MEKELLE UNIVERSITY

COLLEGE OF SOCIAL SCIENCES AND LANGUAGES

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

URBAN WATER SCARCITY AND ITS SOCIO-ECONOMIC IMPACTS IN EASTERN TIGRAY: A CASE STUDY OF FREWEYNI TOWN, ETHIOPIA

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MEKELLE, ETHIOPIA

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ATHESIS SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES, IN PARTIALFULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF A R T S I N GEOGRAPHY AND ENVIRONMENTAL STUDIES.

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THESISAPPROVALFORM

We, the undersigned, members of the Board of Examiners of the final open defense by Zebib Bisrat.Zebib have read and her thesis entitled: Urban water scarcity and its socio-econoic impacts in Eastern Tigray:A case study of Freweyni Town,Ethiopia, and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfilment of the requirements for the degree of masters of arts in geography and environmental studies.

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Abstract

Climate change affected water availability in northern Ethiopia. The main objective of the study was to investigate the underlying causes and impacts of urban water scarcity on households in Freweyni Town, Eastern Tigray. Employing a combination of stratified random sampling (probability-based) and purposive and convenience sampling (non-probability-based), the research gathered data from 338 households through structured questionnaires and analyzed the responses using SPSS version 21. The study applied the Falkenmark Water Stress Indicator as the primary metric for evaluating water scarcity. Results revealed a critical shortfall in water availability, with individuals consuming an average of only 10.52 liters per day—equivalent to 3.83 cubic meters per year—far below the benchmark of 1700 cubic meters per year that signifies water accessibility. This places the town in a state of absolute water scarcity. The root causes identified include rapid population growth, urbanization, financial constraints, and a lack of institutional, technological, and managerial capacity. The consequences of this scarcity are both health-related and economic: households face heightened exposure to waterborn diseases due to reliance on unsafe sources such as unprotected rivers, and they incur additional financial burdens from purchasing water from vendors and repairing outdated infrastructure. Furthermore, the study highlights unequal and inadequate water service delivery across the town. In response to these challenges, the research recommends the development of additional boreholes, strengthening the capacity of water service institutions, adopting sustainable financing mechanisms, and enhancing the involvement of non-governmental organizations and private sector actors in the local water supply system.

***Keywords**: Drought, water shortage, household, Eastern Tigray*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Water is a natural limited source, but fundamental to the life and health of human beings, the pressure is increasing to provide clean drinking water to people. Globally about 69% of water resources is used for agriculture, 23% for industrial while domestic use accounts for 8%. However, because of the differences in levels of technology, while developing countries devote as much as 88% of their water to agriculture, the developed nations use less than half for agriculture (Postel, 1990; Postel, 1991). Water as a natural resource should be readily available and affordable but in many instances, it is scarce and beyond the reach of many people (World Bank, 1993). Engelman (1995) reported that of about 2.5% of the water resources that can actually be consumed, only one third of it is accessible as the balance two-thirds are confined in glaciers and permanent snow cover. Gleick (1995) and Larsen (2004) reported that about 17% of the world population, majority of who are living in developing countries, has no access to fresh water to meet their domestic and other requirements.

Water scarcity or lack of safe drinking water is one of the world's leading problems affecting more than 1.1 billion people globally, meaning that one in every six people lacks access to safe drinking water (Blue planet network.org., 2012.). As of 2006, one third of all nations suffered from clean water scarcity, but Sub-Saharan Africa had the largest number of water-stressed countries than other place on the globe. In Africa, the struggle for access to clean drinking water is one of today's most obvious examples of how water scarcity leads to the stalling and reversal of human progress. While each individual living in the United States uses on average 100 to 175 gallons of water per day in the home, the average African family uses only 5 gallons of water per day (http://enwikipedia org/wiki/water scarcity in Africa, as accessed on 10 August 2017). Water is already over-appropriated in many regions of the world. More than one-third of the world’s population – roughly 2.4 billion people live in water-stressed countries and by 2025 the number is expected to rise to two-thirds. (UN-FAO, 2007).

Gleick (1995) reported that Africa is already one of the driest continents in the world, and with an increase in population and a decrease in amount of rainfall, its countries are facing water stress and

scarcity. Declining water quality is an acute problem around the world, particularly in developing countries where there are notable increases in agricultural and industrial production, coupled with a lack of adequate wastewater treatment. In many developing countries including Africa, waterways traditionally used for drinking water or other community needs have been heavily contaminated (Daniel Wild et al., 2007).

Ethiopia was known as the 'water tower 'of east Africa due to its huge water resource potential from lake, rivers, stream, reservoirs, small water bodies, flood plains and swamps. However, the country's water resources have contributed little to access to clean and safe water supply, socio-economic development, irrigation and hydropower (Kidane maraim,2009). Most rivers that originate within the country flow across borders to neighboring countries, and are transboundary. Unevenness of the spatial and temporal distributions of water resource coupled with population growth and socio-economic processes such as urbanization, industrialization and intensive agriculture have put an enormous pressure even on the available fresh water resources all over the world (Korca and Jusufi(Kidane maraim,2009). Furthermore, the increased water demands and degradation of its quality further intensified the water scarcity everywhere (OAS,1998).

Similar to many African countries, parts of Ethiopia face water shortages, poor sanitation, and a lack of access to clean water sources.

About 45 million Ethiopians lack access to safe water and 76 million lack access to improved sanitation. Of those who lack access to improved sanitation, a staggering 28 million practice open defecation. In rural Ethiopia, a water organization survey found that many women and children walk more than three hours to collect water, often from shallow wells or unprotected ponds they share with animals. Recurring droughts result in famine, food shortages, and water-related diseases, as people are forced to rely heavily on contaminated or stagnant water sources.

Potable water scarcity was a common problem in Tigray region and drinking water consumption rate or per capita has categorized in to three levels with their liter per day. Eastern Tigray region, particularly, Fireweyni town was found at third level with standard of 40 liters per person per day but the actual consumption rate was 8 liters per day per person. Therefore, Fireweyni town is oneof attacked by scarcity of fresh water because consumption rate per person is extremely low of far from the given standard level (water supply and service of (water supply report, 2017).

On the other hand, the Freweyni town administration has a problem with a clean water supply. Tigray Television Broad Cast September 16, 2024 report stated that the town has urban water scarcity problems and this was irritating residents of the town. According to 2024/2025 Water service office annual report, they had planned to distribute 144,000 cubic meters of water and achieved (distributed) only 81,930 cubic meters (56.89%) to 36,786 of the town's population.

1.2 Statement of the Problem

This research was focused on evaluating on urban water scarcity and its socio economic impacts in Freweyni town, Eastern Tigray. Water scarcity is a lack of secure access water to satisfy basic demands (standards). Eastern Tigray is said to be a water tower of Tigray but, a lack of potable water supply is common, and half of the population is affected by water scarcity.

Potable water scarcity is one of the most obvious problems in both developed and developing countries (water supply office in Freweyni). And it results many negative consequences in the societies. It is clear that fresh water scarcity has substantial health, economic, and social impact on the overall human being. For instance, when people move from place to place for various reasons, they are challenged in fresh water scarcity. Which is a worldwide problem and many are affected by disease and also many people die in fresh water problem, because neighboring drink water transfer is costly in the regions (Rogers, 1986).

Freweyni town, where the study was conducted, is found in eastern part of Tigray region. And it is highly covered by sedimentary rocks. Besides, it is always affected with shortage of rainfall. Freweyni town, like other towns of Ethiopia, suffers from fresh water scarcity.

In the town there was no adequate fresh water supply. And the government has tried to address this inadequate fresh water supply of the community using different methods. However, the problem could not be completely alleviated. That is why, the researcher interested to study this burning problem and this proposed study was concentrated on the extent of the fresh water scarcity, the associated factors and its consequences.

1.3 Objectives of the Study

1.3.1 General Objective

The main objective of the research was to assess the level of urban water scarcity and its socio-economic impacts in the Eastern zone of Tigray Freweyni town,

1.3.2 Specific objective

The research has the following specific objectives

- To examine the health and economic effects of inadequate urban water supply in frewini town
- To identify the causes of water scarcity in Freweyni town.
- To explaine the roles of the water supplies institution regarding the provision of service to the town.

1.4 Research Questions

- What are the major causes of Freweyni town water supply scarcity?
- What are the impacs ofwater supply problem on thesocio-economic activities of Freweyni town communities?
- What coping mechanisms do the town administrarion applys to solve the water scarcity and its socio-economic impacts of the study area?

1.5 Delimitation of the Study

The study is delimited to Freweyni town. It mainly focused on assessing urban water scarcity and its socio-economic impacts on the selected town. It employs five years' time series (2010 - 2016E.C) data of the urban water scarcity and its socio-economic impacts on the selected town. More over, the relevant data used in this study were gothered from 338 respondents (residents) who were selected using stratified sampling from probability, purposive and convenience from non-probability sampling method.

1.6. Limitation of the study

Every research had limitations and this particular one is no exception. There had also been no in-depth previous research on water in the community and so it might be very difficult to do a comparative study or to either improve up on or deal with another side of the previous study.The challenge was budget and good administration of the town.

1.7 Significance of the Study

This research paper has the following significances.it;

- Enable the community, governmental and non governmental organizations to known and understand the people's potable water problem and to find possible ways that can help to minimize this particular problem.

- Beside to this study signifies for the participants in eradicating scarcity of potable water. Who wants to conduct with this and other relate studies?Itmay show water problem and related impacts that needs to be addressed to come up with solution.
- Thestudywillfurthermaterial foracademic purposes, andasan added literature totheexisting knowledge.
- Furthermore, this study signifies for other researcher to get different references to accomplish the study and to advance the knowledge and experiences of the researcher.

1.8 Organization of the Paper

This thesis is reasonably categorized in to five chapters. The first chapter is the introduction part which includes, back ground of the study, statement of the proble, the objectives of the sudy, research questions delimitations and limitations and significances of the study. . The second chapter deals with literature review and overall contextual linkage with in urban water scarcity and its socio-economic impacts on community. The third chapter deals deeply with the research methodology and description of the study area. The fourth chapter articulates findings and discussion of the study regarding urban water scarcity and its socio-economic impacts in Fireweyni town. The final fifth chapter is about conclusions and possible recommendations based on the findings.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Empirical Literature

A clean water supply has a substantial impacton 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 accessand lowerincidence of water borne diseasessuchcholera, typhoid, and diarrhea (Ahmedetal. 2016).Access to clean water also makes it possible to practice greater clean liness, which enhances general health and quality of life.

