SAMPLE

ASSESSMENT OF URBAN WATER SUPPLY AND CONSUMPTION IN ASAYTA TOWN , AWSIRESSU ZONE, AFAR NATIONAL REGIONAL STATE, ETHIOPIA

M.A THESIS

ABBREVIATION AND ACRIMONY

ANRS	Afar National Regional State
APDA	Afar Pastoralist Development Agency
ATM	Asayta Town Municipality
ATWSSO	Asayta Town Water Supply Service Office
AWPRDO	Asayta Woreda Pastoral and Rural Development Office
AWV	Africa Water Vision
BoFED	Bureau of Finance and Economic Development
BPS	Booster Pumping Station
CBO	Community Based Organization
CSA	Central Statistical Agency
EWWCA	Ethiopia Water Works Construction Agency
GTP	Growth and Transformation Plan
JMP	Joint Monitoring Program
PH	Potential of Hydrogen
PMC	Private Meter Connection
PPIAF	Public Private Infrastructure Advisory Facility
MDGs	Millennium Development Goals
MICs	Middle Income Countries
MoWR	Ministry of Water Resources
MoWIE	Ministry of Water, Irrigation and Energy
SSA	Self Supply Acceleration
UAP	Universal Access Plan
WAE	Water Aid Ethiopia
WRG	Water Resources Group
WSDP	Water Sector Development
WASH	Water Sanitation and Hygiene

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1. INTRODUCTION

1.1. Background of the Study

During 2000 to 2006 the proportion of the population with access to an improved drinking water source in developing regions rose from 74 percent to 84 percent. However, nearly 1 billion people were still using water from unimproved sources such as shallow wells, rivers, streams, ponds and drainage ditches-with their attendant health and safety risks. Large numbers of those who lack access to improved water supply infrastructure live in urban areas (Andre, 2006).

A large group of households who live in the expanding slums of cities through the developing world earning incomes of less than 50 US dollars per month. Many of these households currently have neither private piped connections nor the income to obtain them. In densely crowded slums, there are often large benefits associated with improved sanitation. As improved sanitation is crucial for public health, improvements in water supply must compete with sanitation investments for the limited public subsidies. Here the challenge is to design tariffs and subsidies so that the basic needs of all households can be met (Yewondossen , 2012).

Similarly, lack of access to safe and adequate water supplies contributes to ongoing poverty both through the economic costs of poor health and high proportion of household expenditure on water supplies in many poor communities. This is arising from the need to purchase water, time and energy expended in collection. Access to safe drinking water and sanitation is a global concern. However, developing countries have suffered from unimproved sources and inadequate sanitation services (Tegene and Van, 2004).

In relation to this Kharti (2007) Stated that the problem of water scarcity in urban areas of developing countries especially in Africa is a major concern. It is estimated that by 2050, half of India's population will be living in urban areas and will face acute water problems. It was reported in 2002 that about 1.1 billion people were still using water from unimproved sources, and two thirds of these people live in Asia.

In similar way Toyobo and Tnimovo (2011) pointed out that the demand for safe, adequate and accessible urban water activities particularly in third world countries has been increasing over-time as a result of the rising standard of living and the population increase resulting from natural growth, as well as rural-urban migration. Under such circumstances planning for water delivery system in both short-run and long-run is critical to ensure that the population receives adequate water supply.

In Africa in 2006, 602 million people had access to improved drinking water sources in 2006.This shows coverage increased from 56% in 1990 to 64%. The rate at which Africans gained access to improved drinking water sources, 245 million people since1990, falls short of that required to meet the 2015 MDG drinking water target (Haysom, 2006).

It is known that that Ethiopia has adopted the international millennium declaration. And also the water supply and sanitation UAP was ratified by the Ethiopian parliament in 2005 and is the current guiding planning framework for WASH. The MDG target is to attain 70% of national potable water access in 2015. UAP national targets are much more ambitious than those set under MDG. It is to attain 98% of rural potable water access within 1.5 km (15 liters/capita/day) and 100% of urban potable water access within 0.5 km (20liters/capita/day) by the end of 2012(MoWR,2006).

The investigator considered from his observation and experience that the problem of water in Asayta town is growing from time to time. Improving the water supply coverage has a number of advantages for the society of the town as well as for the government socially and economically. Thus, the justification for this research is to investigate the problems in relation to the availability, production, distribution mechanisms and the consumption of water in Asayta town.

