services fee was set and managed by the government and the left 11 % they didn't know who set services fee and manage the schemes as shown (table 20).

Table 20.who is responsible to set and manages water services fees

Who manage water services fee	No , respondent	Percentage
Water committee	47	39
Community	43	35
we don't know	13	11
Government	19	15
Total	122	100

Surveys were conducted of households and members of the water committee in a sample of three kebeles shows that greater than 11.4 % of the respondents were satisfied with water supply systems, 30 % of the respondents revealed the water supply system were fairly satisfied and 42% and 16.4 % of the respondents they were poorly satisfied and very poorly satisfied respectively with the discharge, amount of water, test, number of hours water is available, and on the waiting time they spent to fetch water (Figure 11).

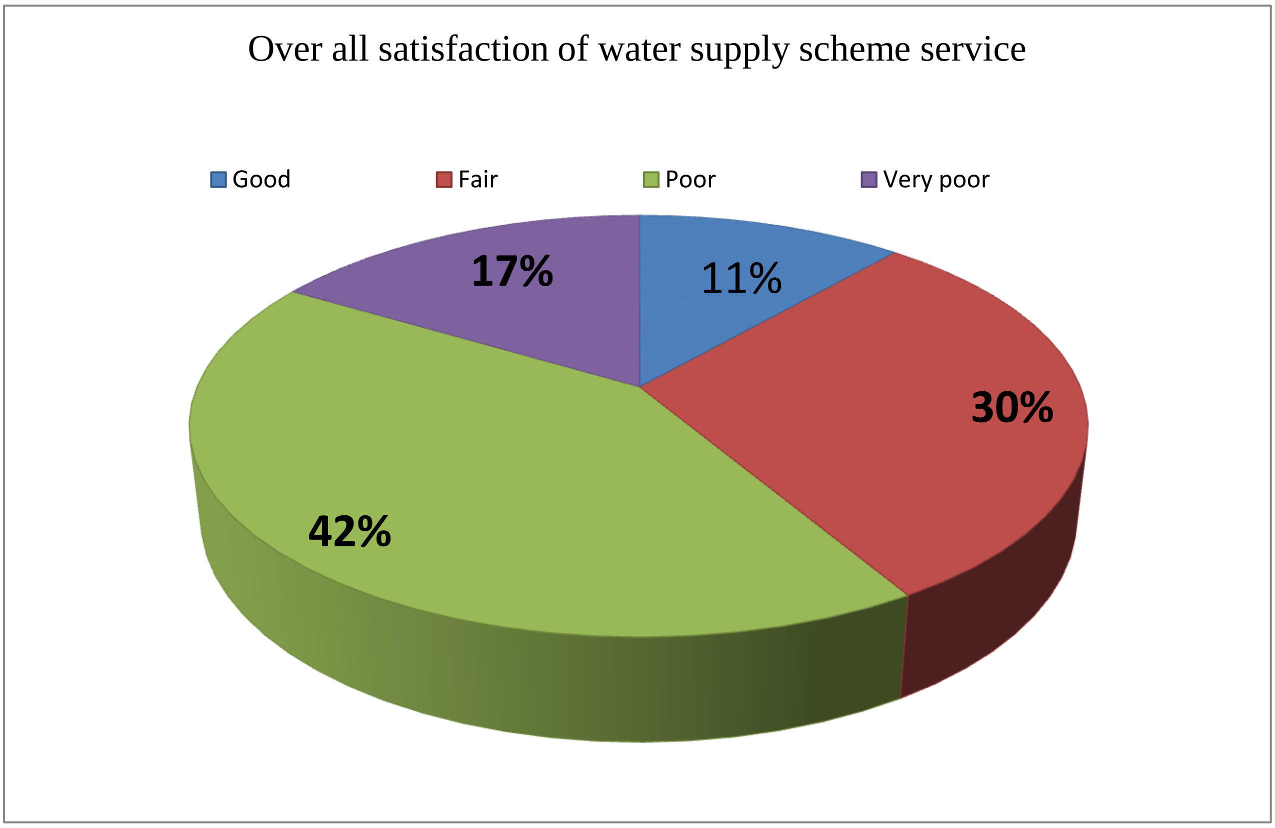

Figure 11.Overall satisfaction of water supply schemes.

4.7. Measuringservice level of water supply schemes using sub-indicators

Sub-Indicators of water scheme service level: These indicators to aggregate from rural water supply service level factors these are technical, institutional, financial environmental and community issue factors.

4.7.1. Physical condition

Physical condition scores were based on a series of 10 questions from the technical questionnaire. The study involved 10 questions regarding rural water systems. The physical condition indicator measures the overall functionality of the water system and construction quality. A perfect physical condition score indicates that a water system was free of Contamination and has high quality construction without visible defects in the water supply schemes. Construction quality: Overall construction quality was evaluated by a survey researcher and data collectors following a full inspection of the water system.

4.7. 2. Operations and maintenance

Data for this sub-indicator was based on 10 questions from the technical assessment and interviews with the water committee, included Artisans. The Operation maintenance score measures how well a community is performing on the institutional and organizational aspects of system maintenance. A perfect score indicated the community has a trained system operator, who was hired based on ability and knows how to perform basic maintenance procedures. The operator must have access to tools, spare parts, manuals, and blueprints for the system, and know where to get help for major repairs.

Finally, a perfect scoring community will not have experienced a decrease in water flow since the construction of the system, and must have sufficient water flow to meet community needs.

4.7.3. Consumer Satisfaction

Consumer satisfaction data was based on answers to 10 questions from the household surveys.

The score for the community represents the average score of each of the 10 households surveyed

In each community. For a community to receive a score of 10, all members of the community would have to rate their service as good. They would be satisfied with their water discharge,water available, and the quantity, color and taste of the water. They would no longer use other sources of water, and would report increased water consumption and use of water fornew purposes.

4.7.4Willingness and ownership

This indicator gauges to measure popular support for sustaining the water system. Scores are based on 10 questions from the household questionnaire. The indicator measures the degree to which community members feel responsible for maintaining their water system. A perfect score in this category would mean all members of the community believe that the water system belongs to them. Community members would express satisfaction with the management of the system and willingness and ownership -to-pay monthly fees for service. In addition, people would expect the community to finance future maintenance, repair, and system replacement.