Empirical data also indicates that having access to a clean watersource 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 formi dable obstacles in meeting their population's needs for a sufficient and safesupply of water. Various factors, including urbanization, population increase, climate change, andinsufficient infrastructure, provide challenges to guaranteeing that every one 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 (Ahmedetal, 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 distributionis expected to rise by roughly 64 billion cubicmeters annually due to the approximately 80 million additional people who join the world's population eachyear(Takada et al.,2022).54% of people onthe planet in 2006 had a piped connection to their home, plot, or yard, and 33% use dmoresophisticated water sources.

Water is an essential resource for human existence and economic growth. Having ana dequate 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, providingnations with asufficient supply of clean water for drinking, cleaning, washing, and other uses improves human services by lowering the prevalence of water borne and water-related illnesses like typhoid, cholera, amoeba, and diarrhea (Dietleretal.,2021). Inaddition, this reduces the rate of death and morbidity, the quantity of missed work days, and the level of work proficiency. Reducing the prevalence of illnesses will decrease demand for improvedcare and make it easier to equalize the installment problem, which is particularlydifficult 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 managementare crucial for the country's financial, social, and ecological well-being.Water supply, sanitation and hygiene are fundamentalneeds and human rights (Atube etal.2021).

A vitalnatural resource and necessity for humans is water. Every human action is meaningless without access to asufficient quantity of water, and theright to use other optional sources will be misused. A means of accessing water is abasic necessity and ranks among the most important human rights. People's livelihoods and lives depend on thewater (Wilson etal, 2022).

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 asufficient and clean residential water supply for drinking, cooking, and sanitation. Consequently, this leads to improved well being and the appropriate kind of open spaces that suit the type of waterholder theyuse (Issahaku etal, 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).

2.1.1 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. 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).

2.1.2. 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.

2.1. 3. DomesticWater 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 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.

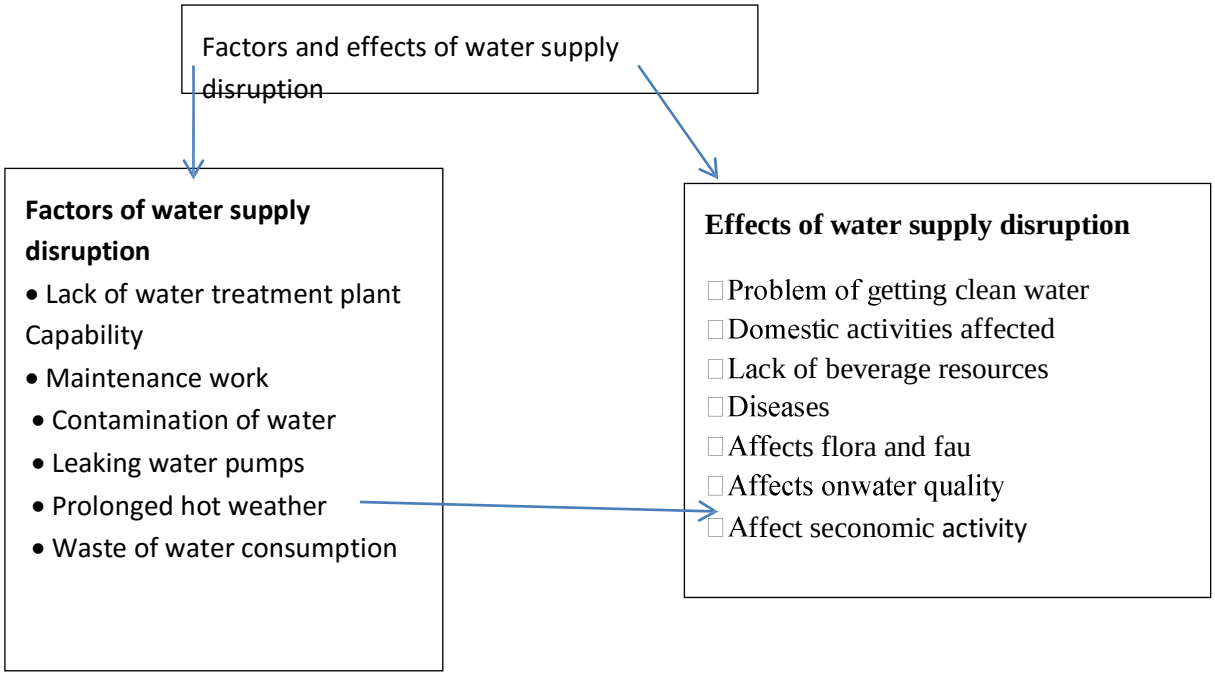

Figure 1. Conceptual framework
(from related literatures)

2.2. Water scarcity dimensions

Among the causes of water scarcity, population growth, and urbanization remains the most important factor. This is because; increasing population growth in urban areas causes demand for water for domestic and other purposes. Responses for such demands are low due to the lack of financial capacities in Freweyni town.

According to (Molle and Mollinga 2003, pp. 530–531), water scarcity has various dimensions. Managerial scarcity occurs when the system of water remains without being maintained or managed properly. Users cannot be served properly due to the leakages everywhere. Institutional scarcity is failing to meet the balance of water supply and demand due to inadequate technological and institutional innovations. Economic scarcity deals with the inability to provide for example due to a lack of committed human resources and financial capacity to access water amenities.

According to UN (2006), water shortage is a situation whereby water sources become inadequate for the community due to climate change, population growth or other factors that may lead to scarcity of water for consumption. This situation may lead to insufficient water for family consumption (UN-Water, 2006). Water scarcity or lack of safe drinking water is one of the world's leading problems affecting more than 1.1 billion people globally, meaning that one in every six people lacks access to safe drinking water. (Blue planet network.org. 2012) As of 2006, one third of all nations suffered from clean water scarcity, but Sub-Saharan Africa had the largest number of water-stressed countries than other place on the globe.

In Africa, the struggle for access to clean drinking water is one of today's most obvious examples of how water scarcity leads to the stalling and reversal of human progress. While each individual living in the United States uses on average 100 to 175 gallons of water per day in the home, the average African family uses only 5 gallons of water per day (http://enwikipedia org/wiki/water scarcity in Africa).

Water scarcity is a major challenge, affecting every continent on the Earth. Water scarcity occurs when water demand nears (or exceeds) the available water supply. Nearly 20% of the world's population, or 1.2 billion people, live in areas of physical water scarcity, where water withdrawals for agriculture, industry, and domestic purposes exceed 75% of river flows (IWMI 2007). An additional 500 million people live in areas approaching physical scarcity. Another 1.6 billion people live in areas of economic water scarcity, where water is available but human capacity or financial resources

limit access. In these areas, adequate infrastructure may not be available or if it is available, the distribution of water may be inequitable (IWMI 2007).

But water scarcity isn't solely a natural phenomenon; it's also a human one. Numerous human activities – such as untimely water use, pollution, insufficient or poorly maintained infrastructure, and inadequate management systems – can result in or exacerbate water scarcity. As noted by the United Nations, there are adequate water resources to meet our needs, but "it is distributed unevenly and too much of it is wasted, polluted and unsustainably managed" (UN n.d.).Widespread declines in groundwater levels are one symptom of water scarcity. Groundwater is an important source of freshwater in many parts of the world. Some areas, however, have become overly dependent on groundwater supplies.

In the last two decades, advances in well-drilling techniques have significantly reduced the cost of abstracting groundwater. Driven, in part, by these technological advancements, groundwater withdrawals have tripled over the past 50 years (UN 2012).

In some areas, ground water extraction now consistently exceeds natural recharge rates, causing widespread depletion and declining groundwater levels. A recent analysis of groundwater extraction by Wada et al. (2010) finds that depletion rates have doubled between 1960 and 2000 in sub-humid arid areas and are especially high in parts of China, India, and the United States. Much of the groundwater extracted supports agriculture (67%), although it is also used for domestic (22%) and industrial (11%) purposes.

2.3 Causes of Water Scarcity

The study area will be focusing the causes and impact of water scarcity. The cause of water scarcity in each and every area is varied. In other areas the causes may be natural, while in other areas they may be human made. Research conducted in the field of water management has demonstrated that the causes are both human and natural. Therefore, looks at both the natural and human made causes of water scarcity in terms of literature review.

2.3.1 Impacts of Potable Water Scarcity

Potential problem with water supply can be predicated in areas where average precipitation and run off are relative low. Such as in the arid and semiarid parts surface water supply can never be as high as the average annual run off. Because not all run off can be successfully stored Total storage of runoff is possible because of evaporative losses from river channels .as a result shortage in the water

supply are common in areas. With natural low precipitation and run off coupled with strong evaporation (bodkin, 2003).

Majority of people living those area uses water very polluted we generally look at the intended use of the water. Howfar the water departs from the norm. Its effects on public health, or its ecological impacts from a public health or ecological view. A pollutant is any biological or physical substance that in an identifiable excess is known to be harm full to other living things. (FAO, 2010).

CHAPTER THREE

METHODS AND MATERILAS

3.1 Study Area

Location

The study area was in Freweyni town,it is found in Eastern Tigray Region and a capital town of Tsaedaemba woreda.Geographically it lies between $13^0$55’00’’N and $14^0$23’30’’N latitudes and $39^0$28’30’’E and $39^0$53’00’’E longitudes at elevation of 2482m.a.s.l(CSAPFOTR, 2017). This woreda is located 78 km away from Mekelle town and its 37 km far from Adigrat town via northern part. Relatively, it covers administrative area of 615.08 hectares of land with a wide variety of topographic features.

Topography

The town and the surrounding 10 kms radius area is characterized by moderately undulating to gently sloping to the west.To the northeast and east the topographical setup is dominated by highly rugged and undulateing landscapes represented mainly by large ridges,very steep to moderately steep slopes with Low lands and deep gorges.

Shape

Freweyni town is elongated type.The houses are built along the main road and in area where the topography permitted for construction and due to the rugged topography nature of the town and it is easily access to the main road.This makes difficult in the expansion of infrastructure and services.

Climate

Temperature

According to the Koeppen's climate classification Method (climate classification of Ethiopia, by Lemma Gonfa, NMSA, No 3 May 1996) the study area is located in semi-arid climate (WeyinaDega). The mean maximum and minimum annual temperature is between 20.2^0c to 9.6^0c.

Rain fall

In Freweyni town the amount and distribution of rainfall is highly variable from season to season.Most of the annual rainfall is received during the summer; especially in the two months of the year (July and August).Generally, the mean annual rainfall is between 596 and 700mm.

Urban water supply (water resources)

Freweyni town is supplied with piped water obtained from springs and boreholes. There are three springs spatially distributed in different parts of the town and around the town. The existing water coverage of the town on the basis of 20 liters per person per day is 39%.