1.2. Statement of the Problem

Delivering effective urban water service needs to be supported by appropriate and good working condition of the water supply system. Urban water supply systems typically includes water collection and storage facilities at source sites, water transport via pipelines from source sites to water treatment facilities; then from water treatment to the distribution systems. Problems in these components importantly affect the urban water service (Muna, 2006).

In the world over 800 million people use unimproved drinking water sources in 2010, and in 2015 estimates about 672 million people will still using unimproved drinking water resources in the world. At the beginning of 2000, about 1.1billion people in the world were without access to improved water supply in most parts of the world (Bandari and Grant ,2007).

Fresh water will be a critical limiting resource for many regions in the near future. About one-third of the world's population lives in countries that are experiencing water stress. In Asia, where water has always been regarded as an abundant resource, per capita availability declined by 40-60 percent in 1990's. Projections suggest that most Asian countries will have severe water problems by the year 2025. Most of African countries historically have been water-poor. The problem is that the population is growing rapidly putting more pressure on our water supply. On the other hand the amount of water is effectively reduced by pollution and contamination (Gleick, 2002).

On the other hand Tegene and Van (2004) stated that one of the major problems that Ethiopia faces is 42 percent of the population is without a clean water supply, instead being forced to drink from rivers, streams, lakes and even puddles to survive. These sources are often contaminated and animals can frequently be seen urinating in the same water up stream that people then collect form lower down. The health risks from drinking unprotected clean water source are severe, with water related deaths occurring incredibly often, as well as Ethiopians suffering from illness such as bronchitis, tonsillitis, diarrhea, vomiting, eye and respiratory infections as well as the deadly malaria on a far too regular occurrence.

Some local studies were conducted in relation to urban water supply problem in Ethiopia. Among them is "Urban Water Supply: The cause of Asosa Town '' by Asefa Delesho in 2006. His study was mainly focused on the cause of water problems in Assosa town .His finding indicates that the water supply Asosa town could not satisfy the consumption of the people due to increase in the number of the population of the town and weak capacity of water supply service of the town. Thus his study focuses on the factors rather than the other issues to be assessed.

The other study was conducted by Mesret Belachew in 2012, "Assessment of Drinking water quality and determinants of house hold potable water consumption in Simada district, Ethiopia". His study revealed that water supply in urban areas is more or less better than rural areas. But, the water cost is considered very high in urban area especially for the poor. In rural area, people did not use constructed water points because of inadequacy, distance, and longer waiting times. His study was focused on the study of both urban and rural water supply schemes but this investigation in Asaita town is mainly focused on urban water supply and Consumption in the lowland part of Ethiopia.

In addition to the above researches similar study has been carried out in Ambo town by Chala Deyissa under the title of 'An assessment of urban water supply and sanitation: The case of Ambo town, Oromiya region.' in 2011. His findings revealed that the shortage of water supply, high cost of piped water connection, and frequent interruption were the major problems in Ambo town water supply service.

Generally the studies conducted at national level indicated that the supply of water varies from place to place based on residence and consumption was low compared with other countries. However there was no previous study done in Asayta town with this regard. Thus, as filling the gap of other researches, this study was actually intended to assess availability, distribution mechanisms, production, the needs and consumptions of water in low land part of Ethiopia, Asayta. It also assessed the root causes and the major challenges of water supply and consumption in the town.

Asayta town is the capital town of Awsiressu Zone of Afar National Regional State, found in north eastern part of the region within the main rift valley. The town has experienced shortage of water supply since its establishment particularly during dry seasons. Most of the time peoples do not get water when they need because water is not available every day they may get water within two or three days of gap with limited hours, Unless travelled to outside the town to Awash river and other areas to get water for their domestic and other uses or they buy water with high cost from private water sellers (ATWSSO, 2013).

1.3. Objectives of the Study

The general objective of the study is to assess the practices and challenges in the provision of adequate water supply in Asayta Town.

The specific objectives of the study were listed as follows:

1. To assess the status of the existing water supply schemes in Asayta town
2. To assess the adequacy, availability, quality, and consumption of water of the town;
3. To examine the water tariff set of the town in relation to the living standard of the people
4. To identify factors that affect water supply and consumption in the town

1.4. Research Questions

The objective of the study was achieved by answering the following questions:

1. How is the status of coverage of existing water supply of town?
2. Are the availability, distribution and consumption of water found at satisfactory level in the town?

