ADDIS ABABA UNIVERSITY

COLLEGE OF SOCIAL SCIENCES

DEPARTEMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

CHALLENGES AND POTENTIALS OF URBAN WATER SUPPLY IN GEMJABET TOWN, AWI ZONE, AMHARA REGION, ETHIOPIA

BY: ADERAW MENGIST

July, 2024

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Addis Ababa, Ethiopia

DECLARATION

I declare that this thesis entitled **"challenges and potentials of urban water supply: The case of gemjabet town, Awi Zone, Ethiopia"** is entirely my own work and this thesis has not been previously published neither has it been admitted anywhere from another degree or deploma and that such materials as has been obtained from another sources has been duly acknowledged in this thesis. This work is being submitted to the department of geography and environmental studies, as a part of the Master of Arts programme in geography. This thesis is also carrid out under the supervision of Tebarek lika (phd).

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This is to certify that the thesis prepared by **Aderaw Mengist** (ID No, GSK 7419/10), Entitled; **challenges and potentials of urban water supply: The case of gemjabet town, Awi Zone, Ethiopia.** Is submited for partial fulfillment of the requirements for the degree of Master of Arts (MA) in Geography and Environmental studies.

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Advisor _____Signature_____ Date _____

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ABBREVIATIONS AND ACRONYMS

AFP	Agroforestry Practices
CBO	Congressional Budget Offices
CSA	Central Statistical Authority
FGD	Focus Group Discussion
GRFA	Genetic Resources for Food and Agriculture
HHs	Households heads
IBM	International Business Machines
IPCC	Intergovernmental Panel on Climate Change
JMP	Joint monitoring program
MDGS	Millennium Development Goals
UKAs	Urban Kebele Administrations
UNICEF	United Nation International Children for Emergency Fund
UNDP	United Nations Development Program
WHO	World Health Organization
WSSO	Water Supply and Sanitation Office

Abstract

Water scarcity and low quality have become major worldwide problems, especially impacting developing country towns and cities. The issue is made worse in many areas by rapid urbanization since the infrastructure cannot keep up with the rush of additional residents. The goal of this study is to evaluate Gimjabet Town's pure water supply's potentials and obstacles. The purpose of the study is to determine the characteristics of the water supply, the main obstacles, and the effects of the current setup. Through the use of questionnaires and interviews, the study gathers and analyzes cross-sectional data from 184 sampled households utilizing a descriptive research design and qualitative research methods. To pick the sample households, systematic random sampling was used. While secondary data were obtained from published journals, papers, and other publications, primary data were gathered from households, community elders, religious leaders, institutions, and organizations. A descriptive analysis was used to analyze the data. The results emphasize the negative effects of insufficient water supply on the economy and health, especially for women and children. Because most locals rely on tainted traditional water sources including hand-dug wells, springs, rivers, and rainfall, they run a serious danger of contracting waterborne diseases. Based on the findings, reliable/sustainable water distribution network is hindered by high costs, frequent outages, and inadequate infrastructure. Children and women who frequently go great distances to fetch water are disproportionately affected economically and health-wise. In addition, problems with the water supply are made worse by ineffective manuicipal management and a shortage of skilled labor. In order to enhance the water supply system, the community, government, and non-governmental organizations must work together in concert, as the report emphasizes. Accurate population forecasting techniques should be used, distribution networks should be regularly maintained, public awareness of water conservation should be raised, and stakeholder collaboration should be strengthened. Resolving Gimjabet Town's issues requires ensuring sustainable water management techniques.

Keywords: Gimjabe, manuicipal, management, sustainable, infrastructure

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

All living creatures, including people, animals, and plants, need water to survive; without it, none of them could exist on land. Water is the second most important element for life on Earth, behind air (Cord et al., 2022). For each individual, having access to enough clean drinking water in a flexible manner is of utmost important. Therefore, one of the duties of urban authorities is to provide citizens with potable water Abduro et al (2020). A lot of developing nations, including Ethiopia, struggle to provide enough water to their citizens. From the tiniest algae to the largest mammals, water is the source of all resources that support life and everything they eat, drink, and can reproduce (Zhou et al., 2021). Therefore, water is necessary for human needs for a variety of reasons, including social and economic needs (Upton et al., 2020).

The idea that water is the key factor in social advancement, economic prosperity, and poverty reduction is gaining traction. People see it as an economic good these days. The role that water supply plays in accomplishing the Millennium Development Goals (MDGs) has been studied by a number of agencies, with a focus on the direct and indirect contributions that water supply makes to the goal's overarching objectives and most of its targets. On the other hand, water's importance comes from its focus on several developmental projects as well as its critical role in achieving environmental sustainability and aims pertaining to water supply, sanitation, and hygiene (Naiga, 2021).

Worldwide, water is the most vital resource for all public services. Next to oxygen, it is the most crucial element for life (Ribeiro and Mph, 2015). Therefore, anything that has an impact on the availability of water supplies tends to interfere with human survival and quality of life. Water is a basic necessity for human welfare.

Enough water for domestic use is a necessary condition for the social and economic facets of sustainable development. However, the majority of developing nations—including Ethiopia—have poor sanitation, hygiene, and water supplies, which worsen poverty (Rotov et al., 2019). They also have limited access to water.Due to its large number of lakes, twelve major river

basins, including the Blue Nile, and significant potential for both surface and groundwater, Ethiopia is referred to as the "Water Tower" of East Africa (Version et al., 2021). Despite this, the nation has some of Sub-Saharan Africa's poorest sanitation and sanitary infrastructure, along with restricted access to clean water sources. Ethiopia's metropolitan regions provide serious problems to ensuring that every urban inhabitant has access to a relatively acceptable supply of water, as they do to many other developing nations. The highest caution and attention are required for these matters. The disparity between local communities' water supply and consumption was substantial due to a combination of rapid urbanization and population growth, coupled with inadequate infrastructure (Yermolenko et al., 2021). This circumstance also exists in the research area.

Ethiopia has an abundance of surface and groundwater resources, but access to household water supply is restricted because of geographical and socioeconomic obstacles. Numerous factors, including high rates of urbanization, per capita consumption, population distribution, and financial constraints, influence issues related to water management, environmental change, and water consumption for drinking and domestic activities in the study area.

The study area's household water supply is both insufficient in quantity and quality due to mismanagement and population pressure. Ethiopia's water supply and sewerage systems, particularly in the study area, are beset by poor management of the country's physical infrastructure and administrative processes. Issues with scheduling, running, and maintaining are some of these obstacles. Due to the high population density and budgetary limitations of the communities, there are significant issues with the distribution network, demand for water, and low usage of domestic water supplies in the research area (Abebe, 2010).

The objectives of this study are to determine important sources of water supply, gauge household water demand, examine water supply levels, and deal with the actual issues surrounding domestic water supply in the region. Furthermore, the aim of this study is to elucidate the factors that determine household water supply demands in relation to the current water supply infrastructure.

Bibihta Spring, which was created in 1985, is the main source of drinking water for the study town (Ruffino et al., 2022). Although this source has long served as the town's primary source of

high-quality water, it is no longer enough or appropriate to meet the community's present water needs. Despite drilling two additional boreholes in 2015, the town still faces water quality and quantity challenges (Abeje, 2021).

Gimjabet Town is seeing a high rate of immigration-related population expansion, fast urbanization, and minimal investment in portable water supplies. Residents now face water shortages as a result, prompting some to obtain water from unsafe sources or buy it from homes with higher incomes. The population of the town has been growing consistently, which has increased demand for urban infrastructure, particularly for a sufficient supply of water (Akpabio et al., 2021).

1.2. Statement of the Problem

Globally, there are now serious issues with both the quantity and quality of available water (Thu et al., 2022). The means of providing this basic human need in towns and cities, especially in developing nations, provide a difficulty in addition to the limited supply of water. This is because millions of fresh people move here every year without the infrastructure they need. Only 40% of the community is now served by piped water in the study region, which is an inadequate situation. The majority of people obtain their daily water requirements from exposed sources such rivers, hand-dug wells, springs, and rainfall during the wet season. But these sources are frequently dangerous and unprotected, which causes the community to contract a number of water-borne illnesses. For instance, because there is a shortage of residential space in metropolitan areas, traditional hand-dug wells are typically found next to latrine pits and are shallow (8–12 m). The top ten diseases in the study region are water-borne, water-related, and hygiene-related disorders, according to the Gimjabet Town Health Center report from 2023.

Inadequate amount and quality of home water supplies are just one of the problems facing Gimjabet municipality; distribution networks are another. According to the heads of the Gimjabet town Water Supply an Therefore, one of the duties of urban authorities is to provide citizens with potable water.2020; Abduro et al. A lot of developing nations, including Ethiopia, struggle to provide enough water to their citizens. From the tiniest algae to the largest mammals, water is the source of all resources that support life and everything they eat, drink, and can

reproduce (Zhou et al., 2021). Therefore, water is necessary for human needs for a variety of reasons, including social and economic needs (Upton et al., 2020).

d Sanitation (WSS) office, supplying the town's residents with domestic water supply all year round is made extremely difficult by the distribution network. The current piped water supply has a number of issues, including expensive new pipeline connections, high operating and maintenance expenses, and frequent outages.

Many communities are consequently compelled to obtain water from dangerous sources or pay exorbitant fees to illegal merchants and retailers.The town's inadequate water supply has a number of negative repercussions on the local economy and health. Women and children in the study region are most impacted since they frequently have to go a considerable way to get water. Studies on this subject have been carried out in Ethiopia by certain researchers. For instance, a research on the serviceability assessment of Gimbi Town's water supply and infrastructure was carried out by Berhanu et al. in 2023. However, the current study focuses on the potential for and difficulties with clean water supplies. Ayele (2023) focused on determinants in his investigation of the factors that influence the sustainability of home water supplies in Woldiya, a town in northwest Ethiopia. The current paper, however, focused on the evaluation of pure water supplies. In Woreta Town, Tadesse (2023) evaluated the quality of subterranean water sources for irrigation and suggested repurposing agricultural drainage water for irrigation. The use of treated waste water for controlled aquifer recharging in densely populated metropolitan areas—specifically, Addis Ababa, Ethiopia—was investigated by Abiye (2023).

Furthermore, the two researchers (Tadesse, 2023 and Ayele, 2023) mentioned above concentrate on subterranean water for waste water treatment and irrigation. Nevertheless, no research has been done on the potentials and difficulties of Gemjabet town's urban pure water supply. This means that since no research has been done on this particular topic in the study region, the goal of the current research is to fill the gap. In order to evaluate the opportunities and problems associated with urban pure water supply in the research region, this paper was started. To identify and address today's water concerns and to make investments in enhancing the current water supply systems for the future, there must be significant cooperation and engagement from government agencies, non-governmental organizations, and the community.