Economic activities

The main economic activities carried out by household heads in Freweyni town in order to support their families.Dut this trade is the highest economic activity in the study area.In addition to daily labor and governmental employment and also other works and governmental work have also agood contribution in the economic activities.However, more than 50%of the household of the residents of the town directly related their economic activity from non-farming sectors.

Public transport

The town is connected to Adigrat and Wukro by one main asphalt road.The internal roads are almost earth roads.They are motorized and non-motorized intra-urban public transportation service provide with in Freweyni.Similarly, there is one small size bus terminal which is almost 0.19 ha.

Level of urbanization

The level of urbanization in the study area is about 16%,which is less than urbanized than the eastern zone(CSA,2007).

Population size

According to CSA and plan and finance of Tigray region (2017), Freweyni town has 36786 total populations. Around 16519 of the total population are male and 20267 are female,althogh total household is 2200. In Freweyni town there is one primary hospital,four private clinics, one secondary school(9-12),three elementary schools,two private kindergartens(KG) and one Technical and Vocational and Educational Training(TVET).There is road which serves both in wet and dry season but poor infrastructure access for transferring of fresh water supply in the study area (Ibid).

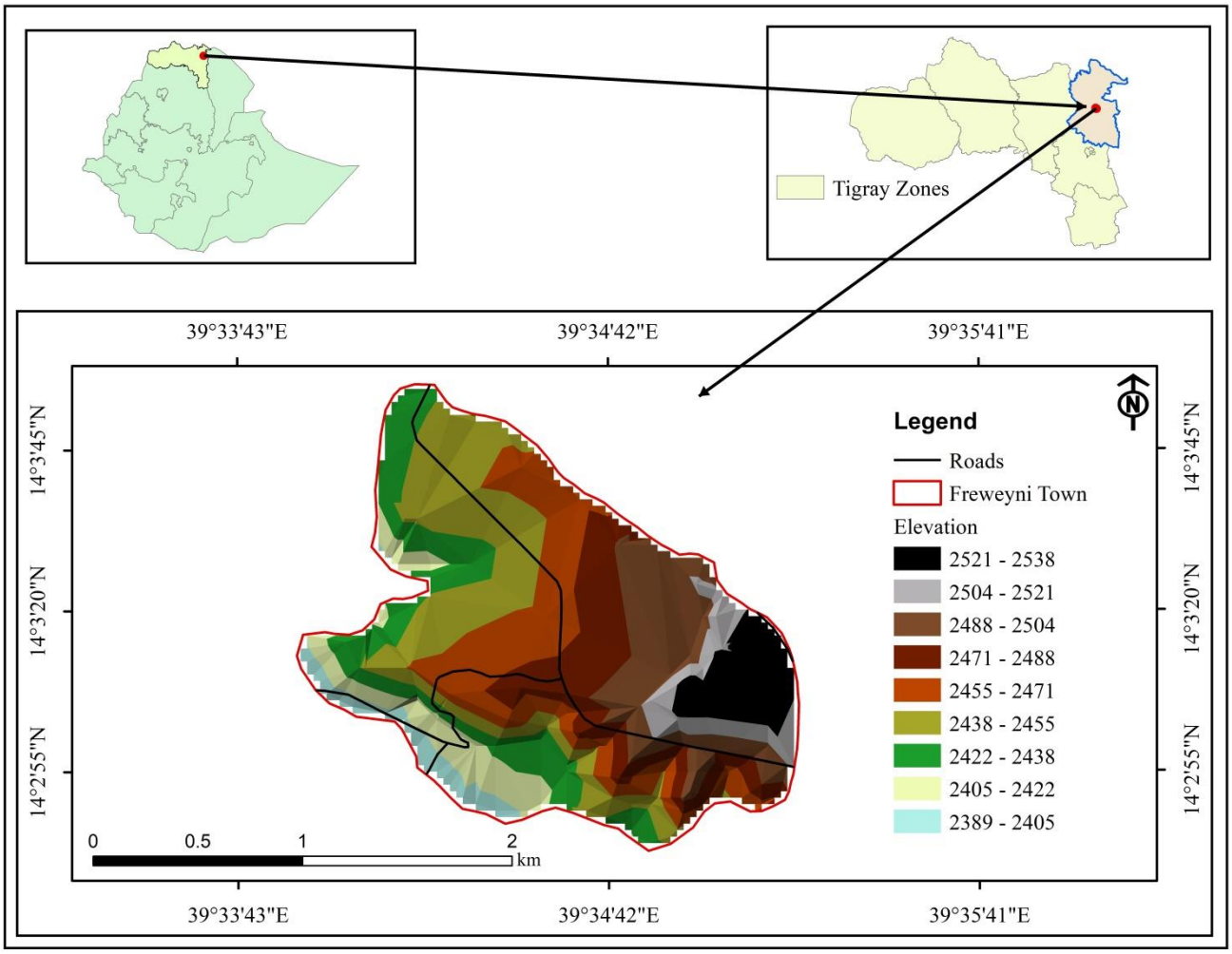

Figure 2. Map of Freweyni Town

3.2 Method

3.2.1 Nature and Source of data

In this study both cross-sectional and longitudinal research designs was used to grasp the necessary data. Cross-sectional research design was employed to gather data about the potable water scarcity and its impact in Fereweyni town via out one shot way (All needed data are collected at a time or a single period of observation).

Longitudinal research design was helped to show the difference between before and after fresh water scarcity in household level throughout data collection for several times at different time interval rather than at a point at a time also clearly showing the impacts on the community of the town. The researcher was employed quantitative approach for gather information focuses on describing a

phenomena across a large number of participants there by providing the possibility of summarizing characteristics across groups or relationships by applying statistical techniques to recognize over all patterns in relations of processes and qualitative approach to gather information focuses on describing a phenomena manner in deep comprehensive which are not rigorously examined or measured in terms of quantity, amount, intensity or frequency in case of Freweyni town.

3.2.2 Sample Size and Sampling procedure

A combination of probability and non-probability sampling techniques was used to select the sample population. Non-probability sampling technique was helped to select the kebele and the principals of municipality.

The researcher was used the following sample size determination formula developed Yamane Taro (1967:886). This formula was used to calculate the sample sizes in 95% confidence level and P =.5 is assumed.

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

N= survey population or number of people on the population

e= error (precision desired) or standard error 5% (0.05)

$$n = \frac{N}{1+N(e)^2} = \frac{2200}{1+2200(0.05)^2} = 338$$

Those338 households are the sample unit or sample size. Then using simple random sampling technique representative 337 household respondents was selected.

33.2.3 Data collection Tools

The study was employed both primary and secondary sources of data collection. The Primary data would be obtained from questionnaire, field observation and interview. Secondary data sources were published and unpublished documents, journals, newspapers, and internet. The researcher employed the following data collection up on the study.

3.2.3.1 Questionnaire:

Both close-ended and open-ended questionnaires were prepared and disseminated to all respondents so as to get sufficient and realiable data. In order to understand the clarity of the prepared questionnaires, in order to check up the standard of validation questionnaires and pre-test

questionnaires was prepared for around 338 respondents. Among the respondents 337 gave response but 1 house hold didn't give responses.

3.2.3.2 Interview

Interview was held to collect data from key respondents or principals.Because it helps a researcher to obtain in depth information and under take further questioning on the issue.It was held with 10 respondents and those respondents were selected uising lottery system.The interview took one hours in total and it was done by arraging suitable time for the interviewees by discussion.All the interview questionairs were translated in to Tigrigna because majorty of the interviewees coudnt read English texts.

3.2.3.3 Observation

Direct observation was also made by the researcher to collect full information about the research problem as a participant in the study area.

3.2.4 Methods of Data Analysis

Since the mixed approach brings a valid result, the researcher employed both quantitative and qualitative methods of data analysis. The data obtained from questionnaires were interpreted and analyzed quantitatively and the data from the open ended questions and interview were interpreted qualitatively.

To look at it separately, the data that gathered from the 338 respondents through questionnaire were entered into acomputer. Then the frequencies, and percentage, were calculated using Statistical Package for Social Sciences (SPSS version 20).With regard to the participants' interview, each question was stated and analyzed separatelygoing through all the participants' 'responses. Then, the researcher has translated into English, paraphrased and concluded the analysis with his own statement (words).

Finally, the data were analyzed and interpreted quantitatively and qualitatively using numbers/percentages and words.

CHAPTER FOUR

RESULTS AND DISCUSSION

The general objective of this paper is asses the level of drinking water scarcity and community in Fireweyni town and measure the performance of water distribution system. Thus the following table shows the demography of respondents in order to meet the goal. Based on the findings of the survey, socio-economic impact of water supply scarcity, cause of water scarcity, proposed from the referenced literature were presented in chapter two. Finally, there is a brief discussionn on data analysis and suggestionns for future work.

4.1 Socio economic 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 1: Demographic characteristic of the sampled respondents

No	Variables	Category	Frequency	Percent
1	Age	20 -30year	59	17.5
		31-40year	110	32.6
		41-50year	86	25.5
		51year and above	82	24.3
2	Sex	Male	174	51.6
		Female	163	48.4
3	Household size	1-3	73	21.6
		4-6	164	48.8
		7-9	92	27.2
		10 above	8	2.4
	Total		337	100

Source: Household Survey, 2025

Table2: Socio – economic characteristic of the sampled respondents

No,	Variables	Category	Frequency	Percent
1	Educationalstatus	Illiterate	47	13.9
		Grade1 -4	15	4.5
		Grage5 -8	50	14.8
		Grade9 -12	75	22.2
		Diploma	76	22.5
		Degree	65	19.2
		Master	9	2.6
2	How longhaveyou livedin Freweyni inyear	1-5	44	13.0
		6 -10	68	20.1
		11-15	47	13.9
		Greater than15	178	52.8
3	MonthlyIncome	Lessthan 1600	10	2.9
		1601-2600	15	4.4
		2601-3600	22	6.
		3601-4600	110	32.6
		Above 4601	180	53.4

Source: Household Survey, 2025

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 town's 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 Donkeys to gather water from neighboring rivers or springs. This result is consistent with a study made by Birhanu (2022) at Freweyni town, who founded as the town community got its water from distance springs other than pipe.