3. Does the water supply service office of the town have affordable water tariff to the residents?

4. What are the factors affecting water supply and consumption of Asayta town?

1.5. Significance of the Study

Studying the extent and coverage of urban water supply service in Asayta town helps to identify the pressing problems in service delivery. Thus, the findings of the study are significant for the municipality of Asayta town for designing more effective method of water supply by narrowing the information gap between supply and demand.

It also helps for governmental and non-governmental organizations which have interest in assisting Asayta town with financial and technical support in the area of urban water supply. In addition to this it contributes to the optimal use of water by various trade organizations, households, stake holders, related offices and other beneficiaries. Finally, the results of this research initiate other investigators to conduct further study in the delivery of similar urban services in other towns of Ethiopia.

1.6 .Scope of the Study

The scope of the study is limited to house hold water supply and consumption. It did not include other consumption of water supply like industrial and other issues. This is to manage the issues of focus in a bit deeper manner rather than considering a number of wide issues together. The study mainly focused on assessing the availability, distribution mechanisms, and consumption of domestic water supply in Asayta town.

1.7. Limitation of the Study

The problem faced by the investigator during the research process was shortage of finance and time. The investigator was holding extra responsibilities other than his regular duty while he was conducting this study. The other problem faced in the course of this study was associated with

getting sufficient secondary data. For example there was shortage of well documented data sources and adequate report especially in the study area from Asayta town water Supply Service office.

1.8. Organization of the Thesis

This thesis was organized into five major parts. Chapter one included the introduction, which focused mainly on the background, statement of the problem, objectives, research questions, significance, the scope and limitation of the study as well as the organization of the thesis. Chapter two dealt with review of different literatures related to the importance and practices of water supply and consumption in relation to global wise, in developing countries mostly in Africa and Ethiopia. Research methodology constituted chapter three of the thesis and includes description of the study area, research design, data collection and analysis methods. Chapter four contained results and discussion which describe the main findings of the study and it is sub divided in to nine sections. Chapter five included summary and conclusion of the study and additionally recommendations were given.

1. 9. Definitions of Key Terms

Commercial use: refers to Putting water to business related activities such as hotels, bars, Recreational areas, markets, car washing, watering animals (Assefa, 2006).

***Dadaa* rains :** Local Afar expression defining few days of showers which normally occur either in November or December (ANRS, 2006).

Domestic Use: refers to Water used for drinking, cooking, sanitation or for Other similar purposes (Getachew, 2004).

Household: any unit of habitual residence where some consumption and/or production may be undertaken in common and where some members may recognize culturally defined relationships of kinship or affinity where the members are related in some way. (Assefa ,2006).

Karma rains: Local Afar expression defining the long rains which usually occur between June and September in the Afar Region of Ethiopia. They can be compared to the long *kiremt* rains in the neighboring Amhara Region.(ANRS,2006)

Safe Water: refers to the water protected from contamination (Meseret , 2012)

Sugum rains: Local Afar expression defining the short rain which usually occur between March and April in the Afar Region of Ethiopia (ANRS, 2006).

Water Coverage: refers to the proportion of people served with the adequate levels of water Supply (Zegeye , 2010).

Water Services Fee: Fees charged for water supply services only (MoWE, 2007).

Water supply Shortage: is used to describe a shortage where levels of water supply do not meet certain defined minimum requirements (Zegeye, 2010).

2. REVIEW OF RELATED LITERATURE

2.1. Water Scarcity at Global Scale

The Millennium Development Goals which are numerical time-bound goals for reducing human suffering, have one of the goals being to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. Provision of safe drinking water and basic sanitation is among the most critical challenges for achieving sustainable development over the next decade. World urban populations, which make up to 50% of the total population on the globe, are growing approximately 5% each year. This has the potential to further strain many over burdened water systems leading to extreme water shortages worldwide (UNDP , 2006).

As indicated by Assefa (2006) water supply system is infrastructure for the collection, transmission, treatment, storage, and distribution of water for homes, commercial establishments, industry, and irrigation, as well as for such public needs as firefighting and street flushing. Of all municipal services, provision of potable water is perhaps the most vital. People depend on water for drinking, cooking, washing, carrying away wastes, and other domestic needs. Water supply systems must also meet requirements for public, commercial, and industrial activities. In all cases, the water must fulfill both quality and quantity requirements.