1.3. Objectives of the Study

1.3.1 General objective

This study aimed at assessing challenges and potentials of urban pure water supply in Gemjabet Town.

1.3.1 Specific objectives

1. To assess the nature of pure water supply in the study area;
2. To identify the major challenges of pure water supply in the study area; and
3. To assess the consequences of pure water supply in the study area.

1.4. Research Questions

1. What looks like the nature of pure water supply in the study area?
2. What are the major challenges of pure water supply in the study area?
3. What are the consequences of pure water supply in the study area?

1.5 Significances of the Study

The major goal is to pinpoint the town's domestic water supply problems, especially for low-income areas that lack access to sufficient and clean drinking water. The investigation's conclusion are noteworthy for a number of reasons: They can provide information about the primary issues facing the town's current water supply system to the Amhara Region's policy-making bodies, particularly the Gemjabet municipality and water supply and sewerage offices. The outcomes can also serve as valuable inputs for future research and the redesign of the town's water supply system, proposing corrective measures for current and future water consumption patterns. Furthermore, this research can contribute to the optimal use of water resources for the town's residents. Additionally, the study can serve as a reference for other researchers investigating the major causes and challenges of inadequate domestic water supply in urban areas in the future.

1.6 The Scope of the Study

The study is conducted on Amhara regional state of Awi Zone, Gimjabet town. The study is focused on the challenges of pure water supply in the study town, specialy in kebeles 01 and 02 out of 6 kebeles of the town. Contextually, the study is focus to assess the challenges and potential of urban potable water supply in Gemjabet town. The research specifically focuses on identifying difficulties in ensuring adequate water supply and determining the town's primary water sources. The sample size is constrained to 6% of the total residential households, which amounts to 184 sampled households from two kebeles within the town. This study considers factors related to temporal changes in water availability, and the current state of water sources in the area.

1.7. Limitations of the Study

Insufficient local studies or materials prevented significant access to water conditions in Gemjabet town, which limited this investigation. Therefore, the researchers had to make do with contrasting the town's water supply with that of other cities. Inadequate funds and time for the investigation posed another difficulty for the researchers. It costs a lot of money, time, and resources to conduct this kind of research.

Moreover, a number of elements, including institutional, social, financial, environmental, and technological ones, play a role in how sustainable water projects are. Acquiring adequate and pertinent primary and secondary data was another major obstacle. A number of government agencies declined to supply the required amount and caliber of information. Additionally, it was difficult to find the essential and pertinent data required for the study because of the offices' poor record-keeping.

1.8. Working Definition of Key Terms

Household: All people living under one rooftop or possessing a different lodging unit, having either guide access to the outside (Shaaban, et al., 2022)

Piped water: is a type of water sources which is designed and protected water supply and used various purposes for community water consumption (Giller et al., 2021).

Safe water: is free from unsafe microorganisms and substances, regardless of whether it might have color, odor, or taste issue because of broken down minerals(Sarpong et al., 2022).

Kebele: the smallest organization of population unit living in town or city in Ethiopia government administration order(Bayou et al,. 2022).

Water demand: water required by the town for household person consumption, creature consumption, business consumption, organization consumption and industrial consumption (Bjornlund et al. 2022).

Water Supply: water used for domestic purpose, industrial, institutional, commercial, public and animals watering in one town or city (Upfold et al.,2021).

1.9. Organization of the Thesis

The study has five chapters. The first chapter consists of the introduction of the paper, statement of the problems, objectives of the investigation, research questions, scope of the investigation, significant of the study, and limitations of the study. The second chapter describes a related literature review on urban domestic water supply. The third chapter explained the investigation of the area (history and background, location, topography, and climatic conditions), materials and methodology which including research design, data sources, and type, data collection techniques and methods of data analysis. Chapter four presents the data analysis and discussions of the findings. The final chapter is focuses on the Conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature

Understanding and forecasting the dependability of water distribution networks requires the use of theoretical models in water supply reliability evaluation. These models take into account a number of variables, including the system's physical elements—such as pipes, pumps, and storage facilities—as well as external variables like population growth and climate. These models can calculate the probability of failures and their effect on the availability of water by modeling different situations.

These models' capacity to examine the stochastic character of failures is one of its main features. This includes taking into account the possibility of equipment failure or problems with the power supply, which might result in shortages of water. Models can assist water management in prioritizing maintenance and investment options to reduce the risk of failures by quantifying these probability.

The capacity of theoretical models to evaluate the financial effects of disruptions in the water supply is another crucial feature. These models can assist policymakers and water managers in assessing the advantages of funding infrastructure improvements or alternative water sources by calculating the cost of water supply disruptions. Overall, theoretical models are valuable tools for improving water supply management. They can help identify vulnerabilities in water distribution systems, prioritize investments, and develop strategies to ensure reliable water access for communities.

2.2 Empirical Literature

A clean water supply has a substantial impact on many elements of human health and well-being, as empirical investigations have repeatedly shown. Reduced mortality rates, especially in children and vulnerable communities, are linked to improved access and lower incidence of waterborne diseases such cholera, typhoid, and diarrhea (Ahmed et al., 2016). Access to clean

water also makes it possible to practice greater cleanliness, which enhances general health and quality of life.

Empirical data also indicates that having access to a clean water source offers financial advantages, such as higher production and lower medical expenses. People, especially women and children, can devote more time and energy to productive pursuits like education, employment that generates revenue, and community involvement when their communities have consistent access to clean water (Farah and Yonis, 2015).

Even with the obvious advantages, many developing nations—including Ethiopia—face formidable obstacles in meeting their population's needs for a sufficient and safe supply of water. Various factors, including urbanization, population increase, climate change, and insufficient infrastructure, provide challenges to guaranteeing that everyone has access to clean water. A diverse strategy is needed to address these issues, one that incorporates infrastructure investments, sustainable water management techniques, and efficient legislative and governance frameworks (Ahmed et al., 2016; Farah and Yonis, 2015).

2.2.1 Urban Water Supply

Distribution of drinking water is an issue on a global scale. The demand for water distribution is expected to rise by roughly 64 billion cubic meters annually due to the approximately 80 million additional people who join the world's population each year (Takada et al., 2022). 54% of people on the planet in 2006 had a piped connection to their home, plot, or yard, and 33% used more sophisticated water sources.

Water is an essential resource for human existence and economic growth. Having an adequate quantity of clean water in metropolitan areas is crucial for the well-being of people in both developed and developing nations (Amondo, Kirui, and Mirzabaev 2022). Accordingly, providing nations with a sufficient supply of clean water for drinking, cleaning, washing, and other uses improves human services by lowering the prevalence of waterborne and water-related illnesses like typhoid, cholera, amoeba, and diarrhea (Dietler et al., 2021). In addition, this reduces the rate of death and morbidity, the quantity of missed workdays, and the level of work proficiency. Reducing the prevalence of illnesses will decrease demand for improved care and

make it easier to equalize the installment problem, which is particularly difficult for least developed countries. One of the most important fundamental resources for the controlled growth of any town, city, or country is water. Improvements in the local water supply management are crucial for the country's financial, social, and ecological well-being. Water supply, sanitation, and hygiene are fundamental needs and human rights (Atube et al., 2021).

A vital natural resource and necessity for humans is water. Every human action is meaningless without access to a sufficient quantity of water, and the right to use other optional sources will be misused. A means of accessing water is a basic necessity and ranks among the most important human rights. People's livelihoods and lives depend on the water (Wilson et al., 2022).

In this sense, safe, clean, adequate, and accessible water sources together with proper hygiene and sanitation are fundamental components of the population's primary health care needs. In line with this, the Ethiopian Water and Sanitation Program has identified a relationship between a decreases in destitution. According to the area program, it is essential to sustainably improve the water supply, cleanliness, and sanitation state in order to reduce excess energy and high time spent in fetching water. Boost the possibility of earning more money by increasing their level of productivity: Lower the cost of social insurance benefits, especially for diseases that are waterborne and linked, including typhoid, amoeba, guardia, diarrhea, and so on. personal satisfaction of the impoverished can be achieved in a number of ways, including limiting household responsibilities and the amount of time spent in fetching water, especially for women and children, improving school enrollment and participation, and improving school hygiene and sanitation.

The Ministry of Water Resources also regarded the additional benefits—particularly the ones that women receive—as the primary advantages of the water plan. These include: -Sparing time and energy, which leads to their participation in other development activities, such as generation, the creation of training plans, and a sufficient and clean residential water supply for drinking, cooking, and sanitation. Consequently, this leads to improved wellbeing and the appropriate kind of open spaces that suit the type of water holder they use (Issahaku et al., 2022).

Therefore, the need for safe, adequate, and readily available urban and rural water supply activities has grown over time, particularly in developing nations due to changing lifestyles,

population growth brought on by normal development, and regional urban migration. In these circumstances, planning for water transportation infrastructure both now and in the future is essential to ensuring that the populace has access to a sufficient supply of local water. Even while only a small portion is actually used for food preparation and other household tasks, the local water supply to homes, businesses, and industry in highly industrialized nations meets drinking water standards (Moshfika, 2022).

2.2.2 Water Supply Reliability Theory

Reliability of the water supply can be described in terms of shortages brought on by physical component failures in a distribution system. The factors that go into determining how reliable a water supply is. They proposed a reliability factor in terms of shortages in annual delivery quantities and created a computer simulation model that was used to assess reliability for particular water supply systems. Reliability factor is a random variable in the system since the electrical power supply and pumping equipment can randomly fail.

The stochastic simulation was conducted repeatedly in order to analyze its random character. This investigation formed the basis of an economic model. The capacity loss during failure, expressed as a fraction for demand rate or demand volume, can be used to create a reliability factor for a single failure or for a predetermined time period. The dependability factor can be obtained analytically from the probability density function of the lost capacity as both the latter and the former are random variables (Moshfika, 2022).

2.2.3. Access of Safe Water

Access is the ability to pay for things with money as well as the detachment, ease, and energy necessary to get the amenities that enhance one's quality of life (Mukhamedieva et al., 2002). The issue of openness also involves the facilities' location within a safe physical reach, their reasonableness, and their legal availability (Robles-velasco et al., 2021).

According to WHO assessments, families founded in low-income regions are more than multiple times more likely than family units in high-income regions of a same country to require access to improved water supply. It has been shown that families earning less than one dollar per day may

be around ten times more likely to require access to improved local water supplies, sanitation, and hygiene than those earning more than two dollars per day (Carlos et al., 2022).