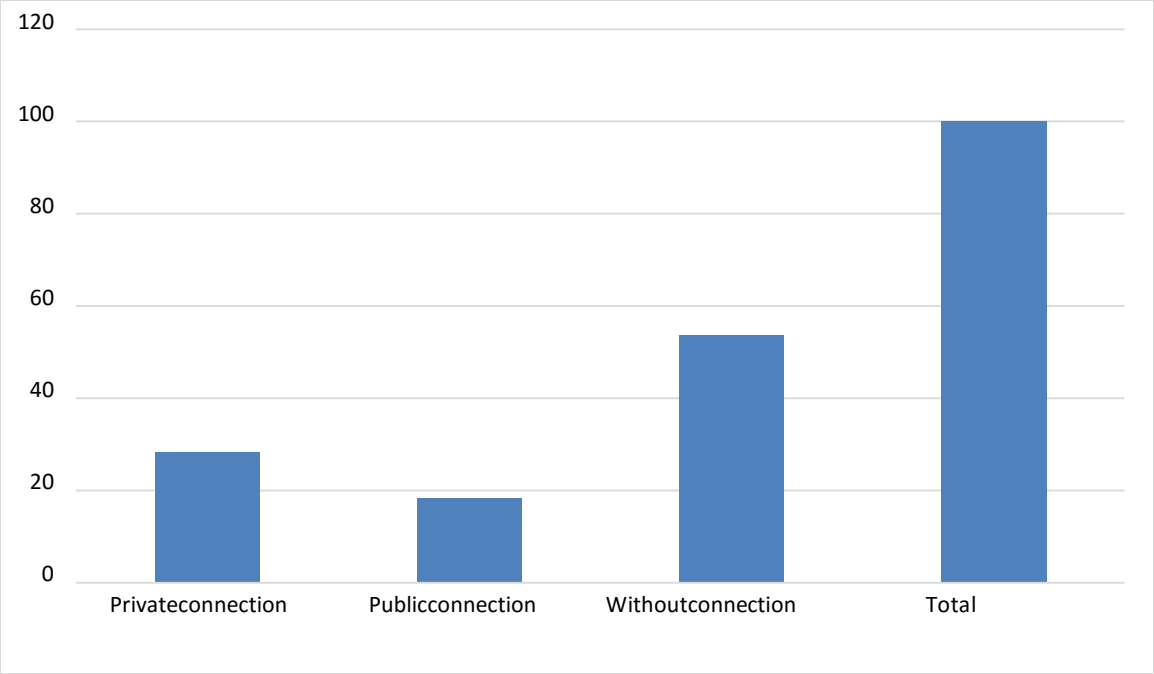

Figure3. Potentialofpurewatersupply instudy area

Source: Household survey, 2025

The goal of expanding the pipeline system is to offer enough clean water to the community. The amount of pipe lines 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 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 House holds 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 Freweyni 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 4 below.

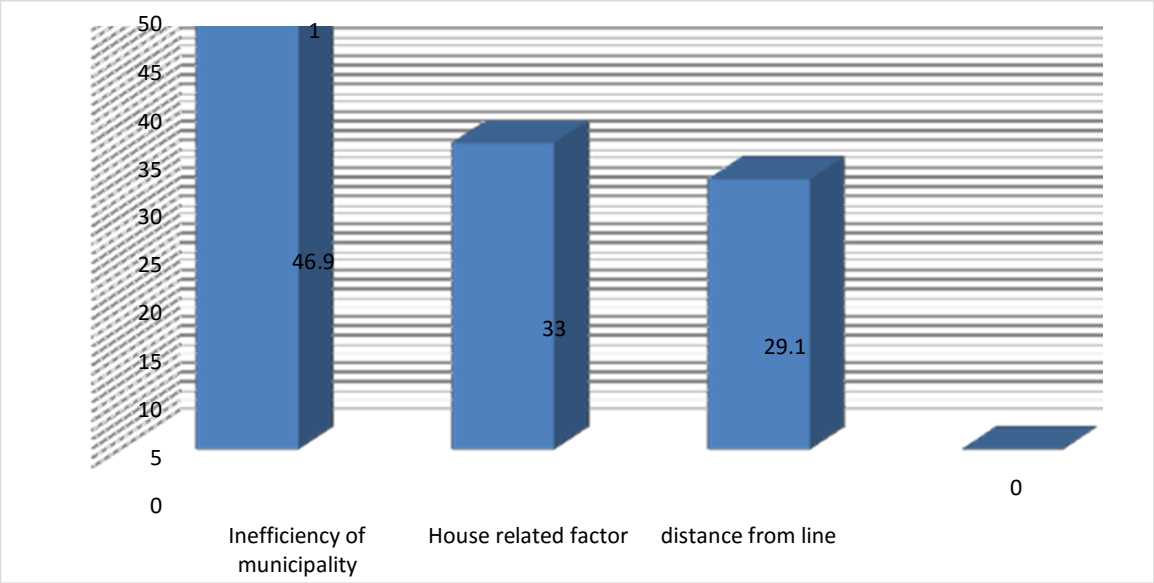

Figure 4.Challenges Related with Water Supply and Delivery

Source: Household survey, 2025

Item three from Figure 5 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 3: Reasonsfor dissatisfactionofthe sample households

No	**Reasonsfor dissatisfaction**	**Rank**	**Frequency**	**%**
1	Pipelineconnectionproblem	1st	110	32.6
2	Water interruption	2nd	75	22.5
3	Distance ofmainpipe	3rd	50	14.8
4	Poor quantity	4th	34	10.0
5	Unskilled worker problem	5th	10	2.9
6	Poor quality	6th	58	17.2
	Total		337	100

Source: Household survey, 2025

Table 3'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.

Table4: Causes of WaterSupplyShortage in Town

Variables	Frequency	Percent
Finicalmatter	67	19.9
Rapid rate of population growth	86	25.5
Frequentbursting pipeline	77	22.8
Water power problem	107	31.8
Total	337	100

Source: Household survey,2025

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.

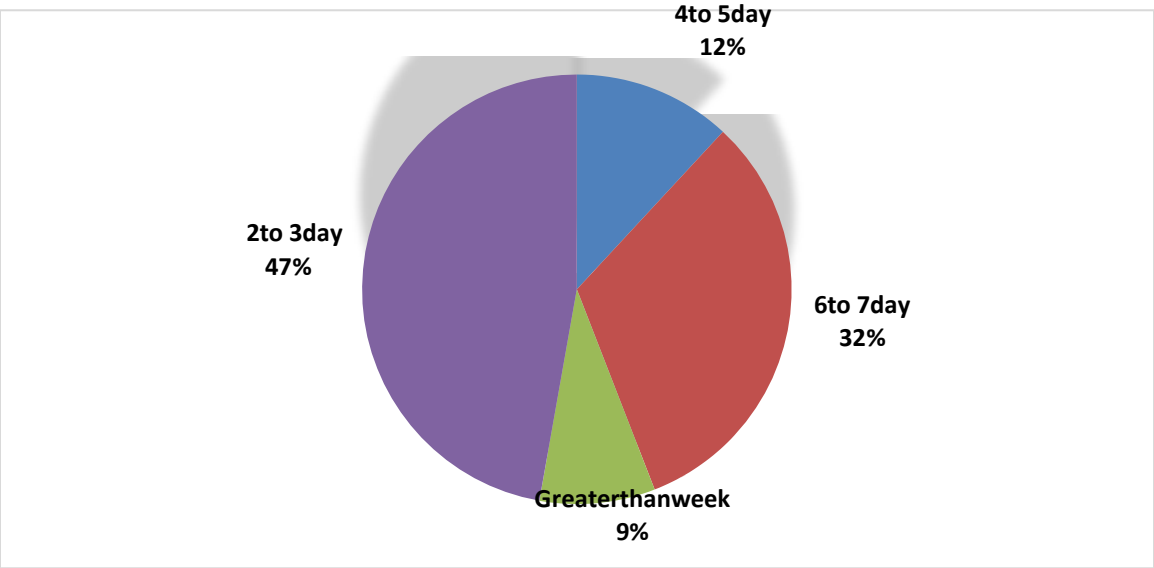

Figure 5. Other constraintstowater supply

Source: Household survey, 2025

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.

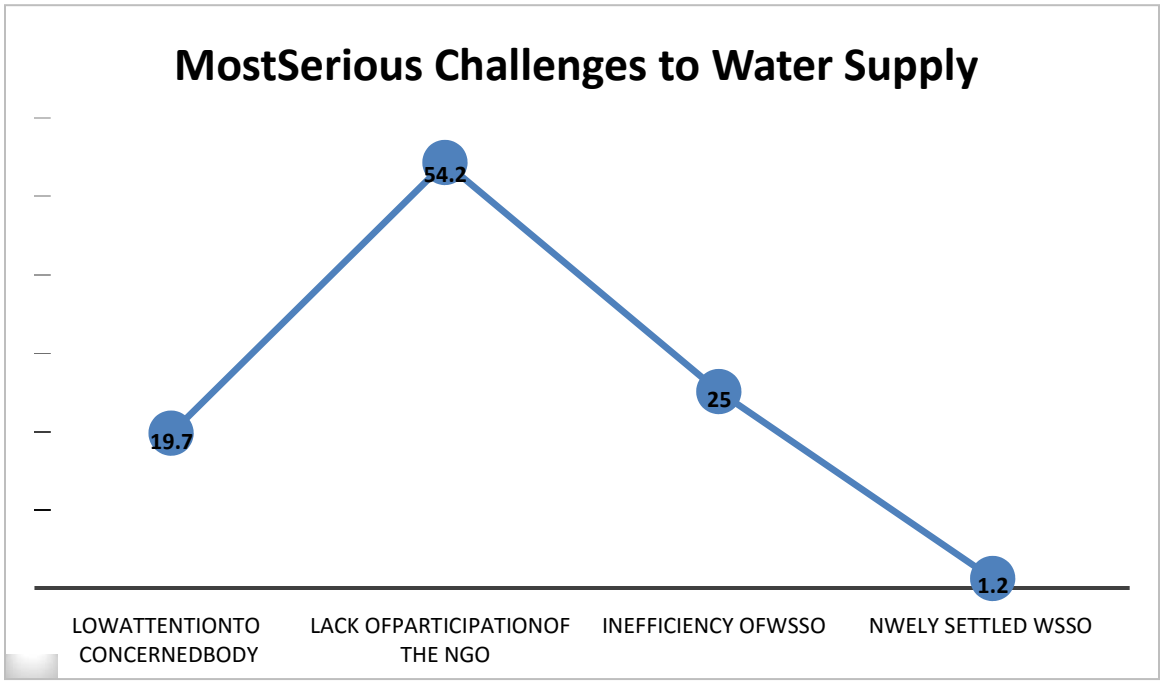

Figure 6: Most seriousproblemtowatersupplyin the studyarea

Source: Household survey, 2025

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 5: 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, 2025

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 who me 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. improvethebetterpublicwaterpoints fromvarious parts ofthe town to remedythe scarcityof water supply.

Figure 7: Alternative water sources of the town

Source: Field Survey, 2025

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 illustrate the study town's consequences for its inadequate water supply.

