Factors affecting effectiveness of Small scale Water Projects in Gewata District, Kaffa zone, SNNPRS, South west of Ethiopia.

A Research Submitted to the School of Graduate Studies of Jimma University in Partial Fulfillment of the Requirements for the Award of Master's Degree in Project Management and Finance (MSc.)

By: HABTU SURRA

Under the Supervision of:

***Main Advisor*: - AREGA SEYOUM (PHD)**

And

Co-Advisor*: - *MOHAMMED GETAHUN (Assistant professor)

JIMMA UNIVERSITY
COLLEGE OF BUSINESS & ECONOMICS
MSC.PROGRAM IN ACCOUNTING AND FINANCE

June, 2020
JIMMA, ETHIOPIA

DECLARATION

I, the undersigned declare that the research Report entitled "Assessment of Small scale Water projects effectiveness and factor affecting Small scale Water projects effectiveness in Gewata district, Kaffa zone, SNNPRS, South west of Ethiopia." Submitted to the Research and Postgraduate Studies' Office of Business and Economics College is original and it has not been submitted previously in part or full to any university.

_____

Date: _____

CERTIFICATE

We certify that the Research Report entitled "Assessment of Small scale Water projects effectiveness and factor affecting Small scale Water projects effectiveness in Gewata district, Kaffa zone, SNNPRS, South west of Ethiopia." was done by Mr. Habtu Surra for the partial fulfillment of Master's Degree under our Supervision.

AREGA SEYOUM (PHD) MOHAMMED GETAHUN (Assistant professor)

_____ _____

(Main Advisor) (Co-Advisor)

Acknowledgement

I really like to say thank you for all my wonderful instructors. It is not common for someone to go as fast as regular students while learning in part time. This is because of the great effort of our instructors in particular and the department in general.

My class mates have been also very good to me. As I have been learning traveling long distance from Jimma, I could not been able to finish this if they were not help full in sharing information and updating me the schedules.

I need to thank also my advisors for their willingness to be my advisors. And also almighty God, who takes a lion share for my success deserves a big thank you.

Abstract

The benefits of having access to an improved drinking water source can only be fully realized when there is also access to improved sanitation and adherence to good hygiene practices. Whereas, An estimated 801,000 children younger than 5 years of age perish from diarrhea each year, mostly in developing countries due to lack of access to clean water. According to Gewata Woreda Water & Irrigation office, large number of water points(30-50%) become non-functional before the intended 5 years' service. Low attention by concerned bodies and affordability of spare parts are some of the factors for the problem. The objectives of this research are to assess the small scale water projects effectiveness and to identify factors affecting the effectiveness of these small scale water projects in Gewata woreda, Kaffa zone, SNNRS of South west of Ethiopia. In general this research will benefit a lot of people groups. Some of them are, government offices specially the district water, energy and mineral office, Non- governmental organizations, researchers and monitoring and evaluation agencies and also researchers. And when we come to the scope of the research, this research focuses only small scale rural water schemes. The limitation of the research might be related with some question like the question to know about the durability of the technology might be too technical that might be answered by technical staffs rather than WASHcos. And the research has employed both qualitative and quantitative data collection procedures. The research design used was community based cross sectional study. And because of small number of water schemes the investigator has took all small scale water schemes for study. The target population Data was collected through interview and the collected data was encoded in to CSpro software and then exported to SPSS for analysis. Accordingly, the effectiveness status of small scale water schemes in the district in terms of their expected service year found to be only 30.94%.And poor utilization status by users, unaffordable maintenance cost and durability of material found to be factors affecting effectiveness of Small scale water schemes in the district. Based on the findings, the investigator has recommended that in parallel to constructing new water schemes, there should be due attention and follow-up for already inaugurated water schemes too. That regular checkup practice of the function of the water schemes need to be strengthen.

Key Words: *Small scale water schemes, Water schemes design period, Effective water schemes*

Contents

List of Table

List of Figures

Acronyms

AA- Addis Ababa

AOR – Adjusted Odds Ratio

CDC – Center of Disease Control

CI – Confidence Interval

COR- Crude odds ratio

ETB – Ethiopian Birr

FGD – Focused Group Discussion

GTP – Growth and Transformation Plan

HEW – Health extension workers

HH- Households

KA – Kebele administration

KAP – Knowledge, Attitude & Practice

KM- Killo Meters

JMP – Joint monitoring program

MDGs- Millennium Development goals

ML- Milliliters

NGO – Non Governmental Organization

SDG – Sustainable Development Goals

SNNPR – South Nations Nationalities Peoples Regional State.

UN – United Nations

UNICEF - United Nations International Children's Emergency Fund

USAID- United States of America International Development

WaSH- Water, Sanitation and Hygiene

WASHco – Water Committee

WHO – World Health Organization

CHAPTER ONE

1. INRODUCTION

1.1. Background to the Study

WASH is the collective term for Water, Sanitation and Hygiene. Universal, affordable and sustainable access to WASH is a key public health issue within international development and is the focus of Sustainable Development Goal 6 which is aimed at Ensuring availability and sustainable management of water and sanitation for all. Due to their interdependent nature, these three core issues are grouped together to represent a growing sector. While each a separate field of work, each is dependent on the presence of the other. For example, without toilets, water sources become contaminated; without clean water, basic hygiene practices are not possible (UNICEF, 2019).

The benefits of having access to an improved drinking water source can only be fully realized when there is also access to improved sanitation and adherence to good hygiene practices. Beyond the immediate, obvious advantages of people being hydrated and healthier, access to water, sanitation and hygiene – known collectively as WASH – has profound wider socio-economic impacts, particularly for women and girls (UN Water, 2019).

Inadequate water, sanitation, and hygiene (WASH) conditions exist in a range of settings, from temporary refugee camps to permanent homes in large cities (CDC, 2019). Access to safe drinking water is measured by the percentage of the population having access to and using improved drinking water sources (CDC, 2016).

Whereas, improved drinking water sources should, provide safe drinking water, and include: Piped household water connection, Public standpipe, Borehole, Protected dug well, protected spring & Rainwater collection. Whereas, Access to sanitation is measured by the percentage of the population with access and using improved sanitation facilities (CDC, 2017).

Improved water resources management and access to safe water and sanitation for all is essential for eradicating poverty, building peaceful and prosperous societies, and ensuring that ‘no one is left behind’ on the path towards sustainable development. These goals are entirely achievable, provided

exclusion and inequality are addressed in both policy and practice. Otherwise, water interventions will fail to reach those most in need and who are likely to benefit most (United Nations, 2019).

Every year, unsafe water, coupled with a lack of basic sanitation, kills at least 1.6 million children under the age of five years. This is more than eight times the number of people who died in the Asian tsunami of 2004. Lack of sanitation alone contributes to about 700,000 child deaths every year due to diarrhea, mainly in developing countries. Chronic diarrhea can have long-term negative effects on children, in terms of both physical and cognitive development. In addition, lack of WASH facilities can prevent students from attending school, impose an unusual burden on women and reduce work productivity (WHO, 2017).