According to Kassa (2001) "In the twenty first Century we are surrounded by the marvels of modern communications, electronics and bio-mechanics; we have charted the human genome and yet we have not mustered the skills, resources and will to provide all members the global population with something as basic as safe water supply and adequate sanitation. Providing for daily water needs is a burden on households with inadequate services in a number of ways, in addition to the direct health threats".

Water scarcity refers to a situation when the water supply is inadequate in relation to the water demand for basic human and ecological necessities, including the production of food and other economic goods. Scarcity is the principal component of the three-fold water crisis because it can drive or exacerbate both access and pollution. The social, rather than environmental, origins of water scarcity the heart of the global water crisis is rooted in power, poverty and inequality, not in physical availability (Assefa ,2006).

On the other hand UNDP (2006) pointed out that distribution of global runoff is highly uneven and corresponds poorly to the distribution of the world population. Asia has 69% of world population but 36% of global runoff. South America has 5% of world population, 25% of runoff. Much of runoff is inaccessible. Amazon River accounts for 15% of runoff and is currently accessible to 25 million people

Already some one third of the world's population is living in either water-scarce, or water-short areas. In supporting this idea Sobsey (2002) indicated that 783 million people, or 11 percent of the global population, remain without access to an improved source of drinking water. Such sources include household connections, public standpipes, boreholes, protected dug wells, protected springs and rainwater collections. The world has met the MDG drinking water target five years ahead of schedule but work is not yet completely done. We must not forget that since it is not yet possible to measure water quality globally, dimensions of safety, reliability and sustainability may actually be slowing progress. Furthermore, there are regions particularly delayed such as Sub-Saharan Africa where over 40 percent of all people without improved drinking water live.

As the cause of this situation Jury and Vax (2007) indicated that the urban population is increasing more rapidly than the rural population in most parts of the world, and the highest rate of urban growth is observed in developing countries. While, during the present decade (1997 - 2007) , the total population of the world (both urban and rural) is growing at a rate of about 1.7 % annually, the world urban population is increasing at an average rate of about 2.9 %. In the developing countries, however, the rate of urban population growth is 3.4 %, but in some of them

it may be as high as 5 **%** or 6 %. Today, about 1200 million people live in urban areas. This vast scale of urban population growth is a measure of the magnitude of future urban water needs.

2.2. Water Consumption in the World

Safe drinking water implies that water is largely free from impurities and microorganisms that frequently cause disease or death. Unsafe drinking water significantly limits human progress close to half of all people in developing countries suffer from health problems caused by water and sanitation deficits at any given time .To address this burden, the world health organization outlines corrective measures, such as providing access to sufficient quantities of safe water, providing facilities for disposal of sanitary waste, and introducing sound hygiene behaviors (Lall, 2008).

A study conducted in San Julian, El Salvador South America showed that, most of the population (96%) has access to the municipal water system; every HH connection is metered and service is provided 24 hours per day. Similar study conducted in two rural of Nicaragua showed that, water supply coverage in the area is 35%. Another case study conducted in Marinilla, North west Colombia indicated that water supply coverage were reaching 99% of the population with all metered connection & provided service of 24 hours a day. A study conducted in Honduras, Latin America since 2004 indicated that, 79% of the people have access to drinking water summarized by (Desalegn, 2008).

The cascade of ensuing benefits from government investment in water and sanitation is so powerful that it can even be labeled as preventive medicine, with analogies drawn to immunizations. In the coming decades, water is thus expected to acquire an increasingly important position on the global agenda. Even today, water-related human morbidity and mortality, which results from widely divergent levels of both water quality and quantity, is already widespread, and almost 80% of the global population faces exposure to high threat levels of water insecurity. The impacts of water shortages are particularly acute in the developing world, where rising populations and climate change are expected to cause severe water shortages for one-third of the population in this century (Legese *et al*, 2006).

2.3. Urbanization and Water Supply in Africa

As indicated by Desalegn (2008) thirty-eight percent of Africa's population in 2006, that is to say 297 million people, lives in urban areas. By 2030, this is expected to grow to approximately 54 per cent of Africa's projected population of around 1405 million. The level of urbanization in Africa is on a par with that in Asia, but lowers than the global figure of 47 per cent, and well below the European and North American levels of over 70 percent.

On the contrary, Awulachew *et al* (2007) pointed out that it must be borne in mind that the definition of what constitutes an urban area differs from one African country to another. For example, in Uganda a settlement with a population of more than 100 is classified as urban, whereas in Nigeria and Mauritius an urban area has a population of more than 20 000 .There are also difficulties in defining a city, as cities are not only defined on the basis of population size but also of administrative or legislative functions. Large cities, however, are generally those with populations over a million, and mega-cities have populations of more than 10 million.