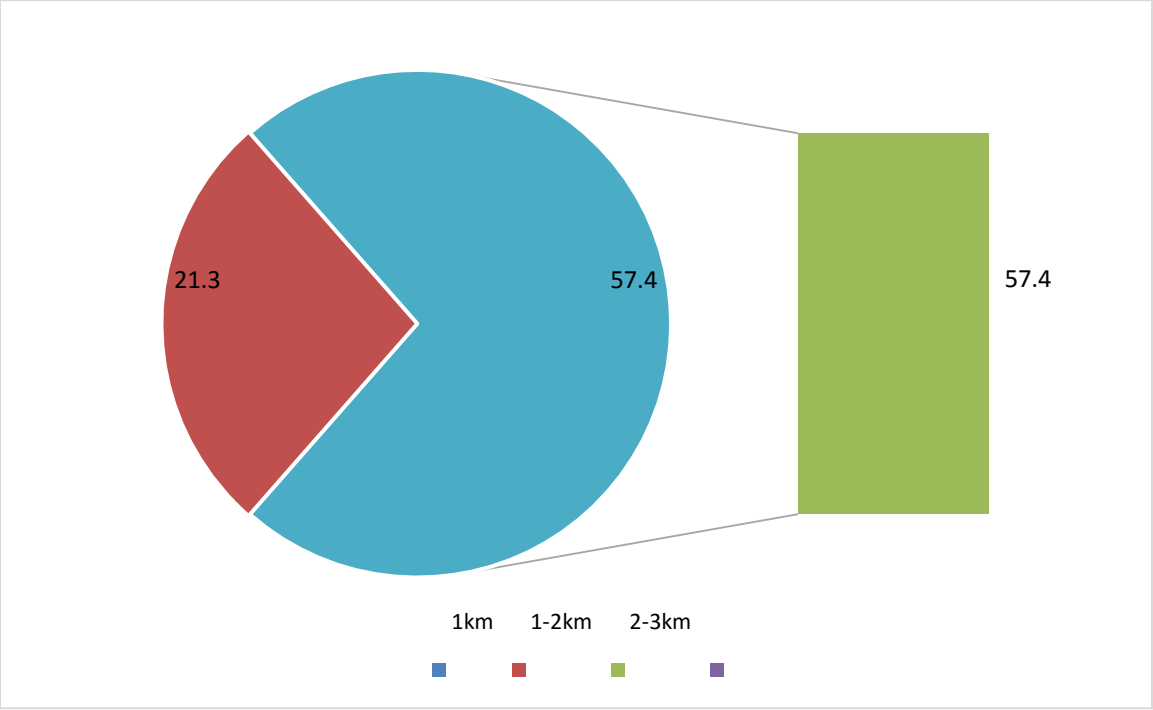

Figure 8: Consequences of Insufficient Water Supply Condition

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 6: What are the main sources of water for Freweyni Town?

Main sources of water	Frequency	Percent
Piped water	150	44.5
Hand dug well	135	40.0
Spring	27	8.0
River	25	7.4
Total	337	100

Source: Household survey, 2025

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 Freweyni town.

Table 7. Water born diseases below 5 and above 6 years old

Month	age	Gender		
		Male	Female	Total
October-December	Under 5	122	79	201
January-March		56	63	119
April-June		106	93	199
October-December	Abve 6	55	44	99
January-March		25	14	39
April-June		45	32	77

Source freweini primary hospital data base

Director of Freweini primary hospital

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This chapeter deals with the conclusion and recommendesions of the research based on the data gathered and analyzed.And the purpose of this study is to examine the causes and consequences of urban water scarcity on households in Freweyni town.

The findings that we have presented suggest that the disparity between population growth, urban expansion, and water supply infrastructure created water scarcity in the town. Due to the low availability of water as well as quality problems of available water supplies, a huge number of households faced water-related health problems. This means a lot of finance was used by the residents for treatment, which in turn influenced their economic activities. From the findings of the study, it can be concluded that communities were poorly informed about almost all aspects of water service delivery in the town. This has affected the involvement of the community in the water supply which would have been benefiting them a lot. This means the local community's knowledge through their experience was not considered in the practical stages.

While this study dealt with water scarcity at the household or domestic level, it does not examine water scarcity and its impact on agriculture, service, industry, and the rest of the sectors. As a cross-sectional study, data has been collected from a specific point in time. Studying water scarcity from different perspectives is crucial for formulating policies at local, national, regional, and global levels. This is because governance and public policy failures often lead to water scarcity. Thus, battling water scarcity is a complex issue; it needs multi-disciplinary approaches and policy interventions.

5.2 RECOMMENDATIONS

Inadequate amount and quality of home water supplies are just one of the problems facing Freweyni 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.
- Safe guarding 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.
- On going 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

Mekelle university

college of social sciences & language

Department of Geography and Environmental studies questionaries for the house holds in freweyni town.

Dear Respondent

- I am a student at Mekelle University and doing this study as a partial fulfilment of the requirement for the award of master of art degree in geography and environmental studies.
- This study is aimed at evalute level of drinking water scarcity and community coping mechanism in the case of Freweyni town in eastern Tigray northern Ethiopia.
- You are assured that high level of confidetiality will be observed when presenting the data.
- The information you provide here will be very helpfull to ensure attainment of the expected objectives under this study. Thus I kindly requested you to give your honest and currently answer.
- Thank you for your cooperation in advance.

Instruction: Please make acircle on the appropriate alternative or fill the provided blank Spaces with correct answers for the following questions.

Name of Respondent _____

Name of Village _____

Name ofWaterSource_____

Socio-economic characteristics of Households

Nameofthe waterpoint	Information ofgiver			HH's size	HH‟s Head	Marital status	Education
	Name	Gender	Age		1.Male	married	illiterate
		1.male 2.female			2.Female	Unmarried Divorced Widowed	Grade1-8. grade9-12 Abovegrade12

II.Identification of Demand responsiveness and non-functionalityfactors ofthe Services.

1. Howmany year's haveyou lived in this area?
2. Whoseideawas itto build theproject?

a. The communityb.Local leader's c. NGOs d. Governmental offices e. other

3. What wereyour major sources ofwaterbeforetheproject?
4. Whoseideawas itto choose thesiteselection oftheproject?

a. The communityb.Local leader's c. NGOsd. Governmentaloffices e. other

5. Whoseideawas itto choosethe type/ technologyofthe project?

a. The communityb.Local leader's c. NGOs d. Governmental offices e. other

6. What was the sourceof theproject funding?

7.Howseverearеproblemswith waterserviceinyour community?

a. low b. fairc. Strongd.verystronge. No problem

8. If your answer for question no 7 is strong or very strong what is the cause?

9 If your answer for no 7 is strong or very strong what is the solution?

III. Identificationoftypeor Participationof beneficiaries

10 Haveyou participated inthe development processes of thewater project?

a. Yes b. No

11What type of participation didyou haveduringthe project development?

a. Cash b.Laborcontributionc. contribution of localmaterialsd.Idea e. Others

Women's participation

12. What typeof participation didyou havein theoverallproject development?

a. planning and management b. implementation c. utilization d. allof theabove e. None

13. Areyou member ofthewatercommittee?

a. Yes b. No c. No committee

14. How many women you think should be members of total wate rcommittee? Circle the number of women.

a. 0 b. 1 c. 2 d. 3 e. 4 f. 5 g. 6 h. above6

15. Do you think representation of more women in the water committee is good for the Society? Why? Alternatively, whynot?

16. What do you think are the reasons that prevent you and other women from participatingin

thewatercommittee?

17. Have you been given special encour agement to participate in the water committee?

a. Yes b. No

18. Do you usually pay afee for your water service?

a. Yes b. No

19. If yes, how much didyou pay?

20 How do you think funds should be obtained for water system repaired?

a. Tariff and additional contribution byusers

b. local government c. NGOs d. Other

21. Do you pay water fees on time? a. Yes b. No

22. If your answer for Q 20 is No, what are your reasons? Explain.

23. Do you think that the collected fee is properly managed?

a. Yes b. No c. don'tknow

24 Are there any educational sessions given in your community's regardinguse of drinking water? a. Yes b. Noc. don'tknow

25. How many sessions did you attend?

26. If your answer for Q 24 is No; what prevented you from participating?

27. Do you get benefit from the education given?

a. Yes b. No c. don'tknow

28. If your answer for Q 26 is yes; what are the benefits to you?

29. For what purpose do you fetch water?

a. HH drinking and food preparation b. Bathingand washing clothes C. Animal drinking d. irrigation of crops e. Other

30. In addition to the project water source. Do you use other sources?

a. Yes b. No

31. Listthe other water sources, if your answer is yes

32. How satisfied are you with number of hour's availabl

a. excellent b. verygood c. good d. some how e. poor0

33. What is your perception of color of water?

a. excellent b. verygood c. good d.fair e. poor

34What is your perception of tast

a. excellent b. verygoodc. good d.faire e. poor

35. Have you satisfiedwith thequantityavailable?

a. Verymuchb.It depends on season c. No

36 If your answer for question no 35 is depends on season when was high?

A. Summer B Autumn C Winter D Spring

37 Isyour overallsatisfaction with theservice?

a. excellent b. verygoodc. goodd.Fair e.Bad

38. Howyou longstand in linealongtime?

39 When you long stand in aline to fetch water?

A Morning B Mid day C Afternoon

40. Howimportant arenew water points foryou andyour society?

a. veryhigh b. high c. somewhat d. notimportante.Ido not know

41. What types of contaminations areyou worried about?

42. Howisyourwater sourceprotected?

43. Howdoyouevaluatethe qualityof theconstruction ofthe project water source?

a. excellent b. verygoodc. good d.Fair e.Bad

44.Is the system being repaired?Howoften?Bywhom?

45. Currentlyarethere anydefectsin catchmentsorwells? a. Yes b. No

46. Haveyou satisfiedwith thesystem? a. Yes b. No

47 If your answer for Q 46 no what is the solution?

48. What isyour perception on tarifflevel?

a. Expensive b. Fair c.Inexpensive d.Ido not know

49. Doyou haveproblems in payingtariff (abilityto pay)? a. Yes b. No c. SometimesI

50.If your answer for Q49 yeswherecould replacement of funds come from?

51. Does communityhadfinancial capacityto sustain theservice.

a. Yes b. Noc. don'tknow

52. Who is the owner ofthe scheme?

a. the community b. local government c. don't know d. NGOs e. others

53. Do you think that the available water supply is sufficient for the community?

a. yes b. No

APPENDIX B

Issues (points) discussed with woreda water experts about the rural Water supply assessment and theirtechnical support.