1.2. Statement of the Problem

A lot of disease could be prevented through increased access to safe water along with sanitation and hygiene related interventions. According to WHO, Almost one tenth of the global disease burden, mainly in the developing countries, could be prevented by water and other water related interventions. Moreover, effective and affordable interventions have been shown to further reduce this burden significantly. The economic return of investing in improved access to safe drinking water is almost 10-fold. Investing in water management will have dual benefits for health and agriculture (Prüss-Üstün A, et.al, 2008)

Despite of the fact stated above, now a days, an estimated of 801,000 children younger than 5 years of age perish from diarrhea each year, mostly in developing countries. This amounts to 11% of the 7.6 million deaths of children under the age of five and means that about 2,200 children are dying every day as a result of diarrheal diseases. Unsafe drinking water, inadequate availability of water for hygiene, and lack of access to sanitation together contribute to about 88% of deaths from diarrheal diseases (UN Water, 2019).

The JMP report (Joint Monitoring Program by WHO& UNICEF), which was released in 2019 after evaluating the status of Clean Water coverage starting from 2000 to 2017 has shown clearly where the countries are in respect of Water coverage.

Accordingly, globally, 117 countries (and four out of eight SDG regions) had estimates for safely managed services, representing 38% of the global population. 5.3 billion People used safely managed

services. An additional 1.4 billion used at least basic services.206 million people used limited services, 435 million used unimproved sources, and 144 million still used surface water. Eight out of ten people still lacking even basic services lived in rural areas. Nearly half lived in Least Developed Countries. In 24 out of 90 countries with disaggregated data, basic water coverage among the richest wealth quintile was at least twice as high as coverage among the poorest quintile. 80 countries had >99% basic water coverage. One in three countries with <99% were on track to achieve 'nearly universal' coverage by 2030 (JMP, 2019).

In Africa, 435 million people lacked a basic drinking water service in 2015, 84% of whom live in rural areas. Whereas, while urban coverage of basic drinking water services exceeds 50% in 52 countries, but rural coverage exceeds 50% in only 29 countries of the continent. This clearly shows that for combined SDG coverage which is use of improved water (with collection time within 30 minutes), sanitation, and hygiene facilities, the regional estimate for urban populations was 8 times greater than rural population. (Roche R et.al, 2017).

Whereas, Ethiopia, in 2015, achieved its Millennium Development Goal target of 57 percent access to safe drinking water. This was just great improvement from just 13 percent in 1990. Yet access to improved sanitation, while also vastly improved since 1990, remains alarmingly low at only 28 percent nationwide. Overall, safe water, sanitation and hygiene (WASH) coverage across Ethiopia remains woefully inadequate. Communities without access to safe water depend on scarce and often seasonal surface water sources like unprotected springs, ponds, streams and rivers, many of which are located far from households and contain severe waterborne diseases. When drought conditions prevail, many of these water sources for people and their crops and livestock disappear. (USAID, 2019). In addition, In Ethiopia, 60 - 80 percent of communicable diseases are attributed to limited access to safe water and inadequate sanitation and hygiene services. In addition, an estimated 50 percent of the consequences of under nutrition are caused by environmental factors that include poor hygiene and lack of access to water supply and sanitation. There are strong links between sanitation and stunting, and open defecation can lead to fecal-oral diseases such as diarrhea, which can cause and worsen malnutrition. Diarrhea is the leading cause of under-five mortality in Ethiopia, accounting for 23% of all under-five deaths (more than 70,000 children a year) (UNICEF, 2018).

In Gewata woreda despite of the problem related with getting reliable information, that the data is just being recorded based on just number of constructed water schemes and assuming all are functional with in their design period, it is assumed that the improved water (safe and clean) water coverage has reached to a level of 66.5%. (GWMEo, 2020).

As it is well known, this years(2020) is the end of GTP II. So that even if we consider the report is reliable, but still the district is far behind than the target of GTP II which is expected to be 100% coverage at the end of the strategic period. But, It is obvious that expecting all projects are 100% effective and assuming that they all are functional till the end of their design period is just "taking something with pinch of salt". That is why this research intended to discover between the constructed water schemes and their actual level of effectiveness in respect of whether they are functioning till the end of the design period or not. Accordingly, till now there is no such kind of researches conducted to assess the effectiveness of water schemes and factors affecting their effectiveness especially in Gewata woreda in particular and Kaffa zone in general. Accordingly, this research will fill the gap related with the stated problem by showing how much water schemes are functioning well and how much are not functioning well in respect to their intended design period and also will identifies the factors affecting water schemes effectiveness.

1.3. Research Questions

The research questions that guide the study are the following

1. What is the status of the effectiveness of the water schemes in respect to their design period in SNNRS, Gewata woreda?
2. What factors are affecting the effectiveness of water schemes in respect to serving the community properly till the end of design period?

1.4. Objectives of the study

1.4.1. General objective

The main objective of this research is to examine the status of water projects effectiveness and identify the factors affecting the projects.

1.4.2. Specific objectives

The research has two specific objectives which are in line with the general objective. These are presented here under.

- To measure the water projects effectiveness in terms of their functionality in respect of their design period in Gewata woreda, Kaffa zone, SNNRS of South west of Ethiopia.
- To identify factors affecting the effectiveness of the water projects in Gewata woreda, Kaffa zone, SNNRS of South west of Ethiopia.

1.5. Significance of the study

The investigation of Water schemes and factors affecting the effectiveness of water schemes will give crucial information for stake holders in the district in particular and stake holders beyond the district in general in planning their intervention now ahead.

In general this research will assist stake holders to have complementary information on

- The effective water schemes status in the district. By knowing this one can easily calculate the clean water overage status of the district.
- Factors affecting the effectiveness of the water schemes in the district.

In general this research will benefit a lot of people groups. Some of them are, government offices specially the district water, energy and mineral office, Non- governmental organizations, researchers and monitoring and evaluation agencies and also researchers. These government bodies and partners may re assess nonfunctional water schemes and may give correction parallel to inaugurating new projects. By doing so they may realize the actual coverage of clean water access for the community.

1.6. Scope and Limitation of the study

1.6.1. Scope of the study

As it is stated above, the objective of this study is to measure the effectiveness of small scale water schemes in Gewata district. Though effectiveness might be defined from different point of view(water quality, accessibility (distance from the users), water output…), this research only focus on the effectiveness of the water schemes in regard to their service life in respect to their design period.

This is because, the researcher believed that reports related to water coverage are just by adding the number of new water schemes without excluding nonfunctional water schemes. This is missing the goal of GTPII by far, which is creating water access 100% at the end of GTPII. As per strategic objective of GTPII regarding improving clean water access, decreasing the percent of non-functionality of water schemes is a key interventions.

In other hand, this research focuses only small scale rural water schemes. This is because the researcher has identified that some medium and large scale water schemes have complicated kind project status. Some of the projects have taken more than 5 years to be constructed and till could not been

inaugurated. And because most of them are still on construction status and because of their small number, I excluded them from the study. In addition, most of the clean water coverage is expected to be addressed by those small scale water schemes that can be constructed even in inaccessible villages.

Thus, the researcher believes that these problems related with medium and large scale water schemes need to be studied in separate studies. Rather it is better to focus on small scale water schemes that are expected to serve a majority of the community.