2.3.1. Urbanization in Africa

Urbanization is growing in both developed and developing countries, and the rapid rise in urbanization in Africa in particular, has received wild attention from and around the world. Indeed, urbanization can mean that, there is an improvement in the social status of people living in rural areas, or upgrading or renaming of rural areas as urban centers, or is the physical growth of urban areas as a result of rural migration and even suburban concentration into cities, particularly the very large ones (Sutton , 2006).

The realities of rapid urbanization and population growth in Africa are objectively potent with the realities of diversity of challenges, constraints and threats to service delivery in urban centers. Urban centers are attraction centers for rural population and, through multiplier effects, population sizes continue to grow concomitant with the demand for the services thus, (hospitals, schools, industrial and commercial zones, security, etc. Rapid urbanization over the last five

decades is changing Africa's landscape and also generating formidable challenges for supplies of water and sanitation services (ADB, 2010).

On the other hand Khan (2003) defined urbanization as the movement of people from communities concerned chiefly or solely with agriculture to other communities generally larger whose activities are primarily centered in government, trade, manufacture or allied interest. It is also seen as the movement of population from rural to urban areas and the resulting increasing proportion of a population that resides in urban rather than rural areas. This phenomenon of urbanization has greatly caught up with the world, Ghana inclusive and it comes with its own set of problems that have become a burden on central government and policy makers who are at a lost as to how to tackle it. The unbridled rural to urban drift in Ghana started in the mid-1980s following the breakdown of the agriculture sector.

According to Getnet and David (2009), urban centers in Africa are growing at a faster rate than anywhere else in the world. In 2009, 40 percent of Africa's one billion people live in urban areas - 60 percent in slums - where water supplies and sanitation are severely inadequate. Africa's urban population without access to safe drinking water jumped from close to 30 million in 1990 to well over 55 million in 2008.

2.3.2. Urban water supply in Sub Saharan Africa

Africa faces huge challenges with multiple issues that adversely affect public health. One major challenge is the ability for both rural and urban Africans to access a clean water supply. In relation to this Hailu (2002) indicated that only 59% of the world's population had access to adequate sanitation systems, and efforts to achieve the Millennium Development Goal, which is aiming for 75% by the year 2015, will fall short by nearly half a billion people. The situation of access to clean water and sanitation in rural Africa is even more dismal than the previous statistics imply.

In 2004, only 16% of people in sub-Saharan Africa had access to drinking water through a household connection (an indoor tap or a tap in the yard). Not only is there poor access to readily accessible drinking water, even when water is available in these small towns, there are risks of contamination due to several factors. When wells are built and water sanitation facilities are developed, they are improperly maintained due to limited financial resources. Water quality testing is not performed as often as is necessary, and lack of education among the people utilizing the water source leads them to believe that as long as they are getting water from a well, it is safe. Once a source of water has been provided, quantity of water is often given more attention than quality of water (Awuah *et al 2009*)

On the other hand Davidson and Esubalew (2009) stated that access rate to improved water supply sources hardly increased in urban sub-Saharan Africa since the late 90's. The percent of the urban population that had access to improved water supply only increased from 67 percent in the late 90's to 69 percent in the late 2000's. This represented an increase of 63 million urban dwellers gaining access to improved water supply from 135 to about 199 million since late 90's.

One third of all nations suffered from clean water scarcity, but Sub-Saharan Africa had the largest number of water-stressed countries of any other place on the globe and of an estimated 800 million people who live in Africa, 300 million live in a water stressed environment. Water Scarcity in Africa is estimated that by 2030, 75 million to 250 million people will be living in areas of high water stress, which will likely displace anywhere between 24 million and 700 million people as conditions become increasingly unlivable (Abraham, 2004).

2.4 Urban population in Ethiopia

In Ethiopia in 1994, 83.9 percent of the total population was found in rural areas, while the remaining 16.1 percent lived in urban areas. Yet regional data indicate that more than half of the population in Dire Dawa (67.5%) and Harari (50.5%) were urban residents. In addition, the proportions of urban residents in Tigray (19.5%) and Gambella (25.2%) regions are relatively larger than the proportion within the total national population. However, summary and Statistical Report of the 2007 Population and Housing Census of Ethiopia does not show the inter-censual

growth rate by place of residence. The inter censual growth rate by place of residence would have shown urbanization and urban population increase in the three census years: 1984, 1994, and 2007 (CSA, 2008).