The amount of the population that has access to a sufficient amount of clean drinking water that is located inside a real separation from the customer's home is used to estimate access to the safe water supply. "Access," as defined at the national level by the WHO/UNICEF joint checking modified, is understood to mean actual use by the populace. Water supply access in an urban area that is no more than 200 meters away from homes to an open stand post may consider functional water access. Access to rural areas shows that a man does not have to spend unequal amounts of time fetching water, depending on the demands of the family. According to Ghernaout (2018), the practical access must be approximately 20 liters per person per day from a source that is separated by less than one kilometer from the customer's family units. Even though safe drinking water cannot contain calories or natural additives, it is essential for human health and the health of other living things on the planet. In addition to improving overall population health and well-being, a safe drinking water supply is crucial for determining death rates, life expectancy, and efficiency. However, the majority of people living in urban and rural communities lack access to a safe and adequate supply of drinking water (Rumalongo et al., 2017).

A plentiful and hygienic source of drinking water provided by home associations, such as shared or private backyard associations. Not only do these residential communities have poor access to a consistently open drinking water supply, but when water is available, there are risks of pollution due to a variety of factors, such as irresponsible wastewater and solid waste transfer and a lack of adequate water supply infrastructure, such as pipelines for water distribution systems (Eytan and Dorothee, 2018).

According to Asgedom (2014), access to safe water is defined as providing the general public with functional access to an adequate supply of clean water, including treated surface water and treated groundwater as well as uncontaminated water from sources like springs and boreholes. An adequate amount of water is required to meet daily needs for local sanitation, sanitary practices, metabolism, and hygiene—roughly 20 liters of clean water per person. This minimum quantity, however, varies depending on whether the location is rural or urban, as well as the temperature and atmospheric conditions surrounding the areas. This is the reason why the Africa Water Development Report of

2016 stated that 20 to 50 liters of safe, clean water should be provided daily to each individual. Since having access to water is necessary for human well-being and employment, the MDG objective for improved water quality is detailed. Basic sanitation and hygiene are also widely seen as vital components of economic and social development, as well as human rights (Ahmed et al., 2016).

The need for better and safer drinking water supplies, appropriate hygiene and sanitation practices, and access to water for other household tasks is greatest for the impoverished residing in rural and peri-urban populations (Chalchisa et al., 2017). According to a 2016 WHO report, around 1.8 million people worldwide die from diarrheal infections each year as a result of contaminated drinking water supplies.

2.2. 4. Domestic Water Supply

According to Arturo et al. (2017), domestic water supply is defined as water used for all residential needs, such as drinking, cooking or preparing meals, washing, taking a shower, cleaning, and sanitation. A set amount of water needs to be available for each of these residential uses. In any case, it is difficult to determine the clearest minimum amount of water needed for each home activity. A basic amount of water is needed by the human body to maintain manageability. the requirements for the water supply's roundness for each of these uses, not only those related to water use. While this broad definition provides a framework for residential water consumption when assessing needs, it is less useful when addressing the quantity of water needed (Kefale et al., 2014). In addition, as UN-Habitat has clearly shown, a family is deemed to approach improved drinking water on the off chance that it has an adequate amount of water—20 liters per capita per day for family use—at a reasonable cost that is less than 10% of the total amount that families pay, accessible to family members without being subject to—mainly to women and children—to what is rapid of what one hour daily for the base adequate amount (Akkaraboyina and Adem, 2018).

The indicates that over 1.5 million people die each year due to inadequate and unsafe residential water supplies, leaving approximately 2.6 billion people globally without access to basic hygienic and sanitation conditions (Ahmed et al., 2016). The majority of those affected are from East and Sub-Saharan Africa. Only 60% of urban and local areas in Africa have access to proper sanitation.

Domestic water supply is fundamental in a number of ways, including the provision of water for households and the lucrative application of their development from an economic and social perspective (Feleke et al., 2018). A sufficient supply of potable water, especially for domestic use, is often used to accurately estimate the population's state of health care and economic development. An unwavering public supply of clean, fresh water is essential for meeting the needs of the country's people and economy. Women and children, in particular, benefit from a steady supply of potable water (Aynalem, 2015). Individuals, households, businesses, and industries all depend on a substantial quantity of reasonably priced, drinking water (Rathnayaka et al., 2016).

According to the Joint Monitoring Program (JMP), which was established in 2016, Ethiopia's local water supply has an impact on people's health, education, and generation, which prevents the nation from developing in a number of ways because large numbers of people continue to drink and use potentially dangerous local water sources (Kumar and Desta, 2018).

2.2.5 Domestic water supply in developing country

Expanding access to a sufficient and secure household water supply together with water resource management and development in both urban and rural regions is one of the core concerns of the Millennium Development Goals (MDGs) (Dagnew et al., 2017). Water used for drinking, cooking, and showering in the home is referred to as household water. As to the United Nations World Water Assessment Program, it is a widely acknowledged fact that water is not distributed equitably around the globe (Mactaggart et al., 2018).

These African nations are rich in shared water resources, but due to their large populations, rapidly growing cities, and lack of access to a safe, sufficient, and drinkable water supply before it became available, there are political and regional issues that call for improved distribution of these water supply administrations. This situation, along with the city's surrounding areas' rapid and unrelenting population growth, has forced it to respond appropriately and favorably to requests for urban household water supply management as soon as possible (Farah and Yonis, 2015).

2.2.6 Major challenges of the pure water supply

One of the main problems facing the distribution system is the lack of access to a clean and safe water source. Water-related problems affect people in both urban and rural areas, but women and children are disproportionately affected because they have to spend more time, energy, and productivity fetching water from a distance for their families. Water-borne diseases have a negative impact on women's productivity and participation in social and political concerns in the research region, as women and children are disproportionately impacted.

2.2.7 Sources of Drinking Water in Developing Countries

Water supply has not been an issue in industrialized nations, either in urban or rural areas. Water treatment facilities have been used sufficiently to ensure people's health; for instance, drinking water is possible (Hassan et al., 2016). As a result, industrialized nations have very low rates of medical problems caused by illnesses that are waterborne or related to water. However, people are forced to use conventional water supplies from unprotected and untreated sources in developing nations, which is having an impact on community health. As a result of the contaminated drinking water supply, thousands of people continuously die. In this manner, it is not considering the quality parameters together with natural quality in connection to sources of water. Anyhow, the origins of urban domestic water supply in developing countries are rainwater, river, spring, groundwater, surface water, and traditional hand dug well water (Marson, 2016).

2.2.8 Water Supply and Sanitation Policy in Ethiopia

Ethiopia has twelve notable rivers that yield an annual flow of 122 cubic meters of water, with an estimated 2.6–6.5 billion cubic meters of potential groundwater (Kumar and Desta, 2018). As a result, each person has access to an enormous amount of water annually, which is equivalent to a typical of 1575 cubic meters. However, as mentioned previously, due to the geology and topography of the nation, as well as differences in global and regional rainfall patterns and a lack of capacity, water is not sufficiently available when and where it is needed (Adane et al., 2017). A portion of the important standards of the planning by Water Resources of Ethiopia are creating possession to bring down levels and upgrading administration of self-rule to the most reduced measurement, advancing inclusion everything being equal, including private part. The ultimate goal of Water Resources of Ethiopia is to accomplish critical financial improvement on the supportability base of the nation.

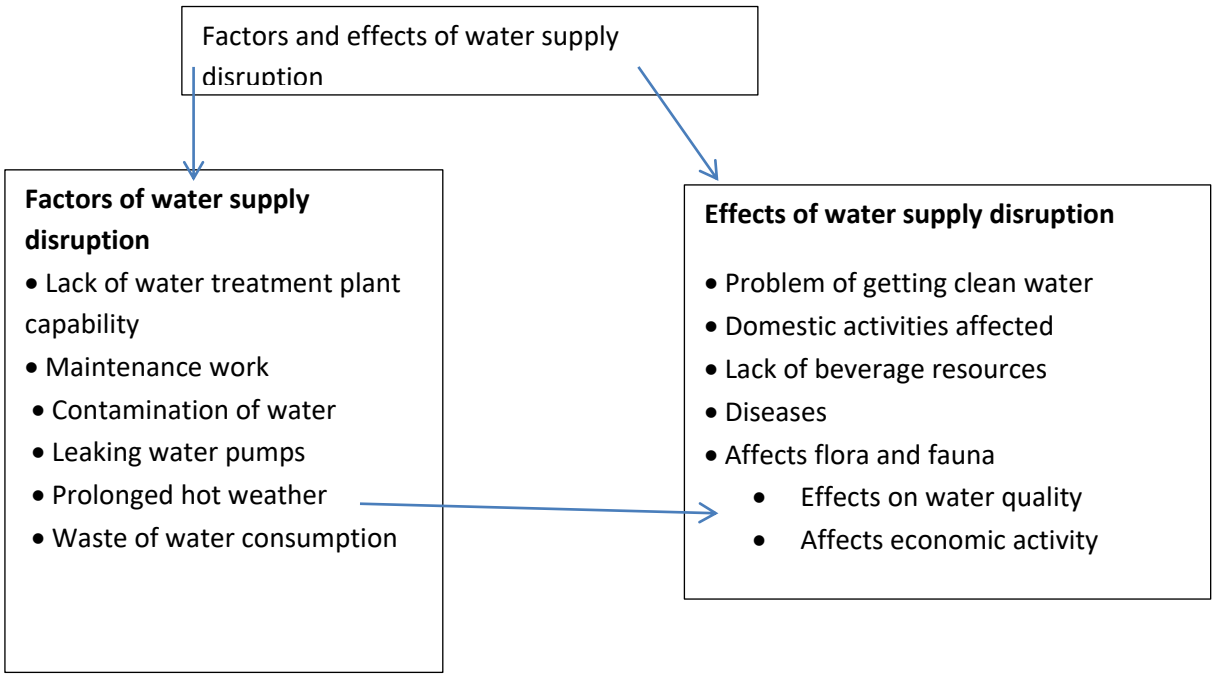

Figure 1. Conceptual framework (from related literatures)

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the study area

3.1.1 Location

The study area, Agew-Gimjabet town, is situated in the Awi Zone, in the northwestern highlands of Ethiopia. It is located 420 kilometers northwest of Addis Ababa at 10°51'-10 ^{0} 58'N and 36°54'E-37 ^{0}09' (Figure 2). The town covers 627 hectares of land at an altitude of 2320 meters above sea level on a basaltic plateau in Ankesha Gugusa Woreda (District). The entire size of the woreda is measures 1029.24 km2 area between 1800-2900 meters above sea level elevation ranges. The main climatic zone is Woina Dega (sub-tropical). The average yearly temperature and rainfall values range between 15-20°C and 1000-2000 mm, respectively. Three discrete rainfall periods (summer, autumn, and spring) are experienced in the area. Summers are characterized by high rainfall spells, whilst autumns and springs are characterized by modest and slight rainfall events, respectively (CSA of Awi zone, 2015).