1.6.2. Limitation of the study

Though making interviews with WASHco leaders is good to get grass root level actual information, some question like the question to know about the durability of the technology might be too technical that might be answered by technical staffs rather than WASHcos.

But the researcher believe that because they (WASHcos) get technical training specially on minor maintenance and water schemes management, It might not be difficult for them to know the real problem. In addition, asking technical staffs from the office might cause bias as they are the owner of the success or failures of water schemes.

1.7 Organization of the paper

This study is organized with 5 chapters. The first chapter is all about introduction of the subject matter. The second one is about the objectives of the study, research question, Scope and limitation of the study. Whereas, the Third one is about the methodology used in this study. The fourth chapter is about the finding and discussion of the study. The fifth is about conclusion and recommendation. The last one is references and appendices.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Theoretical Review

Global population using at least a basic drinking water service increased from 81 to 89% between 2000 and 2015. However, about three out of ten people (2.1 billion people, or 29% of the global population) did not use a safely managed or improved drinking water service in 2015, 844 million people still lacked even a basic drinking water service(UN Water, 2019).

Proportion of population access to safely managed, basic, limited, unimproved water services or surface water in 2015 have been 34%, 29% and 12% respectively in Sub Saharan African countries. That means, 435 million people in Africa lacked a basic drinking water service in 2015, 84% of whom live in rural areas (JMP, 2017).

An estimated 801,000 children younger than 5 years of age perish from diarrhea each year, mostly in developing countries. This amounts to 11% of the 7.6 million deaths of children under the age of five and means that about 2,200 children are dying every day as a result of diarrheal diseases. Unsafe drinking water, inadequate availability of water for hygiene, and lack of access to sanitation together contribute to about 88% of deaths from diarrheal diseases (UN Water, 2019).

A World Health Organization report found that only one-third of the countries surveyed have national WASH plans that are being properly implemented, funded and regularly reviewed. In most countries monitoring was inconsistent and there were critical gaps. Reliable data is essential to inform policy decision, to monitoring and evaluate outcomes, and to identify those who do not have access to WASH. Many countries have WASH monitoring frameworks in place, but most of the data reported was inconsistent, weakening evaluation and outcome data analysis (WHO, 2015).

2.2 Empirical Evidence

Globally, as many as 30 to 50% of WASH projects fail after 2 to 5 years. In Ethiopia, the Government’s current focus is developing a sustainable climate resilient water source and using

appropriate and economical and robust technology for water delivery. Many systems are providing lower than expected levels of service and breaking down before the end of their useful lives. According to UNICEF, especially rural water supplies are expected to serve for 15 years design period (UNICEF, 2015).

National government mapping and monitoring efforts, as well as post-project monitoring by NGOs or researchers, have identified the failure of water supply systems (including water points, wells and boreholes) and sanitation systems as major challenges. Many water and sanitation systems are unsustainable, failing to provide extended health benefits to communities in the long-term. This has been attributed to financial costs, inadequate technical training for operations and maintenance, poor use of new facilities and taught behaviors, and a lack of community participation and ownership. (Carter R.C et.al, 1999).

In Ethiopia, With regard to water and sanitation, according to the GTP I standard, it is planned to increase access to clean water from 84% in 2014/15 to 100% at national level during GTP II period. On the other hand, rural water supply coverage (GTP II standard of 25 l/c/d within 1km radius) will increase from 59% in 2014/15 to 85% by 2019/20. Similarly, urban water supply access to clean water is planned to increase from 51% to 75%. Accordingly, national water supply coverage is planned to increase from 58% to 83% in the same period. In addition, dis-functional rural water supply systems will be reduced from 11.2% to 7% and Urban Fault Waters (UFW) is planned to decrease from 39% to 20% in the plan period (GTPII, 2019).

As per the qualitative data collection through key informant in-depth interview of District water office head, vice head, technician (plumbers) and other professionals, even if the design period for small scale rural water schemes is 15 years, each water schemes are expected to serve the community without any problem at least for the first 5 years. And the first maintenance is expected to be taken place after 5 years service of the schemes. Accordingly, in this research, the term effective water sachem is referred to water schemes that have served more than 5 years without any fault or water schemes that are still functioning well even if they are not yet finished 5 years of service.

2.3. Factors affecting sustained service of water schemes

According to the International initiative for impact evaluation, which was published on what factors affect sustained adoption of safe water, hygiene and sanitation technologies, some of the factors influencing the effectiveness of water projects are sustainable technologies, KAP of the beneficiaries of the projects, affordability of the projects.

2.3.1. Sustainable technologies (durability of the technologies)

The success of Water along with Sanitation and hygiene intervention schemes worldwide depends on daily practice and long term commitment, in conjunction with appropriately usable and durable technologies (Hulland K, et.al, 2015).

According to key informants (while collecting qualitative data), Now a days the market is covered with forged materials that emits the original ones. To identify the original from the fake one is a big headache for contractors, implementing agencies and WASH committees.

Despite of non-functionality of water schemes, improper management and installation of inappropriate technologies and materials of water distribution systems in developing nations can exacerbate poor service of water schemes. The World Health Organization estimates that 25%-45% of water in distribution lines is lost through leaks in developing countries due to poor materials. These leaks can allow for contaminated water and pathogens to enter the distribution pipes, especially when power outages result in a loss of pressure in the water supply pipes. Cross-contamination of wastewater into potable water lines has resulted in major disease outbreaks, such as a Typhoid fever outbreak in Dushanbe, Tajikistan in 1997.(Moe, Christine L. et.al, 2006).

2.3.2. Level of attention for maintenance

Major stakeholders that could affect or be affected by decisions or activities of the drinking-water supplier should be encouraged to coordinate their planning and management activities where appropriate. These could include, for example, health and resource management agencies, consumers, industry and plumbers. Appropriate mechanisms and documentation should be established for stakeholder commitment and involvement.

Organizational arrangements for the maintenance and improvement of drinking water supply services should take into account the vital and complementary roles of the agency responsible for surveillance

and of the water supplier. The two functions of surveillance and quality control are best performed by separate and independent entities because of the conflict of interest that arises when the two are combined (WHO, 2008).

2.3.4. Presence of Active Water Committees

Community-managed drinking-water systems, with both piped and non-piped distribution, are common worldwide in both developed and developing countries. The precise definition of a community drinking-water system will vary. While a definition based on population size or the type of supply may be appropriate under many conditions, approaches to administration and management provide a distinction between the drinking-water systems of small communities and those of larger towns and cities. This includes the increased reliance on often untrained and sometimes unpaid community members in the administration and operation of community drinking-water systems. Drinking-water systems in periurban areas in developing countries – the communities surrounding major towns and cities – May also have the characteristics of community systems (WHO, 2008).

Effective and sustainable programmes for the management of community drinking-water quality require the active support and involvement of local communities. These communities should be involved at all stages of such programmes, including initial surveys; decisions on siting of wells, siting of off-takes or establishing protection zones; monitoring and surveillance of drinking-water supplies; reporting faults, carrying out maintenance and taking remedial action; and supportive actions, including sanitation and hygiene practices (WHO, 2008).