4.7.5. Financial Management

Data on financial management was based on 10 questions from the technical assessment, water

committees, WaSHCOs. Surveyors obtained this information from a review of each community's financial records and interviews with the water committee and treasurer. The study found basic financial management of water systems including tariff collection and savings to be generally low.

Table 21. Scores for each-sub indicator of service level and score for over all service level of RWSS

Name of water point.	**Sub-indicators of water supply schemes service level.**					
	Financial management	Physical condition	Operation and maintenance	Customer satisfaction	Willingness and ownership	Average scores in each WP
WP1	2.5	2	1	1.5	4	2.2
WP2	2.	1.5	1.5	2.5	3	2.1
WP3	1.5	2.5	3	5	3.5	3.1
WP4	1.5	2.6	3	4	4.5	3.1
WP5	3.5	2.5	3	3	3.5	3.1
WP6	4	3.5	3	2	3.5	3.2
WP7	4.5	5	3	3	3.5	3.8
WP8	1.	2	1	3.5	3	2.3
WP9	2	2	1.5	2	3	2.1

WP10	1.5	2	1	3	2	1.9
WP11	2	3	1.5	2.5	2	2.2
WP12	1.5	2	1	2	2	1.7
WP13	2	4.5	3	5	2.5	3.4
WP14	2	4	3	5	3	3.4
WP15	2	4.5	3	5	3.5	3.6
WP16	2	5	3	5	2.5	3.5
WP17	2.5	4	3	5	2.5	3.4
WP18	2	3	3.5	5	3	3.3
Average	2.05	3.08	2.3	3.5	3.00	3.8
	Over all sustainability (2.05+3.08+2.3+3.5+3.00)/5=13.93/5=**2.78**					

Service level excellent (overall service level score of >**7.6**), very good service level (overall service level score between **5.1 – 7.5),** have good service level(overall service level between 2.6 -5.00),have fair service level(overall service level in between 1.00-2.5) and not fair (overall service level<1).

A. Overall service level Scores

Overall service level is total capacity of schemes to continue to deliver its intended benefits over a given period of time. The overall score for service level in each community was an average of the five sub-indicators. The average service level score across projects was **2.78.** This score indicated that the projects were performing good on only 45.8% of the technical, institutional, financial, environmental, and social aspects. As indicated in table 21 the scores for each sub-indicator of service level and the score for overall service level that the sub-indicator scores were fairly consistent within schemes. In other words, a scheme with high scores in overall service level usually has high scores in most of the sub-indicator categories as well. Those projects that score not fair on overallservice level tend to score below average in all categories.

Generally from the study we know that the most influencer sub-indicator in overall service level estimation was willingness and ownership but the lowest influencer sub- indicators were also physical factors in the study area.

B. Excellent and very good scheme service level

As shown in table 21, there is noservice level schemes have received a higher score (>5.1)for

all five sub-indicators and overall service level. The sub indicators of willingness and ownership were community perception on tariff level, ownership, financial capacity of the community to increase service levelof the system, willingness to pay for improvements all are poor status.

C. Potentially goodservice levelschemes:-

Among 18 sampled water supply schemes 11(61%) of them were potentially good service level, most of the water Potentially good supplyservice level schemes of the water supply schemes were have good physical conditions and few of them have good customers satisfaction but financial management of potentially service level schemes were not good except in a few schemes which have not considered any criteria for tariff setting .

D. Fairservice levelschemes :-

As indicated in table 21, a total of sampled water supply schemes 7(39 %) of them were have fairservice level in financial management, willingness and ownership and operation and maintenance which have not considered any criteria for tariff setting and charging the same fee from each and every beneficiary over a long period of times. Capacity oftreasurers was very low and accounts were not maintained properly. Committee members admitted the low financial capacity to maintain the system. Continuous assessment and provision of training to upgrade their performance are needed for such rural schemes and willingness and ownership to increase service level the schemes which have not considered. Assesses community support for service level of the water system. Questions include community perception on tariff level ownership financial capacity of the community to increaseservice level of the system, willingness to pay for improvements Consumer satisfaction score was the lowest in some water supply scheme among 18 water supplies where water supply has stopped working at the time of survey, due to Lack of Good management. The community based scheme has tried to practice intermittent water supply, but community was not satisfied with water discharges, quality and quantity. Physical conditions and operation and maintenance practices are fairly good with a well-organized, strong community based.