The urban population in Ethiopia in 1984, the first census period, was 4.3 million forming 11 percent of the total population. In 1994, the second census period, the urban population was 7.4 million. Total urban population had increased by 12 per cent from that of 1984. In terms of urban centers, in 1984, Ethiopia had 312 urban centers with population of over 2000. In 1994, the second census period, the urban centers in the country grew to 534 registering an increase of 71 percent over that of 1984 though the definitions of the two censuses are not the same .The growth has been much higher for some intermediate 20 towns. For instance, Asayta (6.5%), Assosa (9.9%), Gambella (15%), and Jijiga (9.1%) (Zegeye, 2010).

2.5. Water Problems in Ethiopia

According to Demeke (2009) the geographical location of Ethiopia and its endowment with favorable climate provides a relatively higher amount of rainfall in the region. Much of the water, however, flows across the borders being carried away by the trans boundary Rivers to the neighboring countries. In supporting this idea, kassa (2001) stated that though Ethiopia is often referred to as the ‘ Water tower of ‘ Africa only a quarter of the country’s population have improved access to water sources. Rushing streams from the Ethiopian highlands form tributaries of famous Blue Nile, Tekeze, Awash, Omo, Wabeshebele and Baro-Akobo-rivers which flow across borders to neighboring countries.

Getachew (2004) also indicated that in 2001 urban water coverage of Ethiopia is 74.4%, and population served reaches 9,886,000.The water coverage ranges from 25% in Harar to 96% in Amhara region. However there are discrepancies among different documents regarding urban water coverage. For instance WSDP (2002) in Assefa (2006) indicated the urban water coverage of Ethiopia is 81% in 1994 and increased to 86% in 1998, though the decrease in urban water coverage in 2001 can be explained by an increase in urban population in the years from 1998-2002.

Similarly, Admasu and Fentahun (2003) strengthened that the coverage of water and sanitation in Ethiopia are among the lowest in the world. 41.2 per cent of households have access to safe water, and 21.34 percent of households have access to sanitation facilities. This puts strain on girls and women who are widely responsible for the collection of this vital resource. In addition to this approximately 7.5 million Ethiopians in the Rift Valley area suffer from problems related to high fluoride levels. Nearly 80% of children are affected by dental fluorosis.

In Addis Ababa the amount of water demanded is much higher than the supply. That is, in 1998 the amount supplied by Addis Ababa Authority was only 62 percent of the amount demanded. With regard to the distribution of water, the Welfare Monitoring Survey of 1996 estimated that 36 percent of the households use own tap while 61 percent use public tap or "Bono Water" (MoWR, 2006)

Generally, similar to many African countries, parts of Ethiopia face water shortages, poor sanitation, and a lack of access to clean water sources. In addition to this because of the absence of clean water supply the people are exposed to various water born diseases. Not only illness, many people spend their time when collecting water. Thus the issue of clean water supply is not only a matter of satisfying basic needs, it is also an issue of health care.

2.6. Water Policies and Regulations of Ethiopia

The Federal Ministry of Water Resources in Ethiopia is in charge of setting national policies for the water supply sector. Regional water Bureaus and *wereda* water desks are responsible for investment planning and managing town and city water supply systems. The city administration is responsible for appointing a water board chair and other members and approving investments. As far as water supply for human consumption is concerned, it is to be noted that over 85% of Ethiopians' livelihood is based on farming and livestock agriculture. This has consequently resulted in subsistence level of economic life and thinly spread out settlement so that providing reliable and safe water at minimum cost becomes very difficult (MoWR , 2006).

The water resources management policy is based on the constitution of the Federal Democratic Republic Ethiopia Government Macro Economic and Social policies and development strategies as well as objectives accepted by the Federal Democratic Republic of Ethiopia and the principles of water resources development objectives that would enhance the socio-economic development of the peoples of Ethiopia, furthermore, in consideration of the inclusion of all felt needs and mutual interests of all the peoples of Ethiopia, the policy was discussed in depth and enriched at the grass roots level with representative participants from all Regional States up to *Wereda* level and relevant bureaus (MoWR,2011).