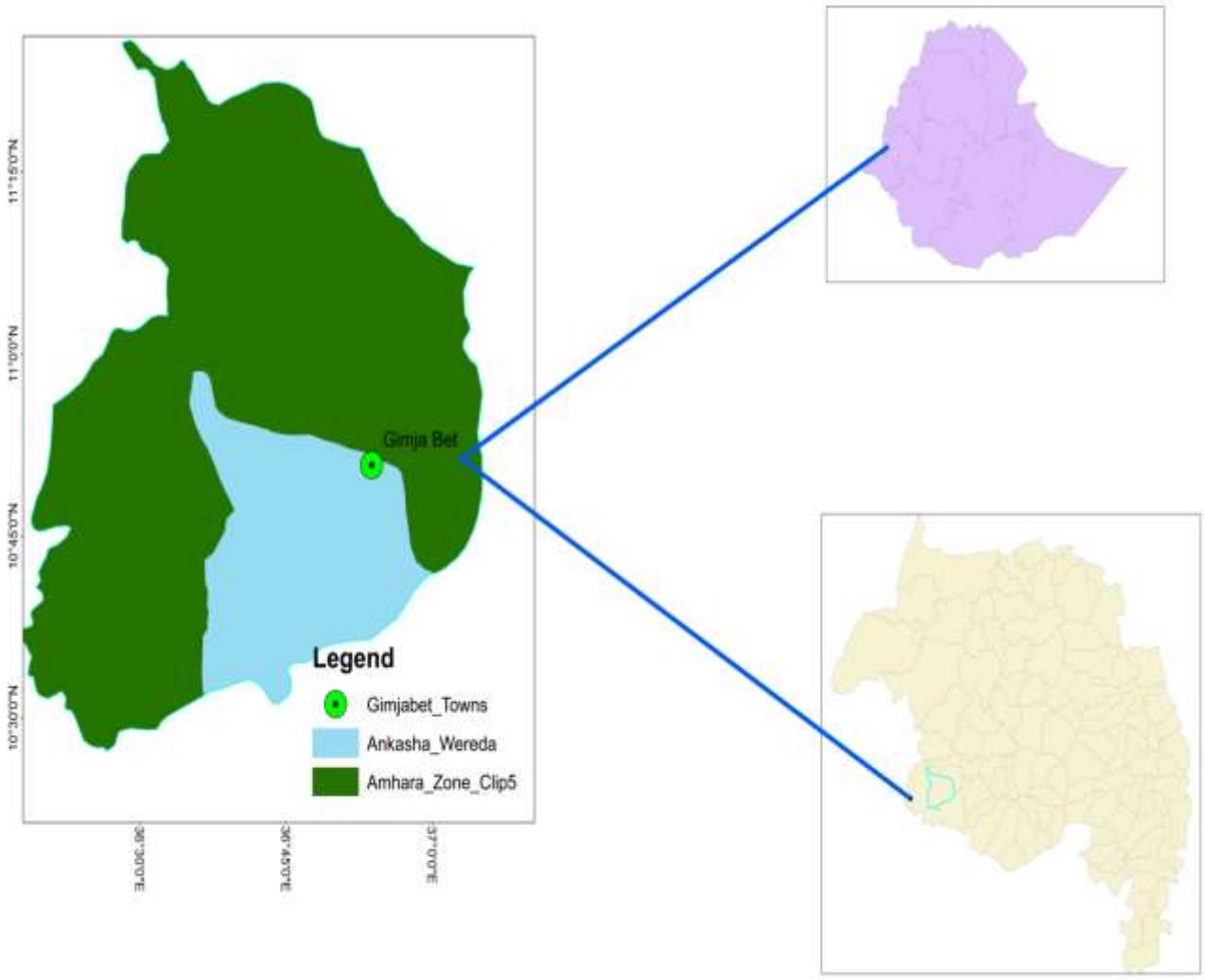

Figure 2 Map of the study area

Source: Drawn using Arc GIS

3.1.2 Population of Gimjabet Town

The population number of Gimjabet town is huge compared to its area and investments of infrastructures, like domestic water supply. The number of people in the study town is expanding rapidly because of moving from rural to urban and pre-urban to urban and also regular population increment inside the town. The total numbers of population in 1994 and 2007 Central Statistical Agency (CSA) of town has 5129 and 21065 respectively and furthermore as now in 2015, 2016, 2017 and 2018 are 35846, 39654, 41735 and 43777 respectively. This shows rapid growth rate of town population year to year.

3.1.3 Existing Water Supply

Gimjabet Town's main supply of water comes from springtime. The spring source was discovered in 1985 and is locally known as Bibhita Spring. The spring, which is located west of the town limit, has a 9 liters per second discharge rate and was constructed by the town government and water office to enhance this source of water. The spring's water is gathered in a collection chamber measuring ten cubic meters, pumped into a reservoir made of stone masonry that holds seventy-five cubic meters, and distributed to users via gravity. Customers receive their water through public points, yard connections, shard connections, and residential areas. The main problem with the current situation is the lack of water. According to data obtained from the water supply office during the specialist's information-gathering visit, all of the households are unhappy with the quantity of water provided, even though they all believed the quality to be good. In addition, the amount of water provided is inadequate for all commercial and hotel establishments.

Improved domestic water supply comes from secondary sources such small springs, rivers, and conventional hand-dug wells. Currently, there are two additional boreholes that are operational; they were built in 2014 and 2015. The cumulative discharge rate of these boreholes is 36 liters per second, or 18 liters per second in a single release. 45 liters per second are released by the spring and the two boreholes combined. Due to the quantity and quality of the water available, the study town's current water supply is currently insufficient for the population. Due to the fact that the town's population does not correspond with supply and demand, the water supply system is intermittent; low-quality, three- to four-day water is delivered for five to six hours each week.

3.1.4 Climate

Based on the metrological data obtained from the National Metrological Administrations Agency, the study town experiences a maximum of 1813mm of annual precipitation and a minimum of 38mm of monthly precipitation. The lowest monthly temperature is 26^0C, and the highest extreme temperature ranges from 25 to 30^0C. According to the Meteorological Organization (2018), February through April has the highest temperatures, while December and January see the lowest. The climatological organization identifies Gimjabet town as having a "Dega" Temperate Rain atmosphere.The district's greater temperature is 28.990c, while its median temperature is 11.270c. The woreda experiences slightly bi-modal rainfall, with a brief spring rainy season in March and April and a longer summer wet season in June, July, August, and September. Annual rainfall in the district, which covers a large region, ranges from 1,300mm to 1,700mm (Agricultural office of Gemjabet town).

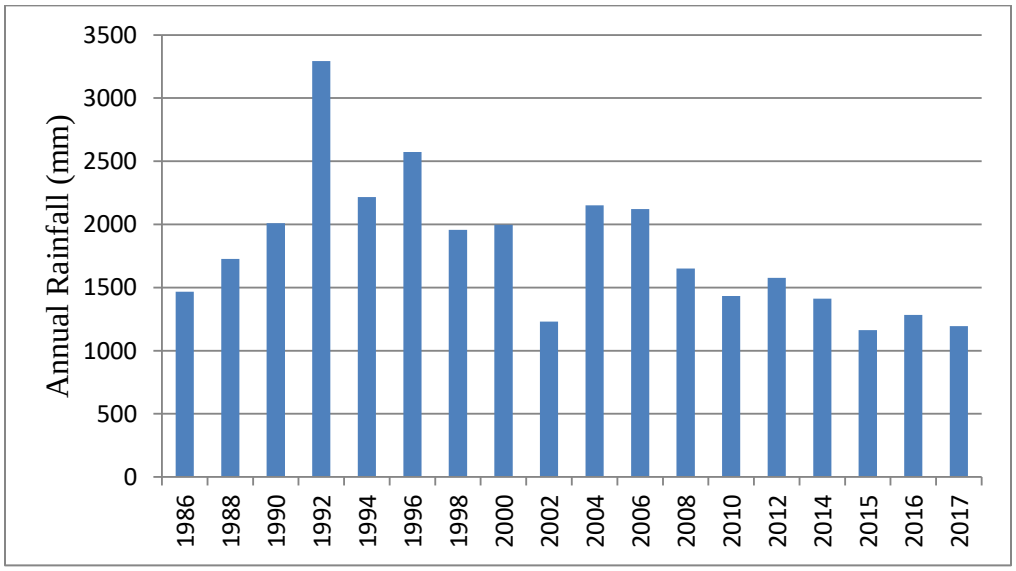

Figure 3.Total annual rainfall of woreda (1986-2017)

Source: National metrological agency (2022)

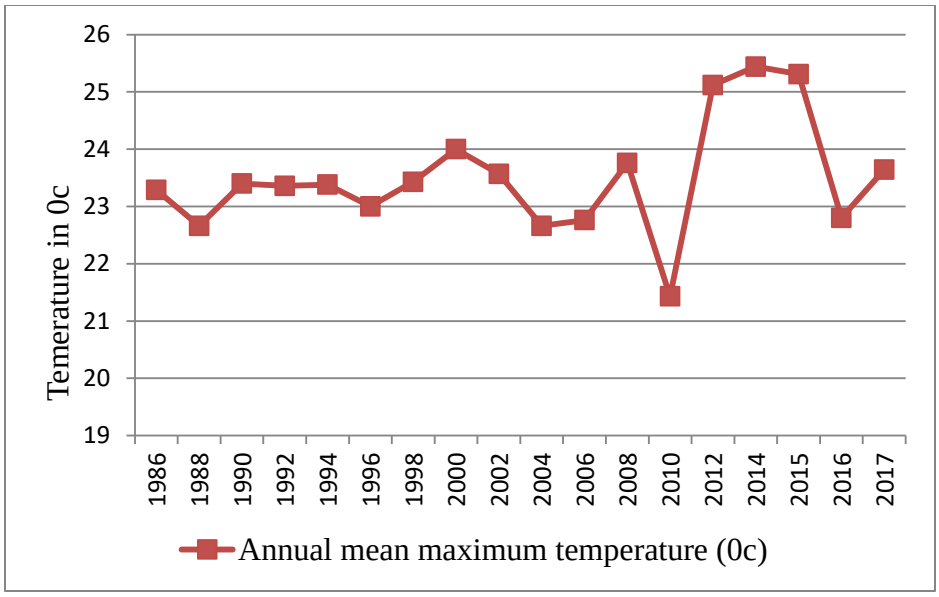

Figure 4.Annual mean maximum temperature of woreda (1986-2022)

Source: National Metrological Agency (2022)

3.2. Methodology of the Study

3.2.1. Research Design

Descriptive survey design was used for this study. This is because descriptive survey research is the type of research that gives the pictorial account of behavior of situation (Neeru, 2012) since the topic of this research studies the internal psychological and physiological impacts of the study area related to water supply.