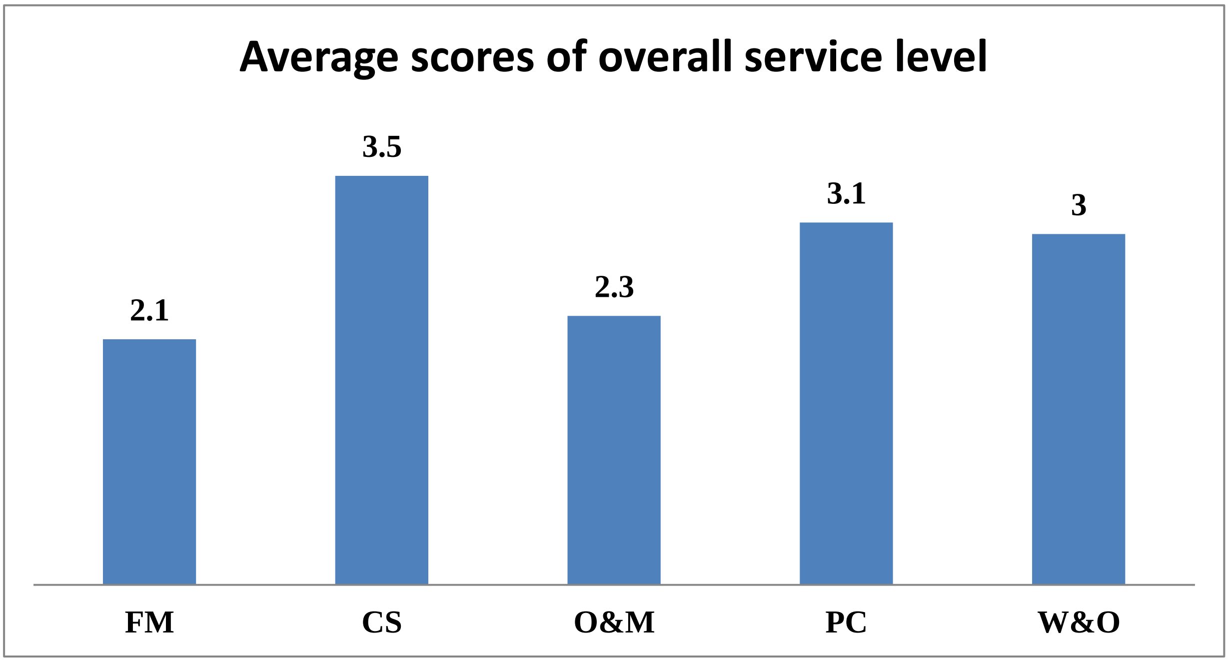

Figure 12.Average scores of sub-indicators distribution in the study Area.

Where, FM=financial management, O&M=operation and maintenance, CS=consumer satisfaction, W&O=willingness and ownership, PC= physical condition and average overall service level.

4.8. Correlations ofservice level factors

Correlation is a measure of the linear relationship between two variables to obtain a correlation in SPSS. The correlation coefficient indicates what percentage of the movement of the service level score can be attributed to changes in the variable in question, when all other variables are held constant. The bivariate correlation is for situations where you are interested only in the relationship between two variables. The partial correlation measures an association between two variables with the effects of one or more other variables factored out.

4.9. Correlation coefficient Interpretation

Correlation refers to a technique used to measure the relationship between two or more variables. When two things are correlated, it means that they vary together. Positive correlation means that high scores on one variable is associated with high scores on the other, and that low scores on one is associated with low scores on the other. Negative correlation, on the other hand, means that high scores on the first thing are associated with low scores on the second. Negative correlation also means that low scores on the first are associated with high scores on the other variables.

Pearson Correlation – This is the correlation between the two variables (one listed in the row, the other in the column). It is interpreted just as the correlations in the previous discussions.

Sig. (2-tailed) – This is the p-value associated with the correlation. The footnote under the correlation table explains what the single and double asterisks signify.

Table 22. Pearson Product Moment Correlations sub indicators of service level

		FM	PC	O&M	CS	W&O
FM	Pearson Correlation	1	.412	.389	-.268	.291
	Sig. (2-tailed)		.089	.110	.281	.241
	N	18	18	18	18	18
PC	Pearson Correlation	.412	1	.697**	.581*	-.029
	Sig. (2-tailed)	.089		.001	.011	.909
	N	18	18	18	18	18
O&M	Pearson Correlation	.389	.697**	1	.698**	.345
	Sig. (2-tailed)	.110	.001		.001	.161
	N	18	18	18	18	18
CS	Pearson Correlation	-.268	.581*	.698**	1	-.018
	Sig. (2-tailed)	.281	.011	.001		.944
	N	18	18	18	18	18
W&O	Pearson Correlation	.291	-.029	.345	-.018	1
	Sig. (2-tailed)	.241	.909	.161	.944	
	N	18	18	18	18	18

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

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

Where, PC =physical conditions, CS = customer satisfaction, FM =financial management,

OM =operation and maintenance and W&O =willingness and ownerships.

The correlations table 22,displays Pearson correlation coefficients, significance values, and the number of cases with non-missing values (N). The values of the correlation coefficient range from -1 to 1. The sign of the correlation coefficient indicates the direction of the relationship (positive or negative). The absolute value of the correlation coefficient indicates the strength, with larger absolute values indicating stronger relationships. The correlation coefficients on the main diagonal are always 1, because each variable has a perfect positive linear relationship with itself. The significance of each correlation coefficient is also displayed in the correlation table. The significance level (or p-value) is the probability of obtaining results as extreme as the one observed. If the significance level is very small (less than 0.05) then the correlation is significant and the two variables are linearly related. If the significance level is relatively large (for example, 0.50) then the

correlation is not significant and the two variables are not linearly related.

From the above Table22,the researcher can conclude that the relationship of financial management and physical conditions shows that they have a positive correlation of **0.412** in between them.(i.e., asfinancial management went up physical condition alsowent up) and that this relationship was at significant level of the **0.089** level. The relationships of financial management and operation and maintenance have a positive correlation of 0.389.(i. e as the first one increase ,the second is also increase) , the relationship was significant at 0.110 level. The relationships of financial management and consumer satisfaction have a negative correlation of -0.268. the relation ship was significant at the level of 0.281. The relationships of financial management and willingness and ownership have a positive correlation of 0.291 with statistical significant level of 0.241 . The relation ship of physical condition and operation and maintenance have a positive correlation of 0 .697 and the relationship was linearly related statistically significant at 0.001 level. The relation ship of physical condition and consumer satisfaction have a positive correlation of 0.581 and the relationship was statistically significant at 0.01 level.The physical condition withwillingness and ownership have anegative correlation of -0 .029 and the relationship was statistically significant at level 0.909. The operation and maintenance with consumer satisfaction have a positive correlation of 0.698 and they were statistically significant at 0.001 and they were linearly related.The operation and maintenance with willingness and ownership have a positive correlation of 0.345and they were statistically significant at 0.161.Consumer satisfaction with willingness and ownership have a negative correlation of -0.018 and their relation ships were at the statistically significant level of 0. 944.