In similar way Yewndossen (2012) also indicated that the policy is believed to provide and impetus for the development of water supply for human and animal consumption. It focuses on increasing the coverage, quantity, reliability and acceptable quality, taking the existing and future realities of the country into consideration. Upon implementation, the policy is expected to achieve the objective of the Ethiopian people to attain adequate, reliable and clean water service that meets the water user's demand.

The policy of supplying free water to any group except for emergency, leads in practice to an unfair situation. Since there are no enough funds to provide such free services, the rural and urban poor are the first to suffer. A better and much more equitable way would be to collect water charges from consumers and then improve and expand the system. Accordingly, the policy envisages supplying improved potable water service for urban areas with tariff structures that are set based on full cost recovery and self reliance (MoWR, 2011).

Tariff regulations ensure that tariff structures are site-specific and determined according to local circumstances. It also ensure that rural tariff settings are based on the objective of recovering operation and maintenance costs while urban tariff structures are based on the basis of full cost recovery. Besides this, it ensures that tariff structures in water supply systems are based on equitable and practical guidelines and criteria. It also establishes a "Social Tariff" that enables poor communities to cover operation and maintenance costs. Additionally, it establishes progressive tariff rates, in urban water supplies, tied to consumption rates. It also develops flat rate tariffs for communal services like hand pumps and public stand posts (MoWR, 2006).

2.7. Self-Supply System in Ethiopia

The water supply and sanitation policy began in Ethiopia in the mid of 1980s. At that time the general policy of the government was to provide water and sanitation through its own public water sector institution with the supply side approach**.** In this regard in order to strength the government owned institutions, the military government (since 1975) nationalized the private sector driller and their equipment first absorbed by Ethiopian Water Works Construction Agency, which was later used to set up the autonomous Water Well Drilling Agency (WWDA). The whole water sector was generally envisaged as a supplier of "free" services which failed to consider the scarce nature of water resource in the country. Tariff and cost recovery also could not get full attention due to the socialist economic policy implemented in the country (MoWR, 2006).

Universal access to potable water of 2010 – 2015 supply and improved sanitation is the target set in the growth and transformation plan. This target is beyond the MDG, where it is 70% access to potable water supply at the end of year 2015 G.C. MoWIE has already achieved the MDG target as the current access in Ethiopia is reached 68.4 %. But still more than 30 % of the population of the country does not get the minimum safe drinking water supply of 15 liters per day per person in a radius of 1.5 kilometers in rural areas and 20 liters per person per day in a radius of 0.5 kilometer from a potable water supply source in urban areas (MoWR, 2014).

Self Supply in the context of Ethiopia is improvement to water supplies developed largely or wholly through user investment by households or small groups of households. Self-supply involves households taking the lead in their own development and investing in the construction, upgrading and maintenance of their own water sources, lifting and treatment devices and storage facilities. Government of Ethiopia, donors and implementing partners recognize the importance and the role that Self Supply can play in accelerating progress to achieve the Growth and Transformation Plan (GTP)/Universal Access Plan goals. They built consensus that Self Supply is no longer to be considered as a stand-alone effort, but is to be embedded into government programs and addressed in the revised sector plan and framework (MoWIE, 2014).

There has been steady development and expansion of the understanding of the contribution of Self Supply approach in Ethiopia over the past decade. Self-Supply already happens across the country through private initiative and investment in well construction and upgrading, spring protection, rainwater harvesting, and HWTS. Centuries old "Ela "(Bore hall) in low lands of Oromiya, Somali and Tigray are the best examples. Given the low-cost technology options, wealth and education are not pre-requisites to investment. Some Self Supply initiatives are undertaken by small groups but private ownership and shared use of groundwater sources is by far the commonest model at present, with owners wanting to keep control over their investment (Assefa, 2006).

According to MoWR, 2006 the international standard the absolute daily minimum amount of water a person needs is 50 liters (13.2 gallons) which include: 5 liters for drinking, 20 for sanitation and hygiene, 15 for bathing and 10 for preparing food. However because of scarcity, millions of people try to exist on 10 liters (2.6 gallons) a day.

2.8. Challenges of Water Supply

Water's crucial role in accomplishing the Africa's development goals is widely recognized. Africa faces endemic poverty, food insecurity and pervasive underdevelopment, with almost all countries lacking the human, economic and institutional capacities to effectively develop and manage their water resources sustainably. Thus, a large number of countries on the continent still face huge challenges in attempting to achieve the United Nations water-related Millennium Development Goals (MDGs). Northern Africa and Sub-Saharan Africa even though in one continent, have made different levels of progress towards the Millennium Development Goal on water (Yewondwossen, 2012).