3.3 Data Source and Type

There are two types of data sources for this study. These are primary and secondary data sources, which are collected from different sources, such as sampled households and some selected offices.

3.3.1 Primary data sources

Primary data are collected from sampled households, the total amount of sampled households are 5%. The total households of the town were used as a sampling frame. The total numbers of sampled households are 184. Institution and organization: governmental association and

organizations, for example, health center, different education organization, administrative school and hospital adminstraters, were interviewed using unstructured questionnaires. In addition to this, private institutions were also interviewed.

3.3.2 Secondary data sources

Secondary data was collected from related sources of the study, for example, books, published journals, papers, yearly report documents, plans of town, and other related materials were gathered with applicable quality.

3.4 Sampling Size and Sampling Technique

Sampling technique helps to draw inferences about the population from which the sample is drawn. It also helps to understand the characteristics of the population by examining only a small part of population. These sample size and the sample selection process or procedure should assure the representativeness of the population. Sample size determination has its own scientific approach and by taking different factors into consideration such as time, research cost, human resource, topography, environmental condition, accessibility and availability of transport. As a result, 184 sample households were included in the study.

A systematic random sampling system was used to choose the representative sample from a total population of study town and total households of the town. This method is better because utilizing the whole population and households of the study town is impossible. Because the total numbers of people and households are huge. Therefore, the sample was determined as 184, which were chosen by simple random sampling techniques.

The sample selection method employed a simplified formula provided by Kothari, (2004) to determine the required sample size at 95% confidence level and with 0.05% level of error.

$$\mathbf{N} = \frac{Z^2.p.q.N}{e^2.(N-1)+z^2p.q}$$

Where N =Size of total population =3030

n = size of sample

e = acceptable error (0.05)

z =standard variant a given confidence level (1.96) 95% confidence

p = (0.05) population proportion

q = 1-p (1-0.05=0.95)

$$n = \frac{1.96^2 x\ 0.05x0.95x3030}{0.03^2(3030-1) + 1.96^2\ 0.05x0.95} = 184$$

The required sample households of each RKA (n) were then calculated using the Formula:

$n1 = \frac{N1}{N}(n)$ n1=size of sample each rural Kebele

N1= Size of population each rural Kebele

N =Size of total population

n = size of total sample

n1=1001/3030 x184 = 61 (kebele-one)

n2=2029/3030x184 = 123 (kebele-four)

Table 3: Simple allocation from the sampling unit

No	Kebele Administration	Total households	sample size
	02	1001	61
	01	2029	123
	Total	3,030	184

Source: Gimjabet Town Administration Office, 2022

3.5 Data Collection Methods

The method of data collection for this study are questionnaires, interview, field observation, group discussion and written document analysis related to the aims of the study.

3.5.1 Questionnaires

Both open and closed-ended questionnaires were prepared to collect data. Depends on the purposes of research and previous study which are related to this study, about the availability of domestic water supply in study town. To accumulate the proper data about the issues under study, questionnaires were distributed to sampled households. Then the selected respondents and some offices used to collect relevant and solid data. Questionnaires were first prepared by English language and translated into Amharic language. This is because to make questions accessible and understandable for sampled households and chosen respondents of the town community. This was done purposely for simplicity, acceptability, and decrease of duplication of ideas during data collection time.

3.5.2 Interview

Semi-structured and structured interview were produced and used to create applicable information. The explanation of semi-structured interview was used to create favorable conditions, in which new question was forwarded during the interview. The interview was commanded with Amharic language to avoid language obstacle and was supported by sound recorders for reducing losses of sound data. The recorded information was divided based on similarities of reactions and then converted into English language for interpretation. This was to get significant and more solid data from sampled households.

3.5.3 Field observation

Field observation is taken for the requirement of getting viable data on the existing domestic water supply of the study town.

3.5.4 Focus Group discussion

Focus group discussion is used to produce appropriate data in two contextual analyses; men and women focus meeting. Conversation on selected discussion is conducted associated to the domestic water supply of the town, for example, water supply production, quantity, quality, availability, water fee and water-borne diseases on town communities.

3.6 Methods of Data Analysis

After completing the data gathering process, the data were coded, arranged, explained, and interpreted using various techniques such as percentage calculations, tables, figures, frequency analysis, and rank requests. Both quantitative and qualitative methods were utilized for data analysis.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1 Socioeconomic and Demographic Characteristic Of The Sampled Respondents

The majority of the information in this part comes from questionnaires, field observations, group discussions, and document analysis. These data and findings were primarily concerned with the features of the sampled homes and a few chosen offices in relation to the state of the domestic water supply services in the research area.

Table 4: Demographic characteristic of the sampled respondents

No	Variables	Category	Frequency	Percent
1	Age	20 -30year	55	29
		31-40year	45	24
		41-50year	40	22
		51 year and above	44	23.9
2	Sex	Male	62	34
		Female	122	66
3	Marital status	Single	**25**	13.5
		Married	**40**	22
		Divorced	**74**	40
		Widowed	**45**	24
4	Household size	1-3	24	13
		4-6	76	41
		7-9	44	23.9
		10 above	40	22

5	How long have you lived in Gimjabet in year	1-5	55	29
		6-10	65	35
		11-15	34	18
		Greater than 15	30	16

Source: Household Survey, 2023

Table 3: Socio – economic characteristic of the sampled respondents

No,	Variables	Category	Frequency	Percent
1	Educational status	Illiterate	65	35
		Grade 1 - 4	30	16
		Grage 5 - 8	20	11
		Grade 9 - 10	64	35
		Grade 11 and above	10	5
2	How long have you lived in Gimjabet in year	1 - 5	55	29
		6 -10	65	35
		11 - 15	34	18
		Greater than 15	30	16
3	Monthly Income	Less than 800ETB	22	12
		800-1600ETB	45	24
		1601-2200ETB	33	18
		2201-3000ETB	76	41
		Above 3000ETB	8	4

Source: Household Survey, 2023

4.2 Potential of pure water supply in the study area

The town center and the vicinity of the official residences in two kebeles contain the majority of the town's prospective pure water supply services. Forty percent of the towns total communities are served by this water source. According to the town's WSS office's official records, the figure is raised yearly. The town's piped water supply has not been used by most residential units. They have access to a number of alternative sources from which they can receive the water they require for daily use, such as privately owned wells that are typically dug by hand, springs, rivers, or merchants who use kareta to gather water from neighboring rivers or springs. This result is consistent with a study made by Birhanu (2022) at Woldiya town, who founded as the town community got its water from distance springs other than pipe.

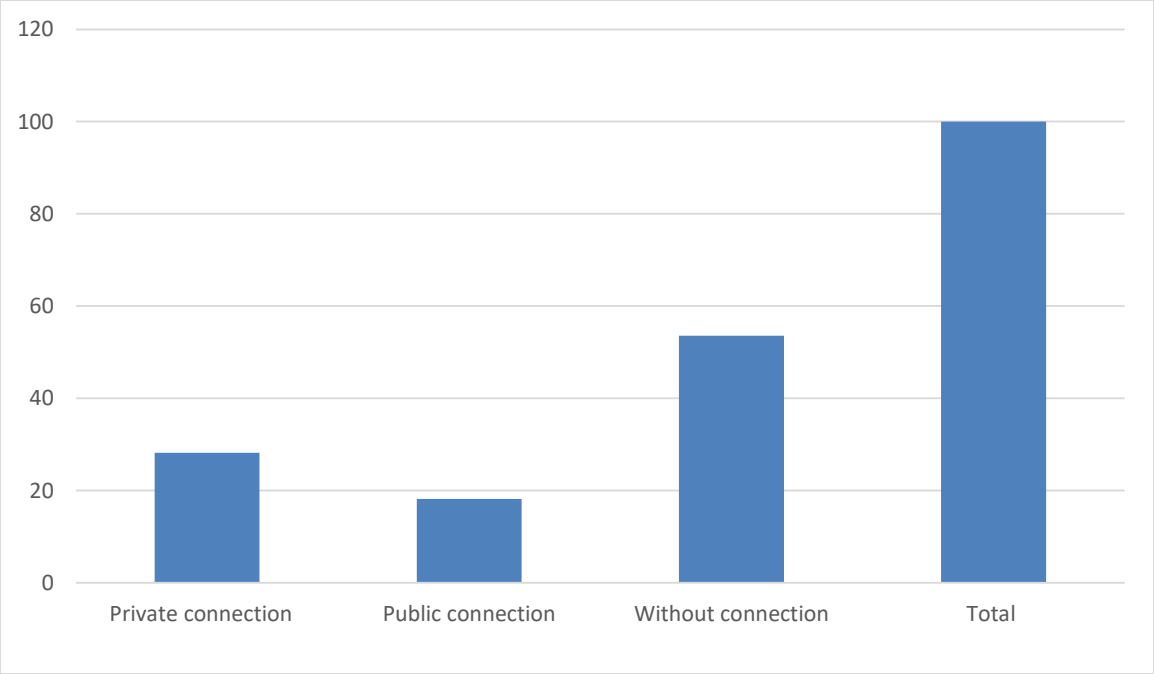

Figure 5.Potential of pure water supply in study area

Source: Household survey, 2023

The goal of expanding the pipeline system is to offer enough clean water to the community. The amount of pipelines surrounding a community, its socioeconomic standing, and the topography of the town all have a role in influencing the productivity of water demand. The two biggest issues are the inadequate distribution of the water supply and the scarcity of water bono for the local community's low-income residents. The majority of local residents don't have enough pipeline surrounding their homes. These factors cause them to travel great distances in order to fulfill their daily needs for various household chores, which costs them time and energy every day of the year. Key informants indicated that among the issues were inadequate water supply coverage and a lack of guidelines on pipeline distribution network density. The majority of the selected homes report that the present distribution pipeline network is illegally laid, with the majority of the pipelines located in the town's center and older neighborhoods. Furthermore, the majority of pipeline distribution networks are located near government residences, as well as in some commercial and private establishments, non-governmental organizations, and governmental sectors. For these reasons, it is exceedingly challenging to line individual pipeline connections for low-income areas. When compared to the entire population or number of

households in the town, the number of people using private meters and house meters for piped water supplies is often quite small, although it is steadily rising throughout the year. The study contradicts the conclusions of Ayele et al. (2023), who established that the majority of pipes in the Dire Dawa municipal administration are built near residential areas.