Table 23. The relationship of sub indicators each other

Sub indicators	Sub indicators	Correlation coefficient	Interpretation
1, Physical conditions	F M	0.412	Positively correlated
	CS	0.581	Positively correlated
	O &M	0.697	Positively correlated
	WO	-0.029	negatively correlated
2, Financial management	PC	0.412	Positively correlated
	O &M	0.389	Positively correlated
	CS	-0.268	Negatively correlated
	WO	0.291	Positively correlated
3,Consumer satisfaction	FM	-0.268	Negatively correlated
	O&M	0.698	Positively correlated
	PC	0.581	Positively correlated
	WO	-0.018	Negatively correlated
4,Operation and maintenance	FM	0.389	Positively correlated
	CS	0.698	Positively correlated
	PC	0.697	Positively correlated
	WO	0.345	Positively correlated
5,Willingness&ownership	FM	-0.268	Negatively correlated
	O&M	0.345	Positively correlated
	CS	-0.018	Positively correlated
	PC	-0.029	Negatively correlated

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

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

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

In this study, the water supply scheme service level of rural water supplyschemes in Gombora woreda has been evaluated using water quantity, quality, accessibility and reliability indicators. Determinant factors affecting the functionality and level of service were identified.

Based on the household survey, 42.6% of the sample households had **6**family members per household. It show that the Size of the family of households is one of the factors that determine the amount of water offered and number of water points to be constructed. From 25 randomly selected water points, 28% were not functional for last four years. The factor for non-functionality of water points were GO,NGO and user community management problem to maintain.

In terms of water quantity : in gombora worede there were **67** rural water supply schemes but the population in the worede were 110,877 (CSA2013).This show that the coverage of water point in the study area is 1 water point to 1,654 people or 1to 275 households. But in the case of the study area the coverage was one water point to the 82 households.Based on the household survey the mean average daily water collection from the water point per household was found to be **60**litresThe mean average per capital **usage**of water collection from a water point was **13** lpcd. Which is less than from UAP.(15 lpcd) because of Socio-economic data showed ,family size did not consider during the time of construction of water points in the study area.The higher per capita water usage (20 lpcd) indicates communities need water for other purposes .Beyond domestic water requirement like animal watering (24.6%), cloth washing (41%) and gardening (2.5%).Therefore during the designing water required for other purposes particularly animals did notconsidered unless alternative accessible sources were not available. Though implementers inform users to apply the service level they need at the project inception (all key informant interviews) it did not become effective so far. The researcher experienced during his stay in the field that communities are not able to identify basic components of water requirement. Most of the water points were not fenced. Due to theses reason most water points were exposed to biological infection, erosion and break dawn of spare parts.

In terms of water quality : chemical, bacteriological and physical water quality laboratory test was done in Hadiya zone water, mine and energy laboratory class by the researcher him self . The result showed that all the **chemical analysis**results were **bellow** the WHO guide line standards. Interms of chemical water quality, the evaluation result was in good condition.

The result of **bacteriological analysis**showed that majority (75%) the water points had detectable levels of total coliform (4 to 41 cfu) , 25% of the water points that fecal coliform bacteria were detected (0 to 30 cfu) and none of the sampled water points were free from both fecal and total coliform. Only 13 water points were found to be free from fecal type of coliform bacteria. The result indicated that bacteriological water quality was concerned in this area and any measurement were not taken by the concerned body to avoid this much of bacteria. The result may affect the user's health and made them to travel long distance to find other safe water sources.According to the biological test report, the evaluation result was not in good condition.

The result of **physical water quality analysis**showed that quality parameters (conductivity, total dissolved solids (TDS), pH, turbidity and temperature), that were considered to have an effect on the Physical Water quality of water for use were determined. However, the results showed that most of the measured values of these parameters were within the WHO guidelines for drinking water quality (WHO, 2004)except the turbidity and ph value of some water points. based on aesthetic and taste considerations except the pH value of the water points (gonjoba,aboi daje and woi dabara on-spot spring) was **9.6,9.09and8.73respectively . which were above the who** guidelines for drinking water quality (WHO, 2004 **standards.** Based on Communities perception and field observationduring the inspection of water schemes the other type of physical water quality(test, color and odor) of visited water points were found most are good except gonjoba on spot spring water point has the coulor change.besides the inspection household survey were conducted on community's perception on the quality of water they fetch from the water point.According to the interview of hadiya zone and gombora worede water resource sector , except two borehole(olawicho and gubucho) out of 67 water supply schemes none of them were tested either phyisio-chemical or bacteriological laboratory test analysis. This showed that the government did not give the priority for the drinking water quality.

In terms of accessibility: the household survey result showed that the average distance from the beneficiary to the water point was 750m(0.75 km). Based on Statistical analysis users spent an average of **50** minutes per capita per day (mpcd) for round trip including time of queue, which was greater than the national target for rural water supply(30 minutes). As the researcher stay on field observation the increased in time spent to collect water was more related with time of queue due to water shortage and crowded of beneficiaries. The result of accessibility showed that the community needs more water supply schemes with in short distance as much as possible.

In terms of service reliability :nearly 61% of sampled beneficiaries answered there were service interruptions because of system failure , drying of source or other reasons . At the result of that the water points were opened 3 days in a week for users. At the time of field visit some of on spot spring with some distribution line were not working because of break dawn of systems. Besides the problem with system failer , water service was interrupted due to lack of community cohesion.

54.1% of beneficiaries of most springs with distribution and borehole face serious water shortage problem during dries period. In these periods beneficiaries face problems like, shortage of water for cattle watering , limitation of domestic water consumption. During the field observation, it was takes at least 4 up to 5 minutes to fill one jerkin(20 liters). This showed that the water point have no water power . At the result of water shortage, communities forced to travelling long distance more than 30 minutes to collect water from unimproved sourceor a river.This indicates that there are water potentials that can be possibly developed. Finally the service reliability indicator show that there are lack of cohesion, supper ion, forecasting of people and woreda water office were not fulfilling their responsibilities appropriately.

Generally the factors that affect the rural water supply scheme service level are summarized as :

- ✓ Design problem(water depth, population forecasting and picking factor for water loss)
- ✓ Lack of community cohesion during construction.
- ✓ Poor monitoring andsupervision of worede staffs during construction.
- ✓ No consideration of other uses of water beyond domestic purpose.
- ✓ Lack of training on going running costs.
- ✓ Provision of water points though it does not yield sufficient water.
- ✓ Lack of water quality in chemical and biological analysis.