According to Federal Democratic Republic of Ethiopia Growth and Transformation Plan II (GTP II), under the Implementation Strategies of Potable Water Supply and Irrigation Development strategy, it is clearly stated that WASH committees will be encouraged to maintain and rehabilitate water supply schemes (GTPII, 2015).

2.3.5. Affordability of the cost of the maintenance by WASH cos

According to a systematic review conducted by Hullan K. and his friends in London, cost and durability were the two most important factors related to a technology, indicating areas where more research could be done on balancing cost-effectiveness of materials and supply chain systems that support long-lasting hardware and long term behavior practice.

According to the study, despite of any kind of technology, and how much benefit it has to give for the community, cost is an important factor for sustainability of the water schemes. This cost may include cost for both first construction and then maintenance at a time of breakdown (Hulland K, et.al, 2015).

In addition, according to key informants who are WASHco members, during qualitative data collection they emphasized the dramatically inflated price of maintenance materials has brought a big challenge for WASHcos to maintain even minor faults of water schemes.

2.3.6. Proper utilization by the beneficiaries

Proper utilization of the water schemes and other WASH technologies and practicing WASH behavior is directly related with the period of the scheme constructed. According to the systematic review at London, there are 4 consecutive period in related with water schemes technologies adoption and utilization.

1. ***Early project period***: - This is frequently a period of excitement and enthusiasm. New technology is introduced in to a community at low cost or no cost, and project personnel and /or community promoters (WASH Cos) explain the new technology and the how to use and its advantages. The novelty of the technology, the promotional activities and other special events all encourage people to try the technology or practice the new behavior. Failure of the project to adequately adopt (learnt to be practiced by the community) may slow the adoption of the technology.

2. ***Late project period***: The initial enthusiasm for the technology or the behavioral recommendations diminishes, and community members have the chance to weigh the advantages and disadvantages of the new against the pre-existing technologies. The continued presence of project staff may ensure that cost and availability do not continue significant barriers to use. Health promoters help people to solve problems related to new technologies. At the same time, people may realize that the promised benefits have not materialized, and return to previous technologies and behaviors. It is during this period that the studies that we describe as maintenance assess whether behavior has been sustained. Ideally there is planning in the late project period, so that community members are in a position to maintain the functionality of the technology, restock on essential supplies, and continue to practice the recommended behaviors after the end of external funding and support.

3. ***Early post project period***: While external support ends, the promotional messages and instructions disseminated by the project are still fresh in people's minds. Projects may have left extra supplies.

People may be motivated to continue practicing the behavioral recommendation in order to maintain health benefits. At the same time, breakdowns in equipment or stock outs in essential supplies may start to bring down the previous level of adoption. The behavioral cue (Reminder) of regular household visits by promoters may be lost. Household members who, from the outset have been skeptical of the new technology or behavioral recommendation may reassert their position and encourage other household members to revert to previous ways. Studies assessing WASH behaviors in this and the following period were classified as sustained adoption studies in this review.

4. ***Late Post-project period***- Problems with breakdowns in equipment and stock outs may worsen, further decreasing levels of adoption. However, the desire to maintain the benefits of the technology or behavior, and new habits and social norms that resulted from the intervention activities during the project period may help sustain previous levels of practice of the WASH behaviors .(Hulland K, et.al, 2015).

In addition, according to the key informants (during qualitative data collection) the major reason for early breakdown of the water schemes is inappropriate utilization practice of the technologies by the users. Most of the time parents sent children to fetch water from those water sources. And because children take everything to game, they play with it and break it easily before its design period.

Conceptual framework

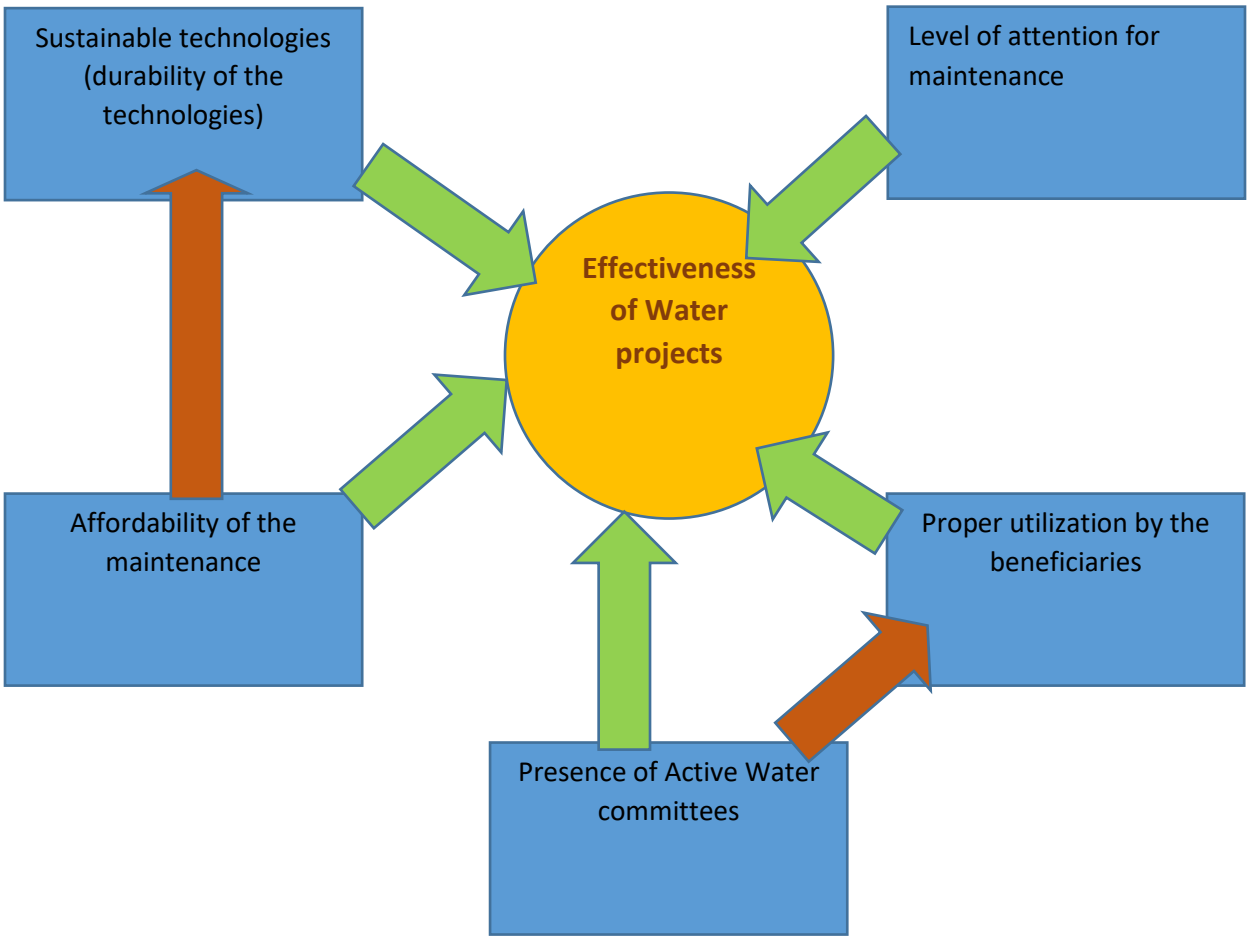

Figure 1. Conceptual frame work showing factors affecting the effectiveness of water projects (Adopted from different sources)

CHAPTER THREE

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Research design

The study employed both qualitative and quantitative research designs. By running qualitative research design, we tried to find out additional factors that could affect the effectiveness of water projects. Then, after identifying additional associated factors, quantitative research design specifically community based cross-sectional research design was applied. This research design shows the real time exact relationship between the dependent variable and independent variables at the time of the data collection.