4.3 Challenges Related With Water Supply and Delivery In The Town

One of the main problems facing the distribution system is the lack of access to a clean and safe water source. Water-related problems affect people in both urban and rural areas, but women and children are disproportionately affected because they have to spend more time, energy, and productivity fetching water from a distance for their families. As a result, water-borne illnesses plague the communities in the research area, which has reduced their production. These difficulties are listed in figure 5 below.

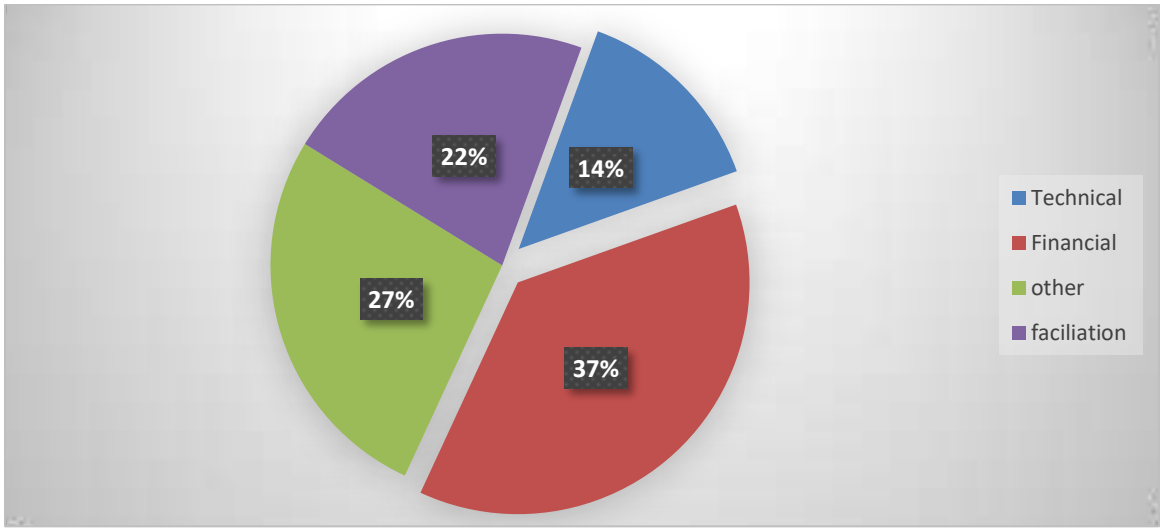

Figure 6.Challenges related with water supply

Source: Household survey, 2023

The majority of the selected homes reported that the town's WSS and community offices' financial constraints were the main cause of their problems with the town's water supply. This is the reason that every year the quantity and quality of the water supply are insufficient. This suggests that the town's household water supply providers are having difficulty providing enough water in both sufficient quantity and quality for the entire community. After conducting a field investigation and interviewing key informants, the two main concerns affecting the town's water

supply efficiency are financial and technical in nature. These difficulties have been recognized as the main causes of the town's water scarcity.

In addition, there is a dearth of qualified labor to address these issues. In addition, the town's landscapes are intricately designed to create superior water supply services. Water balancing or pressure breakdown mechanisms are needed, and distribution pipelines are affected by the water pressure as a result.

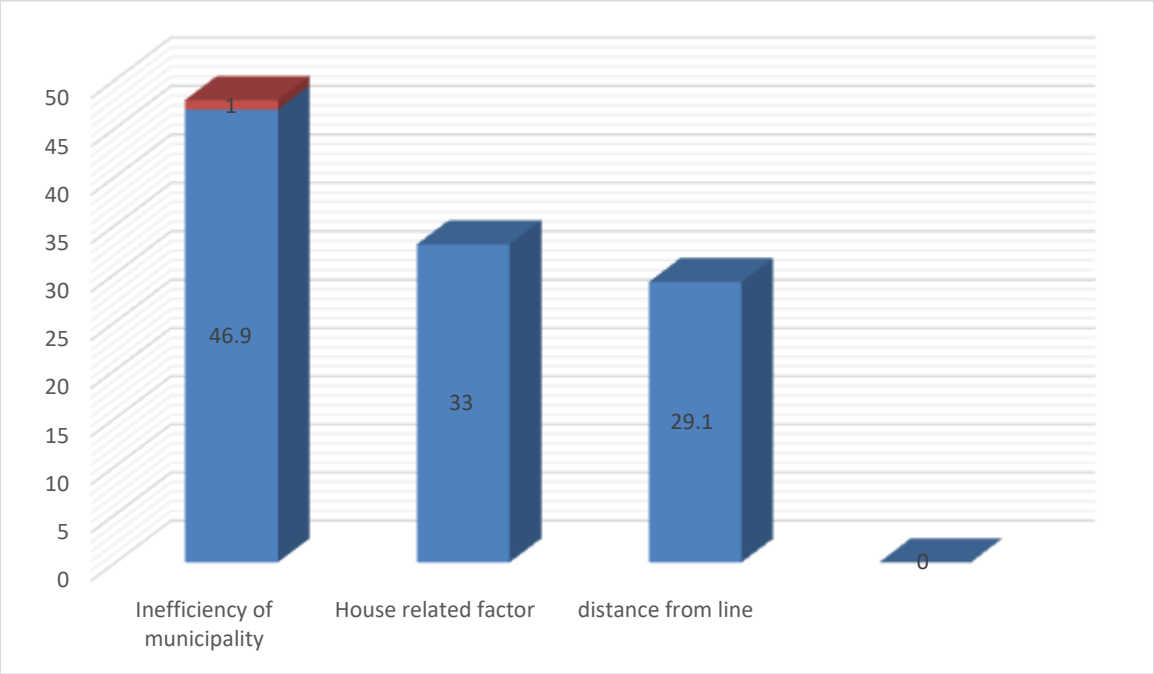

Figure 7.Challenges Related with Water Supply and Delivery

Source: Household survey, 2023

Item three from Figure 7 shows that 29.1% of sampled households are unable to use the pipeline water supply because it is very far from their home to the main pipeline around their villages; 33% of sampled households were unable to use the pipeline because of issues related to their homes; and 46.9% of sampled households are unable to get the pipeline water supply because the municipality is ineffective at resolving issues related to the town's inadequate water supply. Nonetheless, a significant portion of the households in the sample reported that their inability to pay for the pipeline connection was the reason they weren't using a piped water supply system. Some of the tested homes identified the inefficiencies of the municipality in addressing the

town's water supply issues as being related to the pipeline water supply. In addition, the town struggles with managing the master plan effectively. Every season, this condition results in regular disruptions to the town's water supply. The result is consistent with a study made by Amondo et.al. (2022), who founded that poor urban management system adds misery in social service infrastructures mainly water and electricity at Uganda town.

4.3.1 Dissatisfaction of households on Water Supply

The informants define a water supply as having access to at least 20 liters of drinkable water per person per day, having a maximum distance of 500 meters between the sources and the home, and taking no more than 30 minutes to collect water for a round trip. According to UNDP, a person's daily water requirements should not exceed 50 liters, of which 5 liters should be used for drinking, 20 liters for cleaning and sanitation, 15 liters for taking a shower, and 10 liters for cooking. However, there is not enough water in the study area to meet the needs of all domestic activities. As a result, they lose more than 45 minutes collecting water each day for various domestic activities and are unable to gate an adequate quantity and quality of water supply for their needs each day. According to this result, it is more difficult to wastefully transport the benefits of the arrangement water supply in the town. The new growth area of the town is completely devoid of water supplies.

Table 4: Reasons for dissatisfaction of the sample households

No	Reasons for dissatisfaction	Rank	Frequency	%
1	Pipeline connection problem	1st	72	39
2	Water interruption	2nd	50	27
3	Distance of main pipe	3rd	30	16
4	Poor quantity	4th	13	8
5	Unskilled worker problem	5th	10	5
6	Poor quality	6th	9	4.8
	Total		184	100

Source: Household survey, 2023

Table 4's survey results indicate that pipeline connection issues, which accounted for 39% of the survey respondents' discontent with the water supply, water interruptions (27%), and the distance of the main pipe (16%) were the top three constraints in the research area. In addition, a significant obstacle to the water supply in the research region is the main pipe's poor quality and distance.

4.3.2 Causes of Water Supply Shortage in the Town

The research town's water scarcity is caused by numerous issues. The results of the interviews with sampled households indicate that factors such as population density, the type of landscape, the rate at which cities are expanding, water interruptions, seasonal variations in the climate, changes in the financial status of the population, and the way that people use water resources all contribute to water scarcity or insufficiency. These factors are causing daily increases in water usage, which in turn is causing a shortage of water supplies from the study town to meet varied domestic demands. Rapid population increase is having an impact on the water supply distribution system and creating new job opportunities for WSS office staff, such as fixing pipeline breakdowns caused by high water pressure during peak hourly flow. The outcome is in line with a study conducted by Abiye (2023), which found that pollution and a lack of water supply in South African municipalities increase with population strain on a restricted piped water supply. Table 4 below lists the causes of the water scarcity in the research town for this paper.

Table 5: Causes of Water Supply Shortage in Town

Variables	Frequency	Percent
Finical matter	24	13
Rapid rate of population growth	80	43
Frequent bursting pipeline	36	20
Water power problem	44	24
Total	184	100

Source: Household survey, 2023

Table 5 shows that 13% of sampled households explained that financial matters were the reason for the town's water supply shortage, 43% explained that the town's water supply was scarce due to rapid population growth and cited this as a problem. 20% of sampled households explained that the study area's water supply shortages were caused by periodic pipeline bursts in the distribution network due to various factors, and 24% mentioned that the study area's water supply was scarce due to fluctuations in water power on distribution networks. The majority of the tested households did, however, attribute the study town's water supply constraints to the town's fast population increase and frequent distribution network explosions. Because of the influx of people from rural to urban and from suburban to urban areas, the population of towns is growing quickly. The town's water shortages are mostly caused by poor network pipeline quality, high water pressure that simultaneously increases the town's peak hourly demand, and a lack of water pressure breakdown at various distribution network locations. Two more significant factors contributing to the study town's water scarcity are seasonal shifting and interruptions in water use.