5.2. Recommendations

Based on the research finding the following recommendations are drawn to achieve ruralwater supply schemes service levelquality set by the Universal Access Plan:

- All the responsible bodies including communities should be give priority for the non functional water supply schemes to repair in stead of constructing new water points.

- At the designing stage of rural water supply schemes there should be appropriate **population forecasting**, Consideration of water **usage** beyond domestic purpose and otherappropriate picking factor should be considered.

- During designing the probable number of youth in the beneficiary communities whowill got marriage and establish house should be considered.
- For community management model to be effective, clear guidelines and regulations should be established on the extent of operation and maintenance activities that shouldbe covered by beneficiary communities.
- The government with the co-ordination of community and non –government organizations should be construct alternative water supply schemes to avoid water service shortage and crowdedness.
- To decrease water quality problem the worede water supply sector should be check physical, chemical and biological laboratory tests and should be take a measure on a detected water points .
- For operation and maintenance activities, clear guidelines and regulations should be given for the user community .
- The government should create the awareness and ownership among the user community for the sustainability of rural water supply schemes scheme service level.
- Monitoring and supervision by woreda water supply sector staffs should be increased to avoid the shortage and interruption of water service level.
- Activities done by communities in study area to cover theoperation and maintenance cost should be strengthened and scaled up.
- . Based on theinterview with Gomberaworeda water supply coordinator communities collect poorquality construction materials which in turn affect the quality of construction.Therefore, appropriate supervision should be strengthened during construction.
- Spare part supply chain is one of the factors that determine the water pointfunctionality. In the woreda there is no well stoked private or government spare partsupplier. There are private owned construction material shops but they have not spareparts for water supply schemes due to the fact that the spare parts are not availablealone on the market. Therefore government

should work giving special attention oneither option for spare part importing or means to fabricate by local metal industrieslike defense engineering.

- Water supply service needs to be measurablebeyond plans and reports on its achievement. Therefore, further studies recommended to:
  - ✓ Evaluatecommunitieseconomiccharacteristicsandappropriatefinancingmechanisms for ongoing O&M with in a specific community,
  - ✓ Track possible factors that affect rural water supply schemes service level for a set of technology options and set basic and measurable indicatorsof service level and
  - ✓ Evaluate water supply service quality across various areas, approaches,technology options, and socio-cultural settings.

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Appendix

A. Household Interview Questionnaires

1. Name of interviewer____
2. Date of interview____
3. Name of kebele and Village. ____________________

Part 1. Demographic and Socio-Economic characteristics of the respondents

1.1 Sex of respondent A. Male………… B. Female……………..

1.2 Age of respondent(use √)

[ ] 25 -35 [ ] 36-45

[ ] 46-55 [ ] 56 and above

1. 3. Educational ……….?

[ ] No formal education [ ] Primary school(1-8)

[ ] Secondary school(9-12) [ ] Diploma and above

1.4. What are the main sources of income to sustain the livelihood for the family?

[ ] Government employ [ ] Farming [ ] Trading {4} Daily labour

1.5 . How much numbers are in your family ?

[ ] 1-4 [ ] 5 -7 [ ] 8 -10. [ ] 11 and above.

Part 2: Water service level(quality ,quality, accessibility ,community perception and reliability)Current Water Situation.

2.1. How many jerkins of water do you get from water point in a day ?

[ ] 2 jerkins. [ ] 3 jerkins. [ ] 4 jerkins. [ ] 5jerkins. [ ] 6jerkins.

2.2. Do you use additional water from water point other than drinking purpose ?

Water use	No of respondents		percentage	
	Yes	No	Yes	No
Animal watering				
Gardening				
Washing cloth				

2.2. Communities perception on water quality

Variable	Option
Is there water quality problem	Yes
	No

Types of water quality problem	Turbidity [ ]
	Test [ ]
	Color [ ]
	Odor [ ]
	Temperature [ ]
Season of water quality problem occur	Summer [ ]
	Winter [ ]
	Year round [ ]
Causes of water quality problem	Water shortage [ ]
	Cracks [ ]
	Site selection [ ]
	Toilet up hill water point [ ]
	No periodic disinfection [ ]
Did the water problem reported to the GWWR (gombore worede water resource) office	Yes
	No

2.3. Time you take for the round trip to collect water including waiting time from the water point? Minute---------------

2.4. Water service interruption

Variables	option
Service interruptions since the water point commissioned to the users?	Yes [ ]
	No [ ]
If you say yes, average number of days in a year that the water supply interrupted are:-	Less than 30 days [ ]
	30 to 90 days [ ]
	90 to 180 days [ ]
Cause for water service interruption	Drying of source [ ]
	System failure [ ]
	Others [ ]

2.5. Water shortage from the source.

Water shortage and its effect	Option
Water shortage from the water point	Yes
	No
Season then shortage of water from the water supply point encountered	Spring
	Other

Problems community face during water shortage from the water point	Shortage of water for cattle watering
	Limit their conception
	Travel long distance to collect water
	Forced to use unimproved Source
Alternative source of water supply during shortage of water	Improved source
	Unimproved source
	Spring
	River
Time spent for round trip to collect water from alternative source	Less than 30 minute
	More than 30 minute

2. 6. what do you think is the main problem to the non-functionality of the schemes?

{1} Pump failure. {2} Depth problem (seasonality) {3} Construction quality problem

{4} site selection problems {5} design problems {6} Operation & Maintenance problem

2.7. How do you evaluate the current status of the water supply scheme in provision of the Service? ; {1} Very Good {2} Good {3} Fair {4} very Poor;

2. 8. being the scheme needed repair ? {1}Yes {2} No

2.9 How far is the water source from your household (estimated distance)?

{1} 500mts or less {2}501- 1000mts.{3} 1001- 1500mts.

{4}1501-2000mts {5} More than 2-Kilo meters

2.10. How long does it take to go to the water source, fetch water and come back?

{1} 15 minutes or less {2} 16- 45min {3}45- 60min

{4}1hours-1.5min {5} More than 2hrs

B. Observations Check List (Bore hole)

1. Location: name of kebele_________________ Name of the Village/Got______________.
2. Date of observation______________ Scheme type _______________________________.
3. GPS reading: X- coordinates _________Y- coordinate _________Altitude _________.
4. Year of construction____.
5. Other faculties available

No additional facilities at all   Animal troughs

Washing stand   Irrigation system

Guard house   Shower room

Others, ____.