3.2. Data collection procedures

As it is mentioned above, the data have been collected in qualitative and quantitative ways. In qualitative way, there have been in depth interview with professionals and Woreda Water, Mineral and energy office respective staffs. Then as per the information obtained from the office the next step was conducting quantitative data collection through interview technique using structured questioner. The interview was taken place by well-trained data collectors.

3.3. Study area & Target population

The study area of this research was Gewata woreda in Kaffa zone SNNRS south west of Ethiopia. This is because of relatively higher coverage report by the district relatively than any woreda in Kaffa zone despite of the doubtable status on the grass root level.

Gewata is found in South West of Ethiopia, SNNPRS, Keffa zone. The total population of the Woreda estimated to be about 130,000. The woreda lies within in “Dega” (highland) 2.9%, “Woinadega” (midland) 95.4% and “Kolla” (lowland) 1.7% agro climatic conditions. Average annual rainfall of the district is about 1770mm (Encyclopedia, 2019).

The study population is the whole Gewata population that for whom the study inference will be. That are people who live in Gewata district, Kaffa Zone, SNNPRS.

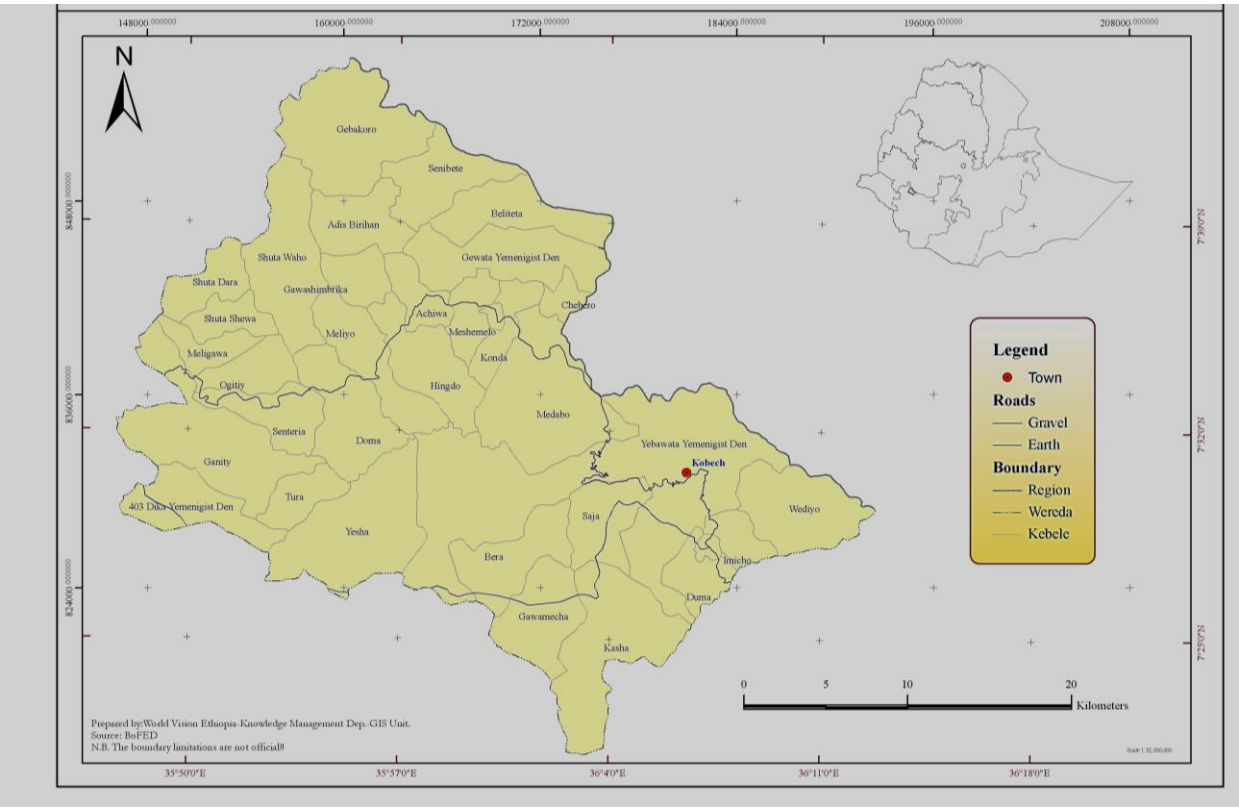

Figure 2. Location MAP of Gewata District

3.4. Sampling procedure and Sample size determination

It is to be recalled that in the researcher proposal it was planned to undertake the data collection on randomly selected 577 individuals out of the total population as per the following fashion. The required sample size for quantitative data collection was intended to be determined by using single population proportion formula. As the coverage of improved water service is 65 % (Gewata Woreda water, Mineral and energy office, 2019), and with assumptions of: 95 % certainty and 5% margin of error. Then, by considering a design effect of 1.5 and 5% of contingency for none response rate, a total sample size became 577 [$n=z^2P(1-P)/w^2$: $n=1.96^2$ x $0.65(1-0.65)/0.05^2$ = 577]

Whereas when the actual data collection began, the actual number of constructed water schemes in the district found to be only 246. And from this figure number of small scale water schemes constructed in the district till now are only 197.

Therefore, the researcher has took all 197 water schemes in to the study and WASHco leaders for each water schemes became interviewee of quantitative data collection. This is because, WASHco is

organized by 7 individuals. And from those individuals only 2 out of 7 WASHco members take technical training on how to maintain minor errors on water schemes. Therefore, relatively, these 2 members have better knowledge and skill towards the subject matter than the rest. Thus, the researcher purposively took 1 member (purposive sampling) who have took maintenance training and who is a leader of the committee from each water schemes.

3.5. Variables of the study and Operational Definition

The outcome variable of the study is effectiveness of small scale water schemes. Whereas there are 5 predictor variables. Such as, sustainable technologies (durable technologies), Level of attention for maintenance by concerned bodies, Availability of active WASHcos, Affordability of maintenance cost by WASHcows, and proper utilization practice by users.

In other hand, regarding the operational definition of the study, the outcome variable was produced as a composite variable from "year of service" and "functionality status of the project at a time". Therefore As per the information obtained from district water, mineral and energy office during qualitative data collection, a single small scale water scheme is expected to serve a community for at least 5 years before its first maintenance. Accordingly, in this research, the water schemes (small scale), which have served for more than 5 years without any problem (even if they are not functional right the time of data collection) or a water scheme that are functional from the inauguration day to the time of data collection (even if their design period is not completed) considered to be effective water schemes. Otherwise the water schemes will be considered as non-effective.