1. How do you prepare water projects?
2. Do you make abaseline survey before the project and what situations do you examine?
3. Did the communities participate in the project?
4. Did communities participate in choosing place of construction for the hand dug wells and spring developments?
5. Did women participatein the processes involved?
6. Did your organization give chance to the community in choosing the type of technology of the water points constructed?
7. How do you know the yield of the well or the spring that your organization constructingis enoughfor the community consumption?
8. Had your organization helped the community in organizing water committee in the community?
9. Did your organization helped the community institutionalizing the hand dug wells and spring developments?
10. Did you make contractor supervision?
11. Do you think that your staff technicians are enough for the woreda water supply systems and capable enough?
12. What problems do you see in the processes of implementing rural water supply systems?
13. At what season does the water point digging? If it is, hand dugwell

APPENDIX-C

Points of discussion with Water Committee Members and women about women participation, training and water service management.

1. Who chose you as a water committee member or simply as a trainee?
2. When didyouget thetraining?
3. For how much days was the training given? Moreover, who gave the training?
4. Do you think that you know all the parts of the water supply scheme that need frequent maintenance?
5. Do you think that the training was adequate so that you can maintain the scheme by your self with out assistance at anytime? If not why?
6. If you and your friend(s) trained with you maintained a failure(s) in the scheme‟s system, how many times the system was maintained and made it function?
7. Has thescheme maintained up tonow bythoseotherthanyouandyourfriends, trained with, becauseyouwereunable to maintain the system?
8. Who covered the maintenancecost?
9. If you and your friend(S) trained with you tried and failed to maintain the scheme, how manytimes the failurehappened
10. Are there maintenanceespareparts available around?
11. Is there an institutional support from the concerned bodies like the woreda water supply offices?
12. How you manage the water point?
13. How the contribution of water fee per month collected? If they contribute
14. Do you have rules and regulation for your committee to govern the community and to manage the water point?
15. How many members are members of the water committee? How many of them are women?
16. What are the major problems faced during management of rural water supply service

Structured questionnaires Tigrigna version

ዩኒቨርስቲ መቐለ

ኮሌጅ ማሕበራዊ ሳይንስን ቋንቋን

ክፍሊ ትምህርቲ ጂኦግራፈን ከባቢያዊ ሳይንስን

መሕተቲ ንመራሕቲ ስድራ ከተማ ፍረወይኒ ዝከበርኹም/ኽንተሳታፈ/ት እዚ መዕናዕቲ ኣነ ኣብ ዩኒቨርስቲ መቐለ ተምሃሪት እንትኸውን እዚ ድማ ንጂኦግራፈን ከባቢያዊ ሳይንስን ብማስተር ዲግሪ ንምምራቅ ከም ሓደ ረቂሒ ዝውሰድ መዕናዕቲ እዩ።

እዚ መዕናዕቲ ናይ ከተማ ፍረወይኒ መንቀሊ ሕፅረት ፅሩይ ዝስተ ማይን ክኸውን ዝግባኡ መፍትሕታትን ንምግምጋም ዝዓለመ እዩ። እቶም ካልኦት ዕላማታት ድማ ብዛዕባ ቴክኒካዊ፣ ከባቢያዊ፣ ፋይናንሳዊ፣ ማሕበረ ቁጠባዊ ረቂሒታት (ኩነታት) ዝኣመሳሰሉ ሓበሬታ ንምእካብ እዩ። ንእትህቡኒ /ባኒ ሓበሬታ ንዝተሓሰበሉ ዕላማ እንትቀርብ ብልዑል ደረጃ ሚስጢር ከም ዝተሓዝ ከረጋግፀልኹም/ኽን ይፈቱ። ኣብ'ዚ እትህቡኒ/ባኒ ሓበሬታ እዚ መዕናዕቲ ትዕቢት ዝግበረሉ ዕላማታት ንምዕዋት ኣዝዩ ሓጋዚ እዩ። ስለ'ዚ ሓቀኛን ቅኒዕን መልስኹም/ኽንክትህቡ/ባ ብትሕትና ይሓትት።

ስለ'ቲግዜኹምን/ኽን ምትሕብባርኩምን /ኽንን የቀንየለይ !

መምርሒ: ነዞም ዝስዕቡ ሕቶታት ካብቶም መማረፂታት ነቲ ትክክለኛ መልሲ ብምክባብ ወይ ድማ ኣብቲ ዝተወሃበ ባዶ ቦታታት ትክክለኛ መልሲ ፀሓፉ/ፊ።

ሀ. መመላእታታት መሕተቲ ንተጠቀምቲ

I. ሓበሬታ ድሕረ ባይታ መልሲ ወሃብቲ መራሕቲ ስድራ

ስም መልሲ ወሃቢ _____ዖታ_____ዕድመ_____

ደረጃ ትምህርቲ _____

ስም መንበሪ ቦታ_____ በዝሒ ኣባላት ስድራ_____

ስም ምንጪማይ _____.

II.ምልላይ ናይ ጠለብ ምላሽ ምሃብን ዘይምስራሕን ረቓሒታት ናይቶም ኣገልግሎታት።

1. ኣብዚ ከባቢ ክንደይ ዓመት ተቐሚጥኪ/ካ?_____

2. እቲ ፕሮጀክት ንምህናጽ ናይ መን ሓሳብ እዩ ነይሩ?

ሀ.እቲ ሕብረተሰብ ለ.መራሕቲ ከባቢ ሐ. ዘይመንግስታውያንትካላት

መ. መንግስታዊ ኣብያተ ፅሕፈት ሠ.ካልእ

3. ቅድሚ እቲ ፕሮጀክት ቀንዲ ምንጪ ማይኩም እንታይ ነይሮም?_____

4. ናይቲ ፕሮጀክት ምምራፅ ቦታ ናይ መን ሓሳብ እዩ ነይሩ?

ሀ.እቲ ሕብረተሰብ ለ. መራሕቲ ከባቢ ሐ.ዘይመንግስታውያን ትካላት

መ. መንግስታዊ ኣብያተ ፅሕፈት ሠ.ካልእ

5. እቲ ፕሮጀክት ዓይነት/ ቴክኖሎጂ ምምራፅ ናይ መን ሓሳብ እዩ ነይሩ?

ሀ.እቲ ሕብረተሰብ ለ.መራሕቲ ከባቢ ሐ. ዘይመንግስታውያን ትካላት

መ. መንግስታዊ ኣብያተ ጽሕፈት ሠ.ካልእ

6. ምንጪ ምወላ / ክፍሊት እቲ ፕሮጀክት ማይ እንታይ እዩ ነይሩ? _____
7. ኣብ ሕብረተሰብኩም ኣብ ኣገልግሎት ማይ ዝረኣዩ ፀገማት ክሳብ ክንደይ ከቢድ እዩ?
ሀ·ትሑት ለ.ፍትሓዊ ሐ ሓያል መ.ኣዝዩሓያል ሠ. ፀገምየብሉን
8. ንሕቶ 7 መልስካ/ኪ ሓያል ወይ ኣዝዩ ሓያል እንተኸይኑ ናይቲ ፀገም መንቀሊኡ እንታይ እዩ?
_____
9.ንሕቶ 7ተ መልስካ/ ኪ ሓያል ወይ ኣዝዩ ሓያል እንተኸይኑ ናይ እቲ ፀገም መፍትሒ እንታይ እዩ?
_____
_____

III. ምልላይ ዓይነት ተሳትፎ ተጠቀምቲ
10.ኣብ መስርሕ ልምዓት ፕሮጀክት ማይ ተሳቲፍኩም'ዶ? ሀ·እወ ለ.ኣይፈሉን
11.ኣብ እዋን ምምዕባል ፕሮጀክት ማይ እንታይ ዓይነት ተሳትፎ ነይሩኩም?
ሀ· ጥረ ገንዘብ ለ.ኣበርክቶ ዕዮ ሐ.ኣበርክቶ ናይ ውሽጢ ዓዲ ንዋት መ.ሓሳብ
12. ኣብ ሓፈሻዊ ምዕባለ ፕሮጀክት ማይ እንታይ ዓይነት ተሳትፎ ነይሩኩም?
ሀ· ውጥንን ምሕደራን ለ. ኣተግባብራ ሐ. ኣጠቓቕማ መ. ኩሎም እዞም ኣብ ላዕሊ ዝተጠቕሱ
ሠ. ዋላሓደ
13. ኣባል ሽማግለ ማይ ዲኻ? ሀ·እወ ለ. ኣይፋልን ሐ. ኮሚቴ የለን
14. ክንደይ ደቂ ኣንስትዮ ኣባላት ኮሚቴ ጠቕላላ ማይ ክኾና ኣለወን ትብሉ? ብዝሒ ደቂ ኣንስትዮ ኣኽብቦ።
ሀ·0 ለ.1 ሐ.2 መ.3 ሠ.4 ረ.5 ሰ.6 ሸ. ልዕሊ 6
15. ኣብ ኮሚቴ ማይ ናይ ሕብረተሰብ ውክልና ደቂ ኣነስትዮ ንምንታይ ዝያዳ ዘይኮነ ?_____
16. ንዓኻን/ክን ካልኦት ደቂ ኣንስትዮን ኣብ ኮሚቴ ማይ ንኽይትሳተፉ ዝዓግቱ ምኽንያታት እንታይ እዮም?
_____
17. ኣብ ኮሚተ ማይ ክትሳተፍ/ፊ ፍሉይ ምትብባዕ ተዋሂቡካ/ኪ ድዩ? ሀ· እወ ለ.ኣይፋልን
18. መብዛሕትኡ ግዜ ንኣገልግሎት ማይ ክፍሊት ትኽፍል ዲኻ/ኪ? ሀ·እወ ለ.ኣይፋልን
19. ሕቶ 18 እወ እንተኾይኑ ብወርሒ ክንደይ ትከፍል/ሊ?_____
20. ንፅገና ስርዓተ ማይ ካብ መን ገንዘብ ክረክብ ኣለዎ ትብሉ/ላ?
ሀ·ታሪፍን ተወሳኺ ኣበርክቶን ተጠቀምቲ ለ. ምምሕዳር ከባቢ ሐ.ዘይመንግስታውያን ትካላት መ.ካልኣ
21. ክፍሊት ማይ ኣብ ግዚኡ ትኽፍል ዲኻ/ኪ? ሀ·እወ ለ. ኣይፋልን
22. ንሕቶ 21 መልስኻ ኣይፋልን እንተኾይኑ ምኽንያትካ እንታይ እዮም?ግለፅ/ፂ።
_____
23. እቲ ዝተኣከበ ክፍሊት ብግቡእ ዝምራሕ ይመስለኩም/ክን ዶ? ሀ·እወ ለ.ኣይፋልን ሐ. ኣይፈልጥን
24. ኣብ ማሕበረሰባትኩም/ክን ብዛዕባ ኣጠቓቕማ ዝስተ ማይ ዝወሃብ ትምህርታዊ መደባት ኣሎ ድዩ?
ሀ·እወ ለ. ኣይፋልን ሐ. ኣይፈልጥን
25.ንሕቶ 24 መልሲካ/ኪ እወ እንተኾይኑ ኣብ ዓመት ክንደይ ግዜ ተሳቲፍካ/ኪ?_____
26. ንሕቶ 24 መልስኻ ኣይፋልን እንተኾይኑ ንኽይትሳተፍ/ፊ ዝዓገተካ እንታይ እዩ?
_____
27. ካብቲ ዝወሃብ ትምህርቲ ረብሓ ትረክብ/ቢ ዲኻ/ኪ?
ሀ·እወ ለ.ኣይፋልን ሐ.ኣይፈልጥን'
28. ንሕቶ 27 መልስኻ/ኪ እወ እንተኾይኑ እንታይ ረብሓ ኣለዎ ንዓኻ/ኪ?_____
29. ንምንታይ ዕላማ ኢኻ/ኪ ማይ እተምዕእ/ኢ?
ሀ. ንመስተን ምድላው ምግብን ለ. ንምሕጻብ ሰብነት ክዳውንትን
ሐ.ንእንስሳታት መ. ንመስኖ ሠ. ንካልእ
30. ብዘይካ እቲ ፕሮጀክት ምንጪ ማይካልእ ምንጭታት ትጥቀም ዲኻ/ኪ? ሀ·እወ ለ.ኣይፋልን
31. ሕቶ 30 መልስኻ እወ እንተኾይኑ ካልኦት ምንጪታት ማይ ዘርዝር/ሪ_____
32. ንኣገልግሎት በዝሒ ሰዓታት ክሳብ ክንደይ ዕጉብ እኻ/ኪ?