6. Scheme Sanitary Inspection

Sanitary Issues	Yes	No
Is there a latrine within 10 m of the well?		
Is the nearest latrine uphill of the well?		
Is there any source of other pollution within 10 m of the well (e.g. animal breeding, cultivation, roads, industry, etc)?		
Is the drainage absent or faulty, allowing ponding within 3 m of the well?		
Is the drainage channel absent or cracked, broken or in need of cleaning?		
Is the cement/slab less than 2 m in diameter around the top of the well?		
Does spilt water collect in the apron area?		
Are there cracks in the cement floor/slab?		
Is the hand pump loose at the point of attachment, or for rope-washer pump: is the pump cover missing?		
Is the well-cover absent or unsanitary?		

7. Out let of water point:

Outlet condition	Yes	No
Is it easy to access and operate for children and disabled?		
Does it provide convenient container placing?		
Is it sufficiently distributing the water (number of taps Vs no. of users?)		
Is queuing observed?		

8. Is catchments rehabilitation done?   Yes   No

9. Is there any detectable physical water quality parameter

Turbidity   Temperature   Colour   Odor   Test

C. Observation chek lists(spring development on spot)

1. Location: name of kebele_________________ Name of the Village/Got_________
2. Date of observation______________ Scheme type ___________________

3. GPS reading: X- coordinates _________Y- coordinate _____________Altitude: ______.

4. Year of construction____.

5. Other facilties available

No additional facilities at all Animal troughs

Washing stand Irrigation system

Shower room Guard house

Others, ____.

6. Scheme Sanitary Inspection

sanitary Issues	Yes	No
Is the collection/spring box absent or faulty?		
Is the masonry protecting the spring absent or faulty?		
Is the backfill area behind the retaining wall absent or eroded?		
Does spilled water flood the collection area?		
Is the fence absent or faulty?		
Can animals have access within 10 m of the spring?		
Is there a latrine uphill and/or within 30 m of the spring?		
Does surface water collect uphill of the spring		
Is the diversion ditch above the spring absent or non-functional?		
Are there any other sources of pollution uphill of the spring (e.g. solid waste)?		

7. Out let of water point:

Outlet condition	Yes	No
Is it easy to access and operate for children and disabled?		
Does it provide convenient container placing?		
Is it sufficiently distributing the water (number of taps Vs no. of users?)		
Is queuing observed?		

8. Is catchments rehabilitation done? Yes No

9. Is there any detectable physical water quality parameter

Turbidity Temperature Colour Odor Test

D: Interview Guide for Hadiya zone COWASH Team Leader

1 Is there any water point inventory done by your office? How frequent is it?

2. What are the major factors affecting the planned rural water supply service quality identified by your office?
3. What are the strategies your organization using to alleviate such problems and ensure rural water supply scheme service level?
4. How do you evaluate the functionality and rural water supply schemes(spring development on spot and hand borehole) service level?
5. How is the operation and maintenance of water points addressed in your approach?
6. What kinds of training communities receive in order to maintain the water points?
7. How are the availability, accessibility and affordability of spare parts organized?
8. What are the problems regarding to spar parts supply chain and what are inventories done by your office?
9. What do you suggest to improve the water supply service quality and sustainability in rural water supply in general and your implementation approach in particular

Appendix E: Focus Group Discussion for (WASHCOs)

Section 1: Respondents' identification

Name of the village/got _------ Name of the water supply scheme_______
Type of the water supply scheme spring on spot Year of construction_2004E.c
Name of present members of WASHCos and/or caretaker and their respective positions
Water committee
Composition, Legal recognition, Election process
Gender participation
Basic activities/responsibilities
Issues related with accountability and transparency

Section 2 Water service quality

1. Quantity
2. Quality(any quality problem encountered your water point)
3. Accessibility(Crowding, distance, service provision time(frequency and duration))
4. Reliability(interruption, shortage and service continuity)
5. WASHCos intervention on water service problem

Section 3: operation and maintenance and Procurement of spare parts

6. Are there local artesian, pump attendants and care takers and guard?
7. How was the procurement of construction materials undertaken? Where were the materials procured from?
8. How often has the water point required maintenance? What kind of maintenance was required? How long did it take to maintain the water point during its last breakage?
9. How is the O&M taken care of? What kind of external support is required for the O&M? How would you run it all by yourselves?
10. What type of O&M related training has the WASHCos/caretaker received? How would you evaluate the training?
11. How is the procurement of spare parts undertaken? Where are the spare parts procured from? How would you evaluate the quality of the spare parts available in the market?

Section 4: Financial management of service level.

12. What kind of knowledge does the community/caretaker have on the costs of different spare parts?
13. How much money is saved in the WASHCos account? How much do you pay per month on average? How do you see the adequacy of the saved money for purchasing necessary spare parts in case of break-downs?
14. Who is responsible for covering the costs of O&M? Why?
15. What kind of solutions would you suggest in order to lengthen the operational life time of the water point .

Sub Indicators Questions

1 Appendix sub-indicator questionnaires

I. Physical condition

1. How do you evaluate the construction quality of the water supply scheme?

2. Who participate in water scheme technology choice?

3. in what Phases of community participation in water supply project development?

4. Do you know if someone is measuring the quality?

5. Is most of the water system working?

6. What type of actors to make major decision regarding the water supply schemes?

7. Have you noticed any exposed pipe leakages?

8. What major problems are encountered in relation with your water supply and service delivery?

9. Have you faced the problem with the water supply scheme none functional?

10. How do you evaluate the current status of the water supply scheme in provision of the service?

II. Operations and maintenance

1. Who was the responsible body in operation & maintenance activities?

2. Are there people appointed to manage the water system?

3. Is there a water system operator?

4. Is the rural water scheme simple to operate and suitable to the users?

5. Existence of local technician and provided with training?

6. Do you think that the operators are sufficiently trained to perform their job?

7. How many times has the system failed in the last year?

8. When the system breaks down, how many days does it take on average to repair?

9. What are the major problems (causes) for rural water supply schemes failure?

10.Is the training on the water supply scheme O & M given to the technician or the water committee?