3.6. Data management and analysis procedure

The collected data was entered directly in to CSpro 7.3.1 version statistical software. This is just to prevent error encoding by the encoder as the software identifies and protects wrong encodings. After the data has been interred the next step was exporting the data directly to Excel for cleaning purpose. Then for analysis the data was exported to SPSS 24 version.

Then after, the data was analyzed in two ways. To answer the status of the effectiveness of water schemes and to get other demographic data, descriptive statics was employed. Then to get the factors affecting the effectiveness, analytic statistic through bivariate and multivariable analysis was conducted.

3.7. Data quality control

The data collectors were 16 individuals and 4 supervisors who have a minimum of diploma in their educational background. Most of them are teachers and have previous experience in data collecting.

In addition before the actual data collection, the data collectors and supervisors have got trained for 2 days on interview skill, how to fill the data and the manner they have to follow while they go to the community for data collection. In addition for the sake of getting familiar with questioner, there were a half day practical session by pairing them to interview each other.

On the other hand, before collecting the actual data, there were a pilot data collection in the nearby villages by randomly selecting HHs. And to prevent errors while data encoding, CSpro was used. This software has a benefit of decreasing the rate of error encoding.

3.8. Ethical consideration

The study was run after getting ethical clearance from Jimma University. In addition the privacy of the respondents was kept strictly through not using their name during analysis and not conducting an interview unless they provide a consent. And the raw data is kept in secured place where it cannot be accessed easily by other individuals.

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1. Result

4.1.1. Socio-demographic characteristics

A total of 197 interviewees (n=197) who are WASHco leaders from all small scale water schemes in the district who were organized from the beneficiaries were planned to be interviewed. And the interviewers were sent to these interviewees and all selected interviewee have participated in the study and responded for the interview. Data were collected from all these respondents (n=197) and presented for analysis. This makes the response rate the study 100%. In other hand, unfortunately all the respondents who are leaders of WASHcos (n=197) found to be male.

4.1.2. Effective water schemes

The outcome variable which is effectiveness of small scale water scheme is a composite variable which is produced by merging the result of two variables. These variables are year of service of the water schemes and functionality status of the water schemes at a time of the study. Therefore if a water scheme said to be effective, whether it need to be functional till the design period or had to serve the community for at least 5 years after the inauguration. Based on this all water schemes (n=197) were checked and from those all small scale water schemes, only 31% of the water schemes (n=61) found to be effective in the district.

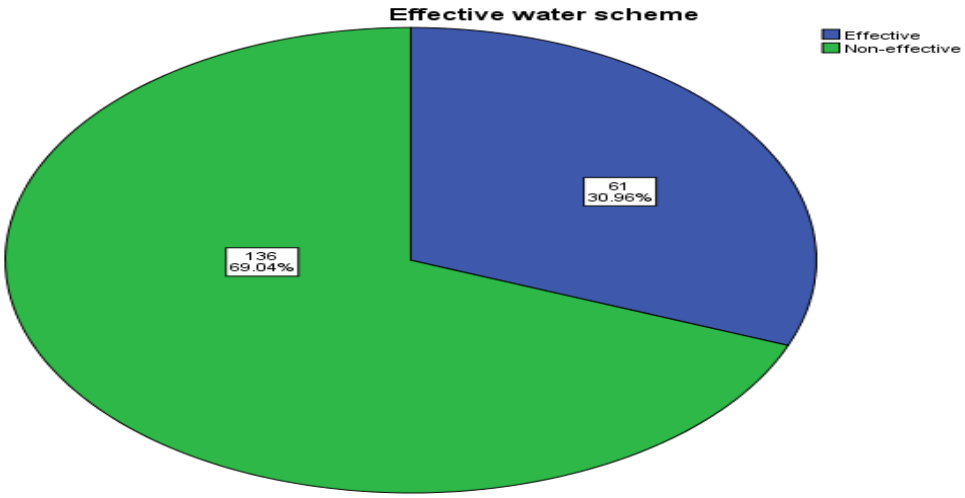

Figure 3. Effectiveness of water schemes in Gewata district, Kaffa zone, SNNRS, South west of Ethiopia

4.1.3. Factors affecting the effectiveness of water schemes

Factors associated with effectiveness of small scale water schemes in Gewata district, Kaffa zone, SNNPR, South west of Ethiopia were assessed using bi-variable and multivariable binary logistic regression.

All variables such as durability of the technology, affordability of the cost of maintenance, presence of active WASHcos, attention by concerned bodies and proper utilization by the beneficiaries were analyzed through bi-variate logistic regression. Variables with less than 0.25 P-Value through bivariate logistic regression and then analyzed by Multivariate logistic analysis to eliminate the possible confounding variables.

Accordingly, from those variables, except "attention by concerned bodies", all variables have shown less than 0.25 P-value significance and so that taken for multivariable analysis. But after multivariable analysis, in addition presence of active WASHcos found to be not significant.

As a result, Proper utilization by beneficiaries when become poor, the chance of the water schemes to be non-effective will increase by 8 times than that of good utilization practice of the beneficiaries {AOR: 8.4, 95%CI (1.79, 39.1)}. In other hand, the odds of non-effectiveness of water schemes will increase by 15 times when there is medium level proper utilization of water schemes by beneficiaries than when there is good practice by beneficiaries {AOR: 15.8, 95% CI(1.4, 182.8).

In addition, when the maintenance cost become not affordable, water schemes found to be 18 times more likely to become non-effective { AOR: 18.3, 95% CI(2.9, 116.5)}. Whereas durability of the technology (materials) also found to be significantly associated with non-effectivity of water schemes in the district. Accordingly when the installed water schemes were constructed by non-durable technologies, the odds of non-effectiveness of water schemes found to be increased by 19 times {AOR 18.9, 95% CI (6.32, 56.76)}.

Table 1. Associated factors of Non- Effectiveness of small scale water schemes in Gewata district, Kaffa zone, SNNPRS, South west of Ethiopia(n=197)

Variables	Effectiveness of water schemes		COR(95%CI)	AOR(95%CI)
	Effective	Non-Effective		
Durability of the technology				
Yes	43	0	1	1
No	14	33	32.8(12.11,88.85)	**18.9(6.32,56.76)****
I don't know	4	103	0.092(0.028,0.297)	0.27(0.06,1.25)
Affordability of maintenance				
Yes	23	3	1	1
No	33	138	26.83(7.64,94.22)	**18.3(2.88,116.47)***
Active WASHco				
Yes	27	17	1	1
No	34	119	5.56(2.72,11.38)	2.83(0.54,14.997)
Users proper utilization				
Good	33	13	1	1
Medium	1	22	0.11(0.049,0.23)	**0.12(0.026,0.56)***
Poor	27	101	5.88(0.76,45.62)	1.89(0.196,18.28)

Note: 1= Reference, ** =p<0.001, * =p<0.05

4.2. Discussion

As it is reported above, non-effectiveness rate of small scale water schemes in the district found to be 69.04%. This is by far deviated from GTPII goal which was intended to reduce dis-functional rural water supply systems from 11.2% to 7% at the end of GTPII (GTPII, 2015). And this report also shows the status is much beyond the global status of dysfunctional rate of water schemes. According to UNICEF report which was released in 2015, globally, as many as 30 to 50% of WASH projects fail after 2 to 5 years' service (UNICEF, 2015).