ሀ·ብሉጽ ለ.ብጣዕሚ ጽቡቕ ሐ. ጽቡቕ መ.ብገለ መንገዲ ሠ.ትሑት

33. ብዛዕባ ሕብሪ ዝስተ ማይ ዘለካ/ኪ ኣረኣእያ እንታይ እዩ?

ሀ·ብሉጽ ለ.ብጣዕሚ ፅቡቕ ሐ.ፅቡቕ መ. ፍትሓዊ ሠ. ትሑት

34. ብዛዕባ ጣዕሚ ዝስተ ማይ ዘለካ/ኪ ኣረኣእያ እንታይ እዩ?

ሀ·ብሉፅ ለ. ብጣዕሚ ፅቡቕ ሐ. ፅቡቕ መ. ፍትሓዊ ሠ.ትሑት

35. በቲ ዘሎ ብዝሒ ማይ ዕጉብ ዲኻ/ኪ? ሀ·ብጣዕሚ ለ.ኣብ ወቕቲ ይምርኮስ ሐ.አይፋልን

36. ንሕቶ 35 መልሰኻ/ኪ ኣብ ወቕቲ ይምርኮሰ እንተኾይኑ መዓዝ ወቕቲ ይበዝሕ?

ሀ.ክረምቲ ለ.ቀውዒ ሐ.ሓጋይ መ.ፅድያ

37. ማይ ንምቅዳሕ ክንደይ ግዜ ኣብ መስርዕ ንነዊሕ እዋን ደው ትብል/ሊ?(ደቂቃ /ሰዓት)_____

38. ማይ ንምቅዳሕ መስርዕ ዝበዝሐሉ እዋን መዓስ እዩ ሀ. ንጉሆ ለ. ቀትሪ ሐ. ኣጋ ምሸት

39. ሓደስቲ ፕሮጀክት ማይ ንዓኻን/ክን ንሕብረተሰብካን/ክን ክሳብ ክንደይ ኣገደስቲ እዮም?

ሀ·ኣዝዩ ልዑል ለ. ልዑል ሐ.ብመጠኑ መ. ኣገዳሲ ኣይኮነን ሠ.ኣይፈልጥን

40. እንታይ ዓይነት ብከላታት እዩ ዘጨንቖካ/ኪ?

_____

41. ምንጪ ማይካ/ኪ ብኽመይ ይሕሎ? _____

42. ፅሬት ህንፀት ምንጪ ማይ ፕሮጀክት ብኽመይ ትግምግሞ/ሚዮ?

ሀ·ብሉጽ ለ.ብጣዕሚ ጽቡቕ ሐ. ጽቡቕ መ.ፍትሓዊ ሠ. ሕማቅ

43. እቲ ስርዓት ማይ ይዕገን ድዩ?_____

- ኣብ ዓመት ክንደይ ሻዕ፧_____
- ብመን?_____

44. ኣብዚ ሕዚ እዋን ኣብ መትሓዚ ማይ ወይ ዒላታት ዝኾነ ጉድለት ኣሎ ድዩ?

ሀ·እወ ለ. ኣይፋልን

45. በቲ ስርዓት ማይ ዕጉብ ዲኻ/ኪ? ሀ·እወ ለ. ኣይኮንኩን

46. ሕቶ 45 መልስካ /ኪ ኣይኮንኩን እንተኮይኑ መፍቲሒኡ እንታይ ክከውን ኣለዎ ትብል/ሊ

_____

47. ኣብ ደረጃ ታሪፍ ዘለካ/ኪ ኣረኣእያ እንታይ እዩ?

ሀ·ክቡር ለ ፍትሓዊ ሐ. ርካሽ መ. ኣይፈልጥን

48. ታሪፍ ናይ ምኽፋል ዓቕሚ (ኣብ ምኽፋል) ፀገም ኣለካ/ኪድዩ?

ሀ·እወ ለ. ኣይፋልን ሐ. ሓደ ሓደግዘ

49. ሕቶ 48 መልስካ/ኪ እወ እንተ ኮይኑ ነቲ ታሪፍ ዝትክእ ገንዘብ ካበይ ክመጽእ ይኽእል ትብል/ሊ?

_____

50. ሕብረተሰብ ነቲ ኣገልግሎት ንምቕፅል ፋይናንሳዊ ዓቕሚ ነይርዎ ድዩ?

ሀ·እወ ለ. ኣይፋልን ሐ. ኣይፈልጥን

51. ወናኒ እቲ ውጥን ማይ ፕሮጀክት መን እዩ? ሀ·እቲሕብረተሰብ ለ. ምምሕዳርከባቢ ሐ. ዘይመንግስታውያንትካላት መ. ኣይፈልጥን′ ሠ.ካልኦት

52. እቲ ዘሎ ቀረብ ማይን ሕብረተሰብን እኹል እዩ ትብሉ/ላ ዶ? ሀ·እወ ለ.አይፋልን

53. ንሕቶ 52 መልስኻ/ኪ ኣይፋልንእንተኾይኑ መፍትሕታት እንታይ እዮም?

_____

መመላእታ ለ

ብዛዕባ ገምጋም ቀረብ ማይ ገጠርን ቴክኒካዊ ድጋፍምን ምስ ክኢላታት ማይ ወረዳ ዝተዘተየሎም ጉዳያት (ነጥብታት)።

1. ፕሮጀክትታት ማይ ብኽመይ ተዳልዉ?

2. ቅድሚ እቲ ፕሮጀክት መበገሲ ዳህሳስ ትገብር ዲኻ እንታይ ዓይነት ኩነታት ትምርምር?

3. እቶም ማሕበረሰባት ኣብቲ ፕሮጀክት ተሳቲፎም ድዮም?

4. ማሕበረሰባት ብኢድ ዝተኻዕቱ ዒላታትን ልምዓታት ፈልፉሊ ማይን ናይ ህንፀት ቦታ ኣብ ምምራፅ ተሳቲፎም ድዮም?

5. ደቂ ኣንስትዮ ኣብቲ ዝሳተፍዎ መስርሓት ተሳቲፈን ድየን?

6. ትካልኩም ናይቶም ዝተሃነፁ ነጥብታት ማይ ዓይነት ቴክኖሎጂ ኣብ ምምራፅ ንሕብረተሰብ ዕድል ሂቡ ድዩ?

7. ትካልኩም ዝሃንጸ ዘሎ ዒላ ወይ ምንጪ ንሃልኪ ሕብረተሰብ እኹል ምኻኑ ብኽመይ ትፈልጥዎ?

8. ትካልኩም ኣብቲ ሕብረተሰብ ኮሚቴ ማይ ኣብ ምውዳብ ንሕብረተሰብ ሓጊዙ ድዩ?

9. ትካልኩም ብኢድ ዝተኻዕቱ ዒላታትን ልምዓታት ፈልፉሊ ማይን ትካላዊ ኣብ ምግባር ሕብረተሰብ ሓጊዙ ድዩ?

10. ናይ ኮንትራክተር ክትትል ጌርካ ዲኻ?

11. ስታፍ ቴክኒሻናትኩም ንናይ ወረዳ ማይ መስርዕ እኹላትን እኹል ዓቕሚ ዘለዎምን ይመስለኩም?

12. ኣብ መስርሕ ምትግባር ስርዓታት ቀረብ ማይ ገጠር እንታይ ዓይነት ፀገማት ትርእዩ?

13. ማይ ኣብ ምንታይ ወቕቲ እዩ ዝኹዕት? እንተኾይኑ ብኢድ ጽቡቕ ጌሩ ዝተኻዕተ

መመላእታ- ሐ

ምስ ኣባላት ኮሚቴ ማይን ደቂ ኣንስትዮን ብዛዕባ ተሳትፎ ደቂ ኣንስትዮ፣ ስልጠናን ምሕደራ ኣገልግሎት ማይን ዝምልከት ነጥብታት ዘተ።

1. **ከም ኣባል ኮሚተ ማይ ወይ ከም ሰልጠንቲ ጥራይ መን መሪጹካ?**

2. **እቲ ስልጠና መዓስ ረኺብካዮ?**

3. **እቲ ስልጠና ንኽንደይ መዓልታት ተዋሂቡ? ብዘይካዚ፡ መን እዩ ነቲ ስልጠና ሂብዎ፧**

4. **ኩሎም እቶም ብተደጋጋሚ ጽገና ዘድልዮም ክፋላት ናይቲ ማይ ቀረብ ስኬም ትፈልጦም ዶ ትብሉ?**

5. **ኣብ ዝኾነ እዋን ብዘይ ሓገዝ ነቲ ስኬም ብባዕልኻ ክትሕልዎ ምእንቲ እቲ ስልጠና እኹል እዩ ነይሩ ትብሉ? እንተዘይኮይኑ ንምንታይ?**

6. **ንስኻን ምሳኻ ዝሰልጠኑ ዓርክኻን (ዓርክኻ) ኣብቲ ስኬም ውድቀት (ውድቀት) እንተዓቂብኩም ስርዓት፡ እቲ ስርዓት ክንደይ ግዜ ተዓቂቡን ከም ዝሰርሕን ተገይሩ?**