III. Consumer satisfaction

1. What is your overall satisfaction?

2. Reasons for dissatisfactions with the management of water supply schemes

3. Are you satisfied with your water discharge?

4. Do you think the existing water supply source is adequate to beneficiaries?

5. Are you satisfied with the job performed by the organization in charge of providing water?

6. Now that you have the water project, do you use more or less water in your house?

7. Do you think the water supply source now you are using water quality problem?

8. Concerning sufficiency of improved water supply schemes for drinking water?

9. Perception of Water Color

10. Perception of Your Water Taste

IV. Willingness and ownership

1. Whose idea was it to provide the water supply Schemes to the community?

2. Are you Participate final decision of the schemes?

3. What type of participation did you have during the project development?

4. Who manages the schemes?

5. To whom does the system belong? (Community or government)

6. Do you think that the community will have the financial capacity to keep the system working over the next years?

7. Are you willing to pay more than what you pay now for improved service?

8. Do you know what the tariff is used to pay for?

9. Have you had difficulty meeting your monthly payments?

10. Do you think the management body adequately performed its duties and responsibilities?

V. Financial management

1. Did you contribute money for capital assets during the construction of the scheme?

2. Is the collect water fee from beneficiary was fair?

4. Stated reasons why respondents pay water fee?

5. How money Present distribution of payment of monthly water fee?

6. Who collected fee management responsibility?

7. Who set and manage the price of the water fees?

8. Evaluation of financial contribution & management in water scheme

9. The capacity of water committee to manage the finance

10. Did the scheme have bank account or financial record?

Appendix A: Rural water schemes location of the study area.

No	Name of water point	Kebele	Secheme type	X-coordinate	Y-coordinate	Z-coordinate
1	Gonjoba	bukuro-salata	spring on spot	357184	836015	2010
2	Abo- Daje	bukuro-salata	spring on spot	361427	835439	2117
3	Woi-dabar	bukuro-salata	spring on spot	361319	835669	2133
4	Mahali bukuro	bukuro-salata	spring distribution	362282	835241	2153
5	Jijo- nafera	bukuro-salata	spring distribution	363464	840803	2403
6	Bethel mander	bukuro-salata	spring distribution	361116	840034	2219
7	Layi salat	bukuro-salata	spring distribution	361535	840269	2247
8	maxine	arara-ogaro	spring on spot	360550	839582	2208
9	Fincawa	arara-ogaro	spring on spot	366065	839692	2210
10	Inede	arara-ogaro	spring on spot	359391	837748	2000
11	Ate	arara-ogaro	spring distribution	361427	835239	2117
12	Ogaro	arara-ogaro	spring distribution	362053	840389	2219
13	Hankash	tachigna gana	borehole	361116	840034	2219
14	Gubucho	ltachigna gana	borehole distribution	360653	839692	2210
15	Matenchoso	tachigna gana	borehole distribution	356383	834964	2033
16	Shalele	Tachigna gana	borehole distribution	358141	833950	2053
17	Xoriceba	tachignawugana	borehole distribution	354477	835359	1989
18	Kore ido	Tachigna gana	borehole distribution	352789	836015	2146

Photo taken when the sample of water points are transported by icebox from d/t on spot spring and borehole.