4.3.3 Other constraints to water supply

According to item two of figure 5, 8.7% of sampled households reported that the town's water supply had interrupted for two to three days during the month; 11.9% of sampled households mentioned that the town's water supply had failed for at least four to five days during the month; 32.2% of sampled households reported that the water supply had interrupted for six to seven days during the month; and 47.2% of sampled households reported that the water supply had interrupted for more than a week during one month throughout the year. The majority of the sampled households explained that the town's water supply was interrupted more than once a week during a month of the year, with the degrees of interruption going up in order from 2 to 7 and more than one week in a month, respectively.

The majority of the time, the study town experiences water interruptions due to a variety of issues, including a lack of trained labor to quickly and easily resolve the issue, a shortage of generator oil and daily electricity, and a shortage of water at the sources to keep up with the town's rapid population growth. This results in daily water supply problems in the study town

throughout the year, and it is difficult to resolve these issues quickly because they call for large sums of money and highly qualified labor.

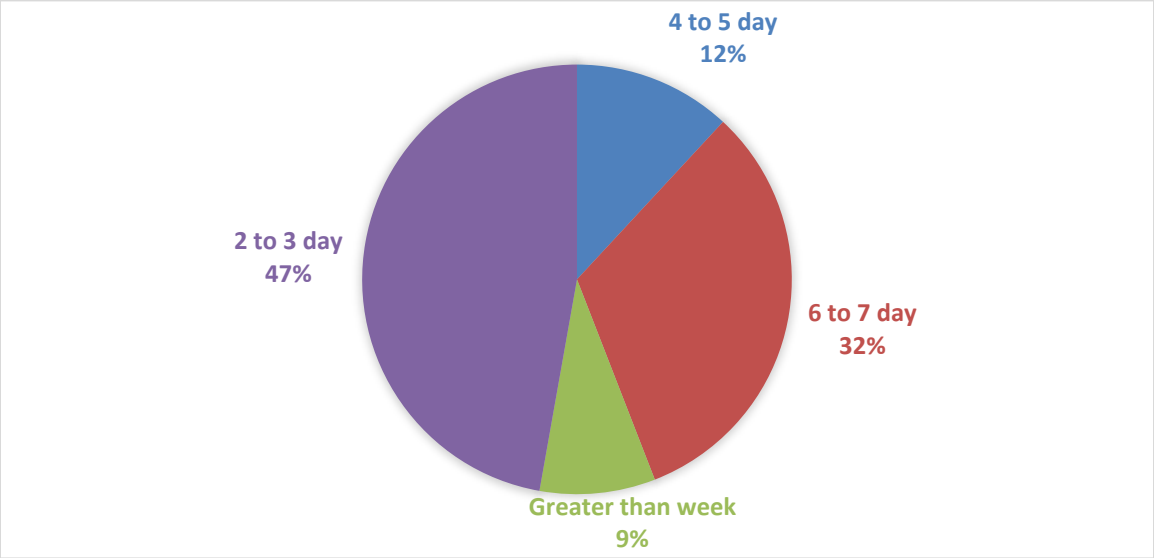

Figure 8. Other constraints to water supply

Source: Household survey, 2023

Based on the aforementioned data, 1.2% of the houses in the sample were able to provide an explanation for why the water office was unable to resolve the stoppage of the town's water supply: the occurrence of newly organized offices. On the other hand, 19.7% of the sampled families cited the lack of attention paid by the chosen individual who was tasked with handling the difficulties. Furthermore, the lack of involvement by NGOs in identifying and resolving issues related to the municipal water supply was cited as the reason for 54.1% of the examined

homes.

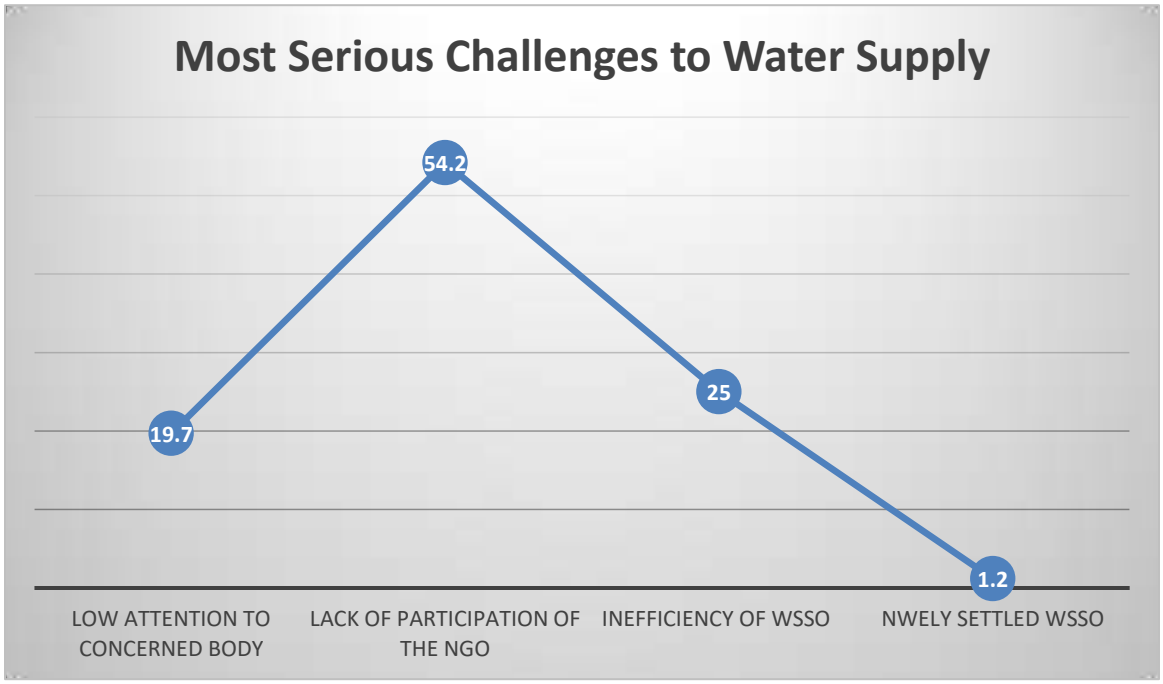

Figure 9: Most serious problem to water supply in the study area

Source: Household survey, 2023

According to the head of the water office, the town's complete lack of water supply and interruptions are caused by a lack of funding as well as a failure on the part of governmental, non-profit, and private institutions to provide the necessary supplies and trained labor. This is the reason why there is always a water supply interruption.

4.4 Most important sources of domestic water supply in the town

Table 6 shows how sampled households were informed about daily taped water access for domestic consumption, how scarce town water supplies are due to population growth, how 93.5% of sampled households were informed that the supply of water is not commensurate with daily demand, and how 59% of sampled households stated they would be willing to pay whatever amount of money to improve the current urban water supply.

Table 6: Water consumption in study area

Variables	Response	Frequency	Percent
Do you get daily taped water access for your domestic consumption?	Yes	84	46
	No	100	54
Is supply of water proportional with your daily demand?	Yes	12	6.5
	No	172	93.5
Are you willing to pay any amount of money to improve the current water supply?	Yes	109	59
	No	75	41

Source: Household Survey, 2023

Therefore, in order to reduce these kinds of issues from a few segments of the town's population and distribute water equally among all residents, the town's water and sewerage office must implement a shifting system of water supply. Either way, there are advantages and disadvantages to the water supply exchange system. Its principal benefit is that it exchanges the time at which water flows from each portion of the town to make up for any inadequacies in water supply. This is especially beneficial for places without piped water supplies, which may only have access to them a few days a week at most for drinking.

Furthermore, raise community knowledge about the importance of gathering enough water for daily needs till transitional periods. Its demerit goes to some community, for whome that uses alternative sources from water venders buying by high cost and other use unprotected sources because during their turning time water interruption may be happened. Moreover, the most ideal arrangement of water supply to meet such a developing necessitate will be during extending the quantities of pipe lines with proficient arrangement of distribution by taking thickness of the population into thought and separation between stand channels during designating water points and sufficient demand from the sources. Under such circumstances, it is essential to mobilize the populace, CBO, and self-improvement groups that can assist in the establishment of public water points by laboring and contributing money or materials to improve the better public water points from various parts of the town to remedy the scarcity of water supply.

Figure 10: Alternative water sources of the town

Source: Field Survey, 2023

4.4.1 Consequences of Insufficient Water Supply Condition in Town

The study Town's women and children were primarily responsible for searching for and gathering domestic water to address the town's water shortage issues. Occasionally, husbands would also gather water when their wives or children were sick and they were near water sources.

Figure 8 illustrates the study town's consequences for its inadequate water supply.

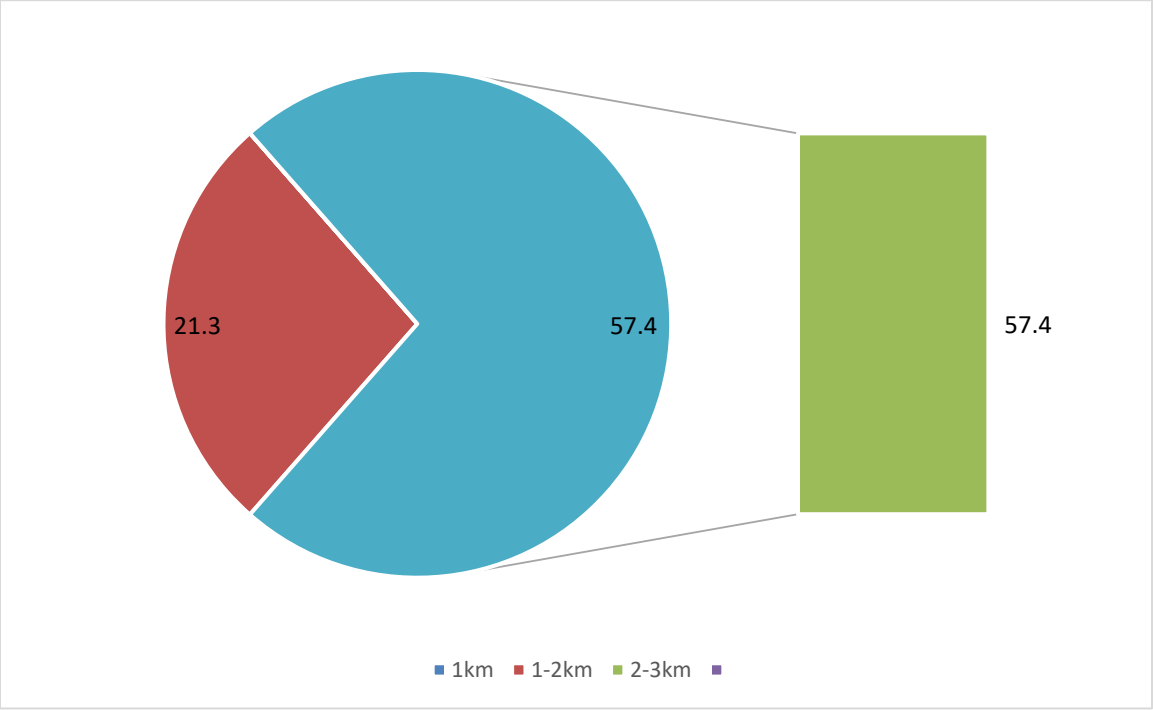

Figure 11: Consequences of Insufficient Water Supply Condition

Figure 8 of item two shows that 21.3% of sampled households were informed that water sources were located 2-3 kilometers away from their homes, 57.4% of sampled households were informed that water sources were located 1-2 kilometers away from their homes, and 21.3% of sampled households were informed that water sources were located 1 kilometer away from their homes in order to fetch and collect water on a daily basis.