In other hand, multivariable logistic regression has shown 3 out of 5 independent variables have significant association with the outcome variable. As it is shown above, all independent variables and the outcome variables have a positive relationship, that while independent variables show improvement, the outcome variable also shows significant improvement in all cases.

Accordingly, Proper utilization of water schemes by beneficiaries when become poor, the chance of the water schemes to be non-effective will increase by 8 times than that of good utilization practice of the beneficiaries {AOR: 8.4, 95%CI (1.79, 39.1)}. In other hand, the odds of non-effectiveness of water schemes will increase by 15 times when there is medium level proper utilization of water schemes by beneficiaries than when there is good practice by beneficiaries {AOR: 15.8, 95% CI(1.4, 182.8). This is in line with the study conducted by Hulland K., and his friends in 2015 in London on the title of "What factors affect sustained adoption of safe water, hygiene and sanitation technologies?" According to the study, users' proper adoption of the technology is crucial for sustained service of water schemes.

The maintenance cost is also a variable that shows significance with the outcome variable. That when it became not affordable, water schemes found to be 18 times more likely to become non-effective {AOR: 18.3, 95% CI (2.9, 116.5)}. This is also in line with the systematic review by Hulland K., and his friends in 2015 in London. According to the study cost is an important factor for sustainability of the water schemes.

Whereas durability of the technology (materials) also found to be significantly associated with non-effectivity of water schemes in the district. Accordingly when the installed water schemes were constructed by non-durable technologies, the odds of non-effectiveness of water schemes found to be increased by 19 times {AOR 18.9, 95% CI (6.32, 56.76)}. This is also consistent with the study conducted by Moe, Christine L. & Rheingans, and Richard D. in July 2006 on the title of "Global challenges in water, sanitation and health". According to the study, despite of non-functionality of water schemes, improper management and installation of inappropriate technologies and materials of water distribution systems in developing nations can exacerbate poor service of water schemes. The World Health Organization estimates that 25%-45% of water in distribution lines is lost through leaks in developing countries due to poor materials.

In addition, this result is also in line with the study conducted by Hulland K., and his friends in 2015 in London on the title of "What factors affect sustained adoption of safe water, hygiene and sanitation technologies?" According to the study, the success of Water schemes along with Sanitation and hygiene intervention schemes worldwide depends on daily practice and long term commitment, in conjunction with appropriately usable and durable technologies.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

As we can see from the result, the status of effective small scale water schemes in the district is only 30.96%. This is in other hand the coverage status of clean water access in the district. This is by far different from what the district is reporting. That the district believe that the clean water status in the district reached 65%. Whereas the report has been produced just by assuming all constructed water schemes are functioning well.

In other hand by considering this finding, we can trace the stand of the district from GTPII target point of view. As per the target of the GTPII, at the end of the period (2020), the status of clean water coverage expected to reach 100%. Considering this, we can easily witness that how the district is failed and lagged far behind than the target.

When we look at the associated factors, durability of the materials, and affordability of the maintenance cost and proper utilization of the schemes by beneficiaries, these all factors are what someone even lay man can hypothesize about the effect they produce on water schemes. According to Mr Asrat who is district water, mineral and energy office head (during in-depth interview) now a days, Relative lower cost of High copy materials are easily accessible in the market than the original materials. This might be the reason for being a first choice by a contractors while constructing water schemes. In other hand sky rocketed cost of maintenance is also becoming a headache for the community and also for partners.

According to most of WASHco leaders (during In-depth interview while qualitative data collection) inappropriate utilization of water schemes by beneficiaries is also another problem for non-functionality of water schemes. According to them, fetching water mostly is assumed to be the responsibility of the children. And children by nature take everything as a game. So that while they fetch water they play with the materials and break it easily before it gives intended benefit for the community.

The recommendation of the investigator is as follows:

For Policy makers: This problem which is found by this study assumed to be not only the problem of this district only. If so, this will highly affects the effort of clean water access creation among the

nation. Therefore, while planning to create access they have to think also about the sustainability of projects as per the strategic objective of GTPII may be by strengthening regular monitoring of water schemes.

For District Government Officials: The district is lagging far behind than what they are assuming on the paper. Therefore as per the finding, they have to work hard in correcting the problems related with poor materials quality by changing with original materials, supporting local WASHcos in maintaining minor problems and by awareness creation for the community and placing laws and regulations on proper utilization of the water schemes among the community.

For NGOs and partners: They have to give due attention in correcting and maintaining the non-functional water schemes in equivalent manner than constructing new water schemes. Because while the previous became not effective, but running forward for new project is multiplying the effort of creating access to clean water by zero.

References

United Nations International Children's Emergency Fund (UNICEF), (2019), *Water, Sanitation and Hygiene*, Geneva.

United Nations Water, (2019), *Water Sanitation and Hygien, Geneva*.

Center for Disease Control (CDC), (2019), *Global Water, Sanitation & Hygiene program, United States of America.*

Center for Disease Control (CDC), (2016), *Assessing Access to Water & Sanitation, United States of America.*

Center for Disease Control (CDC), (2017), *Assessing Access to Water & Sanitation, United States of America.*

United Nations, (2019), *'Leaving no one behind' World Water Development Report*, Geneva.

World Health Organization, (2017), *Lack of sanitation for 2.4 billion people is undermining health improvements,* Geneva.

Prüss-Üstün A, Bos R, Gore F, Bartram J. Safer water, better health: (2008), *costs, benefits and sustainability of interventions to protect and promote health., World Health Organization*, Geneva'

United Nations Water, (2019), *leaving No one behind*, Geneva.

United Nations Children's Fund (UNICEF) and World Health Organization (WHO), (2019), *Progress on household drinking water, sanitation and hygiene 2000-2017. Special focus on inequalities*. New York.

Roche R, Bain R, Cumming O (2017) *A long way to go – Estimates of combined water, sanitation and hygiene coverage for 25 subSaharan African countries*. PLoS ONE 12(2):e0171783. doi:10.1371/journal.pone.0171783 greater than for rural populations.

USAID. (OCTOBER.2018), *Gov/Ethiopia Fact Sheet – Water, Sanitation And Hygiene.*

Joint Monitoring Program (2017), *a snapshot of Drinking Water, Sanitation and Hygiene in Africa*, Geneva.

United Nations International Children's Emergency Fund (UNICEF), (2018), *UNICEF Ethiopia WASH CPD Evaluation (2012-2016),* Ethiopia.

Gewata Woreda Water, Minral & Energy Office (2020), *Annual report of 2011 EC*. Konda, Gewata.

"WHO, (March 2015), UN reveals major gaps in water and sanitation – especially in rural areas". Retrieved 19

Carter, R. C.; Tyrrel, S. F.; Howsam, P. (August 1999). *"The Impact and Sustainability of Community Water Supply and Sanitation Programmes in Developing Countries"*. Water and Environment Journal. 13 (4): 292–296. Doi:10.1111/j.1747-6593.1999.tb01050.x. ISSN 1747-6585)

Federal Democratic Republic of Ethiopia, (2015), *"Growth and Transformation Plan II (GTP II) (2015/16-2019/20)"*, Addis Ababa, Ethiopia.