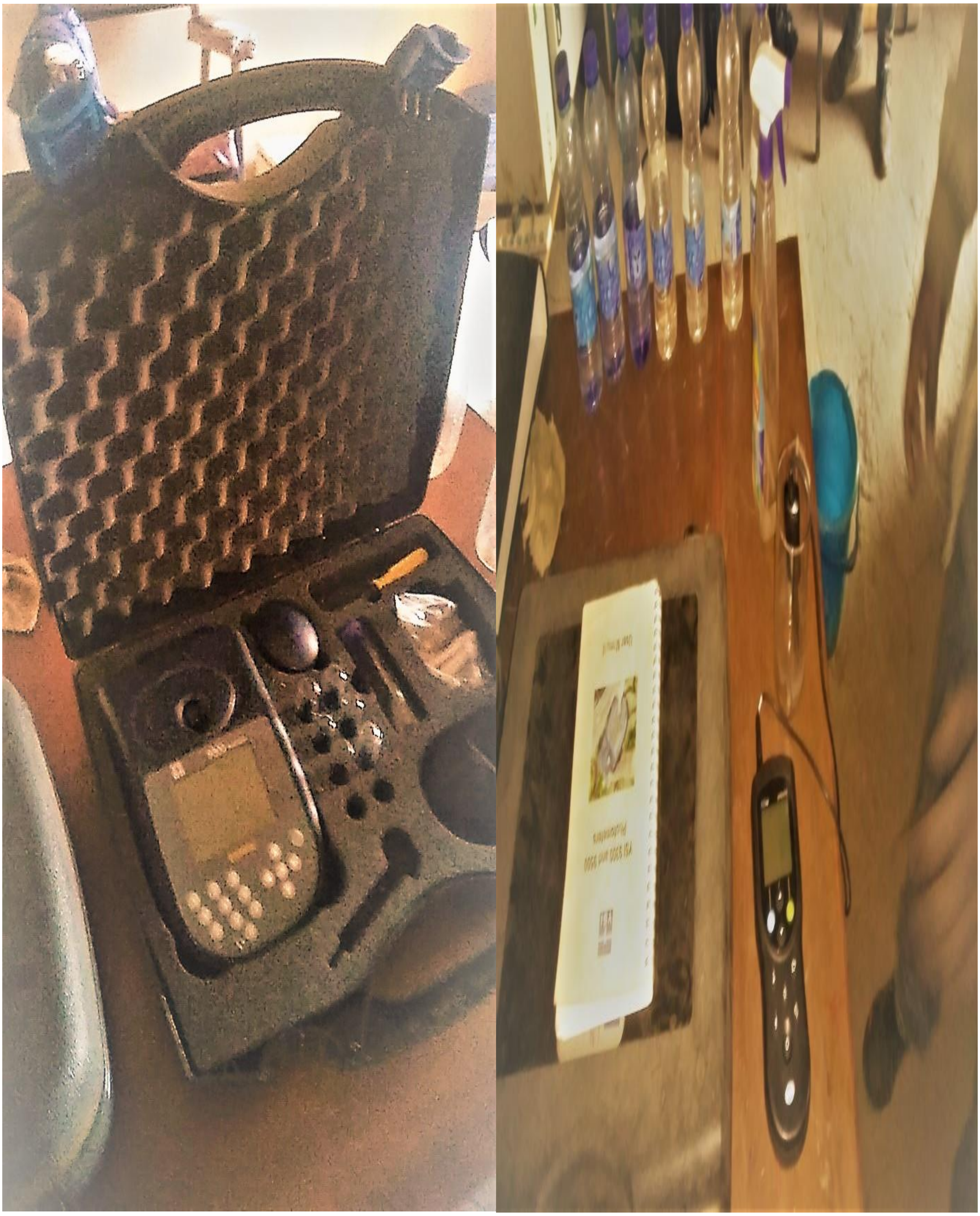

Photo taken when chemical water quality test analysis was done

Appendix B: chemical water quality laboratory test result of Hadiya zone in Gombora worede the three kebeles(bukuro-salata, Arare-ogaro and Layignaw gana).

Name of water point	Kebele	Iron(Fe) Mg/l	Potassium (K)Mg/l	Calcium(Ca)Mg/l	Sulphate (S_{O4}^{2-}) mg/l	Free chlorine (Cl_2)mg/l
Gonjoba	A	0.02	5.1	14	0	0.26
Abo- Daje	A	0.02	2.3	10	0	0
Woi-dabar	A	0.04	3.4	14	0	0
Mahali bukuro	A	0.02	2.7	8	5	0
Jijo- nafera	A	0.02	3.1	7	5	0
Bethel mander	A	0	3.4	8	0	0
Layi salat	A	0.01	4.2	6	4	0
Maxine	B	0	2.5	7	5	0
Fincawa	B	0.02	3.00	10	0	0
Inede	B	0	2.9	11	8	0
Ate	B	0.01	3.00	6	6	0
Ogaro	B	0.01	2.7	10	7	0
Hankash	C	0.11	12.00	16	1	2.5
Gubucho	C	0.11	11.00	16	1	2.5
Matenchoso	C	0.11	12.00	15	1	2.5
Shalele	C	0.11	12.00	16	1	2.45
Xoriceba	C	0.11	11.00	16.00	1	2.4
Olawa	C	0.11	12.00	15.00	1	2.38

Note: A= for bukuro salat, B=for Arare- ogaro and C= for Tachi gana kebeles.

Analyzed on………………….. by Solomon mekeso signature………………..

Approved on…………………..by W/R/S/M/C/P Signature………………………..

Appendix C: Physical Water quality analysis of the three kebeles

Name of water point	Kebele	pH	Temperature(o C)	Conductivity µs/cm	TDS Mg/l	Turbidity (FTU)
Gonjoba	A	9.6	22.6	118.8	59.4	74
Abo- Daje	A	9.09	22.7	75.2	37.51	10
Woi-dabar	A	8.73	22.5	108.5	54.25	0
Mahali bukuro	A	8.14	22.8	108.1	54.05	0
Jijo- nafera	A	8.15	22.6	108.00	54.00	0
Bethel mander	A	8.5	22.7	107.1	53.55	0
Layi salat	A	8.2	22.7	108.2	54.1	0
Maxine	B	7.9	22.8	162	81	5
Fincawa	B	8.3	22.6	105.6	52.53	1
Inede	B	7.8	22.8	101	50.5	4
Ate	B	8.2	22.7	108.4	54.2	2
Ogaro	B	8.6	22.7	109	54.5	0
Hankash	C	7.8	22.8	164	82	6
Gubucho	C	7.6	22.6	162	81	5.66
Matenchoso	C	8.01	22.6	161.4	80.52	5.4
Shalele	C	8.2	22.8	161.2	80.51	5.4
Xoriceba	C	7.8	22.6	163.00	81.5	5.36
Olawa	C	8.02	22.8	162.00	81.00	5.36

NOTE:- A=for bukuro-salat kebele , B= Arare- ogaro kebele and C= for Tachi gana kebele.
Analyzed on…………………. by Solomon mekeso signature……………….

Approved on…………………..by W/R/S/M/C/P Signature………………………..

Appendix :D 1.Bacteriological laboratory test result of drinking water

Zone	Hadiya	Date of sampling	1.01/05/2015 E.C	Nature of source	
Worede	Gombora		2.02/05/2015 E.C	Source	1.spring on spot
Kebele	Bukuro-salata		3 03/05/2015E.C		2.borehole
	Arare-ogaro	Date of testing	1.01/05/2015	Sample number	
	Layignawu-gana		2.02/05/2015 E.C		
			3 03/05/2015E.C		

Name of water point	Keb ele	Number of fecal in 100ml	Total coliform
Gonjoba	A	10	4
Abo- Daje	A	30	20
Woi-dabar	A	1	15
Mahali bukuro	A	0	20
Jijo- nafera	A	0	10
Bethel mander	A	0	13
Layi salat	A	0	14
maxine	B	3	31
Fincawa	B	1	20
Inede	B	5	19
Ate	B	3	31
Ogaro	B	3	30
Hankash	C	0	41
Gubucho	C	0	38
Matenchoso	C	0	38
Shalele	C	0	33
Xoriceba	C	0	35
Olawa	C	0	32

Some Photo of biological testing in laboratory and its result

Analyzed on1-3/05/2015E.C by Solomon mekeso signature……………….

sample of on spot spring and borehole during the field observation of physical water quality.

some Photos of FGD held on WASH'S commite's

Sample of Photo of during the observation functional and non functional water points

Photos of animal tanker and observation of physical water point on a source of scheme

Sample of chemical and biological test analysis in laboratory.