A large portion of the sampled households walked one to two kilometers each day to gather and search for water from their homes; however, the water sources were unsafe and unprotected, with different particles entering the sources through different channels during the summer and winter, making the water unfit for human consumption. Figure 8 of item two shows that 21.3% of sampled households were informed that water sources were located 2-3 kilometers away from their homes, 57.4% of sampled households were informed that water sources were located 1-2 kilometers away from their homes, and 21.3% of sampled households were informed that water sources were located 1 kilometer away from their homes in order to fetch and collect water on a daily basis.

A significant portion of the sampled households walked one to two kilometers each day to gather and search for water from their homes; however, the water sources were unsafe and unprotected, with different particles entering the sources through different channels during the summer and winter, making the water unfit for human consumption.

Table 7: What are the main sources of water for Gemjabet Town?

Main sources of water	Frequency	Percent
Piped water	75	41
Hand dug well	54	29
Spring	35	19
River	20	11
	Total	100

Source: Household survey, 2023

In the research region, 29% of families rely on hand-dug wells, while 41% of households reported using piped water as their primary water source. According to reports, 19% of families get their primary water from springs. Rivers were mentioned by the remaining 11% as their main source of water. The outcome differs from a research conducted by Abduro et al. (2020), which concluded that rivers, which are present around the town, are the main supply of water for Borena.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Based on its objective, this paper concludes;

- To fulfill the town community's present and future needs, a thorough assessment of the area's surface and groundwater resources is necessary. Assessments of quantity and quality are required for sustainable water management.
- A sufficient and continuous supply of water is provided to every area of the municipality through the equitable distribution of water via pipeline networks.
- Reducing water disruptions and preserving a steady water supply require preventing water pressure breakdowns in distribution pipelines.
- By building more service reservoirs, particularly in the town's northwest, water supply and demand may be balanced, resulting in a fair distribution over the entire area.
- Lowering water pressure in distribution pipelines can be achieved by bending the main water pipeline 60 degrees, which will increase system efficiency.
- Maintaining and improving the water supply system depends on the community's willingness to pay for improved water supply. Increasing the number of public taps, particularly in low-income regions, guarantees that all members of the community have easy access to a daily water supply.

- To identify and address issues related to water supply, cooperation and involvement from all parties involved—community people, CBOs, governmental and non-governmental organizations—are essential.

- Reusing wastewater and putting in place the right technology—like solar energy—can increase the sustainability of the water supply and lessen its negative effects on the environment.

5.2 RECOMMENDATIONS

Inadequate amount and quality of home water supplies are just one of the problems facing Gimjabet municipality; distribution networks are another. Accordingly, domestic water supply all year round is made extremely difficult through the distribution network. The current piped water supply has faced by a number of problems, including expensive new pipeline connections, high operating and maintenance expenses, and frequent outages. As a result, the present paper draws the following recommendations;

- The town municipality should identify the population forecasting method that will be used to accurately predict future population numbers.
- The town water supply service office should be responsible for the ongoing assessment of water sources to ensure sustainable management and meet the town's growing water demand.
- The town water and sewerage service office should be responsible for the regular maintenance and upgrading of the distribution network to ensure uninterrupted water supply and prevent water pressure breakdowns.
- NGOs and the community should adopt measures to raise public awareness of the significance of water conservation and sustainable water management techniques.
- Improving the Water Supply and Sewerage Office's ability to handle the rising demand for water supply services.
- Safeguarding backup water sources to guarantee a supply of water in the event that the piped water system has disruptions. The town's municipality office is responsible for handling this.
- Ongoing assessment and monitoring of the water supply system to spot and fix any flaws or inefficiencies. The Zonal Water Service Office should take such action.
- Working together with pertinent parties to solve issues related to water supply and enhance the community's overall water supply system. NGOs and the community should assist the installed works in this regard.

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Appendices

Addis Ababa University

College of Social Sciences

Department of Geography and Environmental Studies

Dear respondents, the objective of this questionnaire is to assess the major agroforestry practices in Gemjabet Woreda in order to full fill Master degree. All information you are going to provide for researcher will be kept confidentially and used only for the Academic purpose. Your individual response will not be released for any other else. Don't write your name on the answer sheet, your answer sheet will be stored with code number. Please complete all question.

Thank you so much for your co-operation!

Part I: Personal Information

Kebele Administration/Village: _____

Name of Enumerator: _____ sign _____ Date of interview_____

A. Demographic Characteristics of Household's

Note- please put (√) mark or write on provided space to answer question

Annex-1

Questionnaires

<u>Part A</u>. Respondent Background information

Note- you are required to choose the best one:

1. Gender a) Male ☐ b) Female ☐
2. Age a) 20 -30year ☐ b) 31-40year ☐
   c) 41-50year ☐ D) 51year and above ☐
3. 3.Marital status of household head:
   A) Single ☐ b) Married ☐
   C) Divorced ☐ d) Widowed ☐

4. Education level of household head:
   a) Illiterate ☐
   b) Grade 1- 4 ☐
   c) Grade 5-8 ☐
   d) Grade 9-10 ☐
   e) Grade 11 and above ☐
5. Household type:
   a) Male headed household ☐
   b) Female headed household ☐
6. Family size in number or numbers of population in house:
   a) 1-3 ☐ b) 4-6 ☐
   c) 7-9 ☐ d) 10 above ☐
7. How long have you lived in Gimjabet in year?
   a) 1-5 ☐ b) 6-10 ☐
   c) 11-15 ☐ d) Greater than 20 ☐
8. Your job:
   A) Merchant b) Employer ☐
   c) Farming d) Others ☐
9. How much your monthly income?
   A. Less than 800ETB ☐ b) 801-1600ETB ☐
   c) 1601-2200ETB ☐ d) 2201-3000ETB ☐
   E) ABOVE 3801ETB ☐

Part B: Main challenges in water supply in study area

10. What are the main sources of water in Gemjabet Town?
    a) Piped water ☐ b) Hand dug well ☐
    c) Spring ☐ d) River ☐
11. Do you get daily taped water access for your domestic consumption?
    a) Yes ☐ b) No ☐
12. Is supply of water proportional with your daily demand?
    a) Yes ☐ b) No ☐
13. Can you say that there are problems with water supply and delivery services in study area
    A. Yes, there is a problem ☐ b) No, there is no problem ☐
14. If your answer is yes for question seven, what are the problems?
    a) Technical ☐ b) Financial ☐
    c) Facilitation ☐ D) Other ☐
15. How do you perceive the current provision of piped water is an issue worth discussion? a) Extremely serious ☐ b) Serious ☐
    c) Very serious ☐ d) Not serious ☐

16. For what purpose(s) do you face serious water shortage?

a) Drinking ☐ b) Cleaning/ hygiene ☐

c) Both ☐ d) other ☐

17. If you are not satisfied at the current water provision of the town, why are you dissatisfied?

a) Pipeline connection problem ☐ b). Water interruption problem ☐

c) Distance & location of main pipe ☐ d) distribution system issue ☐

18. What are the causes of water shortages in your town?

a) Poor and inefficient distribution ☐ b) Financial issue ☐

c) Rapid growth rate of people ☐ d) Frequent burst of pipelines ☐

e) Fluctuation of water power ☐

19. What are the main causes of water supply interruption?

a). Production issue ☐ b). Technical issue ☐

c). Power problem ☐

20. The water supply service interruption lasted for

a) 2 to 3 days ☐ b) 4 to 5 days ☐

c) 6 to 7 days) ☐

21. At what season the water is highly interrupted?

a) Summer ☐ b) Winter (Dry season) ☐

22. How reliable is the water supply from your sources during dry seasons?

a) There is not at all ☐ b) There is slightly ☐

c) Quite reliable ☐ d) Very reliable ☐

23. Who is responsible for collecting and allocating use of water in your household?

a) Wife ☐ b) Husband ☐

c) Children ☐

24. How far is the water source from your household? Please specify in kilometers (km)

a) 2-3km ☐ C) 1-2km ☐

b) Less than 1km ☐

25. How much time do you take to get the water?

a) More than 1hour ☐ C). 40-1hour ☐

b) 20-40mint ☐ D). 20min ☐

26. If you buy water outside your house, how much do you pay (on the average) for one Jeri can (25 liters) of water?

a) 0.25 ☐ b) 0.50 ☐ c) 0.75 ☐ d. 1.00 ☐ e) 1.50 ☐

27. Are you willing to pay any amount of money to improve the current water supply?

a) Yes ☐ b) No ☐

28. If your answer is no for question 31, your reason may be:

a) The municipality should pay ☐

b) The government should pay ☐

c) NGOs should pay ☐

d) Lack of money ☐

Appendix 2

Interview Questionnaires to the Key Informants

Interview guided questions for Gemjabet town water supply and its challenges

1. How many households have access to improve water sources?
2. What do you think the supply condition of improved water supply to the households?
3. Is the available water supply accessible and safe?
4. Is there additional suggestion to improve the problem of water supply in the town?
5. What factors facilitate more the problem of water supply in the town?
6. How many percentages of households have access to sanitation
7. How many percentages of households do not have access to sanitation facility?
8. Is there integration between water supply and sanitation services with your office?
9. Are there cases of illness in relation to water quality related problems, what are?

Interview guided questionnaires for Municipality office

1) What do you think about water supply condition of the Gemjabet town? Justify it
2) Is there demand and supply of water for the household utility matched in the town?
3) If you are working with them what challenges do you face?
4) If you face challenges, what possible solutions you recommend?

Interview guided questionnaires for water, mines and energy office

1) What are constraints in of implementation of sustainable water supply in the town?
2) Do you have any provision (technical, financial and material) from your office to in order to sustain water supply of the town?
3) How do you describe the area in terms of water availability and supply?