Hulland K., Martin N., Dreibelbis R., DeBruicker V., & Winch P.,2015. *"What factors affect sustained adoption of safe water, hygiene and sanitation technologies? Systematic Review Summary".* London: International Initiative for Impact Evaluation.

Moe, Christine L.; Rheingans, Richard D. (July 2006*). "Global challenges in water, sanitation and health"* . Journal of Water and Health. 4 (S1): 41–57. doi:10.2166/wh.2006.0043. ISSN 1477-8920)

WHO, (2008), *"Guidelines for Drinking-water Quality", THIRD EDITION INCORPORATING THE FIRST AND SECOND ADDENDA Volume 1 Recommendations,* Geneva

Encyclopedia, (2019), *Gewata.*

APPENDICES

5.1. English questioner

Jimma University
Business and Economics College
Department of Accounting and Finance

Informed consent & cover page

Hello. My name is _____. I am working with Jimma University. In order to get more information about water projects in your *area/village*, we are conducting a survey of households in the area. Your household has been selected by chance from all households in the area. I would like to ask you some questions related to those water projects.

The information you provide will be useful to find out the status of quality of life in the area, and will be used to inform the program management make decisions.

Participation in the survey is voluntary, and you can choose not to take part or to withdraw at any time during the interview.

All the information you give will be confidential. The information will be used to prepare general reports, but will not include any specific names. There will be no way to identify that you are the one who gave this information.

If you have any questions about the survey, you can ask me, my survey field supervisor who is here with the survey team, At this time do you have any questions about the survey?

Signature of interviewer/Enumerator: _____

Date: _____

Respondent agreed to be interviewed (circle on the answer) YES NO

1. HOUSEHOLD IDENTIFICATION

This section is to be completed for each household visited.

101. Region				
102. District				
104. Community/Kebele Name				
105. Cluster/Village number				
106. Household number				
107. Interviewer number				
108. Date of interview				
109. Time interview commenced				
110. Time interview ended				

Interviewers	Refer at ALL times to your survey manual for instructions. Remember to obtain consent from each household. Write answers directly in the tables and mark the boxes on the left side of each form where there are.
Field Supervisors	Check ALL answers recorded in each section, ensuring gaps or missing answers are obtained BEFORE leaving the cluster. Fill in the right hand results column in sections where there are and please check the tables for validity.

Please complete this part of the form

	Field supervisor	Office editor	Data entry clerk
Name and Signature			
Date			

---

2. HOUSEHOLD CHARACTERISTICS

Can you please tell me the names of all the members of your household who usually live here, sleep here and eat from the same bowl, including yourself. Please include children, relatives or orphans, but do not count temporary visitors. First names are sufficient. Names are only used in the interview and will not be related to data in the report. **Make a list of ALL names before asking other questions.** After getting the full list of family members, continue with the other questions in the table for each person in the list.

HC 01	HC 02	HC 03	HC 04	HC *07*	HC 08
Tell me the first name of all the members of your household	What relationship is (name) to the head of household **1.** Head **2.** Spouse **3.** Child ≥5 year **4.** Child <5 year **5.** Relative **6.** Other	What is (name's) gender? **1.**Male **2.**Female	What age is (Name)? (For children < 5 years write the age in months if HC02 is 4)	What is the highest grade level of school (name) has completed, write the number For the grade level 0 = never 88=Informal Education 99 = post-secondary (Above Grade 10).	Has (name) ever attended TVET? (For children age 12-18 years) 1. Yes 2. No 3. NA
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

1. ***Access to Water, Sanitation & Hygiene***		
1 Water Access		
WA01	What kind of water point was constructed in your vicinity **Mark ONE answer only.**	
	1. Piped into dwelling. 2. Piped into yard / plot. 3. Public tap. 4. Open well in dwelling / yard / plot. 5. Open public well. 6. Protected well in dwelling / yard / plot. 7. Protected/developed spring 8. Protected public well(hand pump) 9. Spring / river / stream. 10. Pond / lake / dam. 11. Rainwater. 12. Rope pump 13. Bottled water. 14. Other.	
WA02	How long does it take to go there, get water and come back? **1.** 0 – 30 minutes' walk from the house / yard / plot. **2.** 30 – 60 minutes' walk from the house / yard / plot. **3.** More than 60 minutes' walk from the house / yard / plot. **4.** Water is piped into the house / yard / plot. **5.** Don't know / no answer.	
WA 03	When did this water point constructed? 1. In this year 2. 1 year ago 3. 2 years ago 4. 3 years ago 5. 4 years ago	
WA 04	Is this source still functional? 1. Yes 2. No	If Yes go to WA 06
WA 05	If No for WA04, for how long has stayed non-functional 1. Less than a week 2. 1 wk – 1 month 3. 1 month – 6 month 4. 6 month – 1 year	
WA 06	If no for WA04, Has this water source ever been maintained? 1. Yes 2. No 3. I don't know	

WA 7	If No for WA04, What do you say about the quality of the materials used to construct this water scheme? 1. Good quality 2. Poor quality	
WA 8	If No for WA04, Do you afford the cost for fixing the problem? 1. Yes 2. No	
WA 9	If No for WA04, How do you rate Practice of the user community members in respect to proper utilization of this water scheme? 1. Good 2. Medium	
WA 10	If No for WA04, Is there Active Water committee (WASHco) who have trained to fix minor problems of this water scheme? 1. Yes	
WA 11	If No for WA04, how do you rate the level of attention given by concerned body to maintain it 1. Good 2. Medium	
WA 12	If Yes for question WA 04, what do you think is the main reason for this sustained service of the water point? 1. Durability of the technologies(Water access projects) was very good 2. We easily could maintain the problem 3. Level of attention for maintaining of projects by concerned bodies is very nice 4. KAP of beneficiaries towards access of water points is very good	
WA 13	Write the exact minutes to get water and coming back home including queue time _____	
WA 14	Amount of water HH fetched for yesterday for all consumption in liters _____	
WA 15	How many people (including children) live in the household _____	
WA16	What is alternative water source for your HH	
	1. Piped into dwelling. 2. Piped into yard / plot. 3. Public tap. 4. Open well in dwelling / yard / plot. 5. Open public well. 6. Protected well in dwelling / yard / plot. 7. Protected/developed spring 8. Protected public well(Hand pump) 9. Spring / river / stream. 10. Pond / lake / dam. 11. Rainwater. 12. Rope pump 13. Bottled water. 14. Other. 15. Don't know / no answer.	

WA 17	how long does it take to go there, get water and come back? 1. 0 – 30 minutes' walk from the house / yard / plot. 2. 30 – 60 minutes' walk from the house / yard / plot. 3. More than 60 minutes' walk from the house / yard / plot. 4. Water is piped into the house / yard / plot. 5. Don't know / no answer.	
WA 18	Amount of water HH fetched for yesterday for all consumption in liters _____	

For data collector: ply say the following for the interviewee.
I really thank you on behalf of Jimma University for participating in this research