7. **እቲ ስልቲ ክሳብ ሕጂ ብዘይካኻን ኣዕሩኽትኻን ብኻልኦት፣ ምስ ዝሰልጠኑ፣ ነቲ ስርዓት ክትሕልዎ ስለዘይከኣልካ ተዓቂቡ ድዩ?**

8. **ናይ ጽገና ወጻኢታት መን ሸፊንዎ?**

9. **ንስኻን ምሳኻ ዝሰልጠኑ ዓርክኻን(ዓርክኻን) ነቲ ውዲት ክትሕልዎ ፈቲንኩምን እንተዘይተዓዊትኩምን፡ እቲ ውድቀት ክንደይ ግዜ እዩ ኣጋጢሙ**

10. **ኣብ ከባቢና ናይ ጽገና መለዋወጢ ኣቑሑት ኣለዉ ድዮም?**

11. **ካብ ዝምልከቶም ኣካላት ከም ኣብያተ ፅሕፈት ቀረብ ማይ ወረዳ ትካላዊ ድጋፍ ኣሎ ዶ?**

12. **ነቲ ናይ ማይ ነጥቢ ብኽመይ ትመሓድሮ?**

13. **ኣበርክቶ ክፍሊት ማይ ኣብ ወርሒ ብኽመይ ይእከብ? ኣበርክቶ እንተገይሮም**

14. **ኮሚቴኹም ነቲ ሕብረተሰብ ንምምሕዳርን ንማይ ነጥቢ ንምምሕዳርን ዝምልከት ሕግን ስርዓትን ኣለኩም ዶ?**

15. **ኣባላት ሽማግለ ማይ ክንደይ ኣባላት እዮም? ክንደይ ካብኣተን ደቂ ኣንስትዮ እየን?**

16. **ኣብ እዋን ምሕደራ ኣገልግሎት ቀረብ ማይ ገጠር ዘጋጥሙ ዓበይቲ ፀገማት እንታይ እዮም?**

መሕትት ማይ ግልጋሎት ከተማ ፍረወይኒ

ቀንዲ ዕላማ ናይዚ መሕትት ሕፅረት ቀረብ ዝስተ ማይ ከተማ ፍረወይኒ ዘጋጥም ምክንያት ሓበሬታ ንምእካብ ዩ። እቶም ካልኦት ዕላማታት ድማ ብዛዕባ ቴክኒካዊ፣ ከባቢያዊ፣ ፋይናንሳዊ ፣ ማሕበረ ቁጠባዊ ረቋሒታት ንዝኣመሰሉ ሓበሬታ ብምእካብ መፍትሕታት ፀገም ቀረብ ዝስተ ማይ ከተማ ፍረወይኒ ንምርካብ ይሕግዘኒ። ስለዚ እቲ ሓቀኛ ሓበሬታ ንክትነግሩኒ በዓልቲ ምሉእ ተስፋ እዩ።

ስለዚ ግዜኹምን ምትሕብባርኹምን የቀንየለይ።

ስም መልሲ ወሃቢ _____ዖታ_____ዕድመ_____

ደ/ት ምህርት_____ስራሕ ሓላፍነት_____

1. ኣብ ከተማ ፍረወይኒ ዝነብር በዝሒ ህዝቢ ክንደይ ዩ?_____
2. ኣብ ከተማ ፍረወይኒ ዝነብር በዝሒ መራሒ ስድራ ክንደይ እዩም?_____
3. ሓደ ሰብ መጠን ዝስተ ማይ ብምዓልቲ ክንደይ ሊትሮ ዩ ?_____
   - መጠን ዓለምለኻዊ
   - መጠን ኢ/ያ
   - መጠን ወረዳና (ከተማ ፍረወይኒ)
4. ኣብ ከተማ ፍረወይኒ ዝነብር ህዝቢ ዝረክቦ መጠን ዝስተ ማይ እኩል ድዩ ?
   ሀ/ እወ ለ/ ኣይፋልን
5. ሕቶ ቁፅሪ 3 መልስኻ/ኺ ኣይፋልን እንተኾይኑ
   ቀንዲ ምኽንያት እንታይ እዩም?_____
6. ሕቶ ቁፅሪ 3 መልስኻ/ኺ ኣይፋል እንተኾይኑ
   ቀንዲ መፍትሕታት እንታይ እዩም ?_____
7. ኣብ ከተማ ፍረወይኒ ዝርከባ በዝሒ ቡምቢ ገዛን ገዛ ክንደይ የን ?_____
8. ኣብ ከተማ ፍረወይኒ ዝርከባ በዝሒ ቡምቢ ገዛን ገዛ ግልጋሎት ይህባ ዶ ?
   ሀ/ ኩሉ መዓልቲ ለ/ በቢ ሰሙን ሐ/ በቢ ወርሒ መ/ ሓልሓሊፈን ረ/ ግልጋሎት ኣይህባን
9. ሕቶ ቁፅሪ 8 መልስኻ/ኺ ካብ ኩሉመዓልቲ ወፃኢ እንተኮይኑ ምክንያቱ እንታይ እዩ?

   _____ _____

10. ኣብ ከተማ ፍረወይኒ ዝነብር ህዝቢ ዝጥቀመሉ ፍልፍል ዝስተ ማይ ግለፅ/ፂ

    _____

11. ህዝቢ ከተማ ፍረወይኒ ዝጥቀመለን ምንጪ/ፕሮጀክት ዝስተ ማይ ክንደይ እየን

    _____

12. ካብተን ዘለዋ ህዝቢ ዝጥቀመለን ምንጭታት /ፕሮጀክትታት ዝስተ ማይ ዝሓሸ መጠን ማይ ዘለወን ክንደይ እየን?

    _____

13. **መጠን በዝሒ ህዝበን መጠን እተን ምንጭታት / ፕሮጀክትታት ዝስተ ማይን ዝተመጣጠነ ድዩ ?**

ሀ/ እወ ለ/ ኣይፋልን

14. **ሕቶ ቁፅሪ** 13 **መልስኻ/ኺ ኣይፋልን እንተኮይኑ መፍትሒኡ እንታይ ዩ?**

_____

15. **ትካልኩም ነተን ኣብ ከተማ ፍረወይኒ ዘለዋ ምንጪ / ፕሮጀክት ዝስተያ ማይ ቁፅፅርን ክትትልን ይገብረለን ዶ ?**

ሀ/ እወ ለ/ ኣይፋልን

16. **እቶ ቁፅሪ** 15 **መልስኻ/ኺ እወ እንተኮይኑ ዝግበረለን ቁፅፅርን ክትትልን ዘርዝር/ሪ**

_____

መሕትትን ቤት መዘጋጃ ከተማ ፍረወይኒ

ቀንዲ ዕላማ ናይዚ መሕትት ሕፅረት ቀረብ ዝስተ ማይ ከተማ ፍረወይኒ ዘጋጥም ምክንያት ሓበሬታ ንምእካብ ዩ። እቶም ካልኦት ዕላማታት ድማ ብዛዕባ ቴክኒካዊ፣ ከባቢያዊ፣ ፋይናንሳዊ ፣ ማሕበረ ቁጠባዊ ረቂሒታት ንዝኣመሰሉ ሓበሬታ ብምእካብ መፍትሕታት ፀገም ቀረብ ዝስተ ማይ ከተማ ፍረወይኒ ንምርካብ ይሕግዘኒ። ስለዚ እቲ ሓቀኛ ሓበሬታ ንክትነግሩኒ በዓልቲ ምሉእ ተስፋ እዩ።

ስለዚ ግዜኽምን ምትሕብባርኽምን የቀንየለይ።

ስም መልሲ ወሃቢ _____ዖታ_____ዕድመ_____

ደ/ትምህርት_____ስራሕላላፍነት_____

1. ኣብ ከተማ ፍረወይኒ ዝነብር በዝሒ ህዝቢ ክንደይ ዩ?_____
2. ኣብ ከተማ ፍረወይኒ ዝነብር በዝሒ መራሒ ስድራ ክንደይ እዩም?_____
3. ኣብ ከተማ ፍረወይኒ ዝነብር ህዝቢ ዝረክቦ መጠን ዝስተ ማይ እኩል ድዩ ?
   ሀ/ እወ ለ/ ኣይፋልን
4. ሕቶ ቁፅሪ 3 መልስኻ/ኺ ኣይፋልን እንተኾይኑ
   ቀንዲ ምኽንያት እንታይ እዩም?_____
5. ሕቶ ቁፅሪ 3 መልስኻ/ኺ ኣይፋል እንተኾይኑ
   ቀንዲ መፍትሕታት እንታይ እዩም ?_____
6. ኣብ ከተማ ፍረወይኒ ዝርከባ በዝሒ ቡምቧ ገዛ ንገዛ ግልጋሎት ይህባ ዶ ?
   ሀ/ ኩሉመዓልቲ ለ/ በቢሰሙን ሐ/ በቢወርሒ መ/ ሓልሓሊፈን ረ/ ግልጋሎት ኣይህባን
7. ሕቶ ቁፅሪ 7 መልስኻ/ኺ ካብ ኩሉ መዓልቲ ወፃኢ እንተኾይኑ ምክንያቱ እንታይ እዩ?

   _____
8. ኣብ ከተማ ፍረወይኒ ዝነብር ህዝቢ ዝጥቀመሉ ፍልፍል ዝስተ ማይ ግለፅ/ፂ

   _____
9. ህዝቢ ከተማ ፍረወይኒ ዝጥቀመለን ምንጪ/ፕሮጀክት ዝስተ ማይ ክንደይ እየን

   _____
10. ካብተን ዘለዋ ህዝቢ ዝጥቀመለን ምንጭታት /ፕሮጀክትታት ዝስተ ማይ ዝሓሸ መጠን ማይ ዘለወን ክንደይ እየን?

    _____
11. መጠን በዝሒ ህዝበን መጠን እተን ምንጭታት / ፕሮጀክትታት ዝስተ ማይን ዝተመጣጠነ ድዩ ? ሀ/ እወ ለ/ ኣይፋልን
12. ሕቶ ቁፅሪ 11 መልስኻ/ኺ ኣይፋልን እንተኾይኑ መፍትሒኡ እንታይዩ ?

    _____
13. ትካልኩም ነተን ኣብ ከተማ ፍረወይኒ ዘለዋ ምንጪ / ፕሮጀክት ዝስተያ ማይ ቁፅፅር ክትትል ይገብረለን ዶ ? ሀ/ እወ ለ/ ኣይፋልን
14. እቶ ቁፅሪ 13 መልስኻ/ኪ እወ እንተኾይኑ ዝግበረለን ቁፅፅርን ክትትልን ዘርዝር/ሪ

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