North Africa has 92% coverage and is on track to meet its 94% target before 2015. However, Sub-Saharan Africa experiences a contrasting case with 40% of the 783 million people without access to an improved source of drinking water from the region. Sub-Saharan Africa is off track from meeting the MDG on water with just 61% water coverage and with the current pace cannot reach the 75% target set for the region (Richard, 2009).

As the cause of this problem Christopher (2006) stated that Africa's rising population is driving demand for water and accelerating the degradation of water resources in many countries on the continent**.** Among developing regions**,** Sub-Saharan Africa is estimated to have the highest prevalence of urban slums and it is expected to double to around 400 million by 2020. Despite the efforts of some Sub-Saharan African countries and cities to expand basic services and improve urban housing conditions. Rapid and unplanned urban growth has increased the number of settlements on unstable, flood-prone, and high-risk land where phenomena such as landslides, rains, and earthquakes have devastating consequences.

Yewondwossen (2012) also pointed out that Sub-Saharan Africa is the world's poorest and least developed region, with half its population living on less than a dollar a day. About two-thirds of its countries rank among the lowest in the Human Development Index. Even when opportunities exist to address outstanding water issues, deep and widespread poverty across the African region constrains the ability of many cities and communities to provide proper water and sanitation services, sufficient water for economic activities and to prevent water quality from deteriorating. Africa faces a situation of economic water scarcity, and current institutional**,** financial and human capacities for managing water are lacking. The situation is exacerbated by competition for public funding between sectors, and heavy public debt burdens in most countries.

In Africa, financing is insufficient and the institutional capacity to absorb what is available is limited. The danger of slippage to already made progress against the MDG on water and sanitation is real. Most countries within the continent are falling short to sustain Water Sanitation and Hygiene commitments, with over 80% of countries reportedly falling significantly behind the trends required to meet their defined national access targets for sanitation and drinking-water. There is insufficient domestic financing for WASH overall with particularly serious for sanitation. This is exacerbated by difficulties in spending the limited funds that are received (Yohannes and Mebratu,2009).

3. RESEARCH METHODOLOGY

3.1. Description of the study area

The study was conducted in Asayta Town, Awsiressu Administrative zone of Afar national regional state. Geographically, the Afar National Regional state is located in the northeastern part of Ethiopia. It is geographically located between 8°49'and14°30'North Latitude and 39°34' and 42°28' East Longitude. The region boarders four National Regional States i.e. in the Northwest Tigray Region, in the West and Southwest; Amhara Region, in the South; Oromia Region and in Southwest; Somalia Region. The ANRS also shares international borders with Djibouti and Eritrea to the East and Northeast respectively. Administratively, the region is divided in to five zones, which are further subdivided in to 32 districts *woredas* and 402 *Kebeles.* With 92,000 square Kms, ANRS is the fifth largest region in Ethiopia (ANRS, 2012).

The name Asayta refers to the area that lay between Barawly in the north, Asademun in the South, Kunskuma in the east and the Awash River in the west. Asayta is reported to have emerged as an urban centre during the Italian invasion of 1937, though settlements had already existed ever since the late 19th century. The origin of the name of the town was related to a woman by the name " Aysha" . This woman used to sell yoghurt to the Italians, which in the Afar language is known as " ita" . Thus the name "Asayta" has eventually been adopted from its original word "Aysha ita'' which in local language means , " Aysha the yoghurt vendor"(BoFED andNPO, 2005).

3.1.1. Location

Asayta town, which is located 652 kms north-east of Addis Ababa, is one of the oldest towns in the Afar National Regional State. Administratively it is found in Zone One of the regional administration; and this Zone comprises of eight *weredas* namely Asayta, Elidar, Afambo, Mille, Dubti, Kurri, Adaar and Chifra. Asayta *wereda* shares boundary with the Republic of Djibouti internationally and with Afambo, Dubti and Elidar *weredas* of Zone One in the region.

As a zonal capital, the town has an administrative linkage with all the *weredas* of its zone. With regard to linkages outside the region, it has strong transport and economic interaction particularly with Dessie town of the Amhara Region. Astronomically, it is located at about 11°35'N and 41°23'E. Topographically, Asaita and its surrounding area consist of basically flat landscape with some hills and small mountains that range in altitude from 350 to 473 m.a.s.l (ATM, 2011).

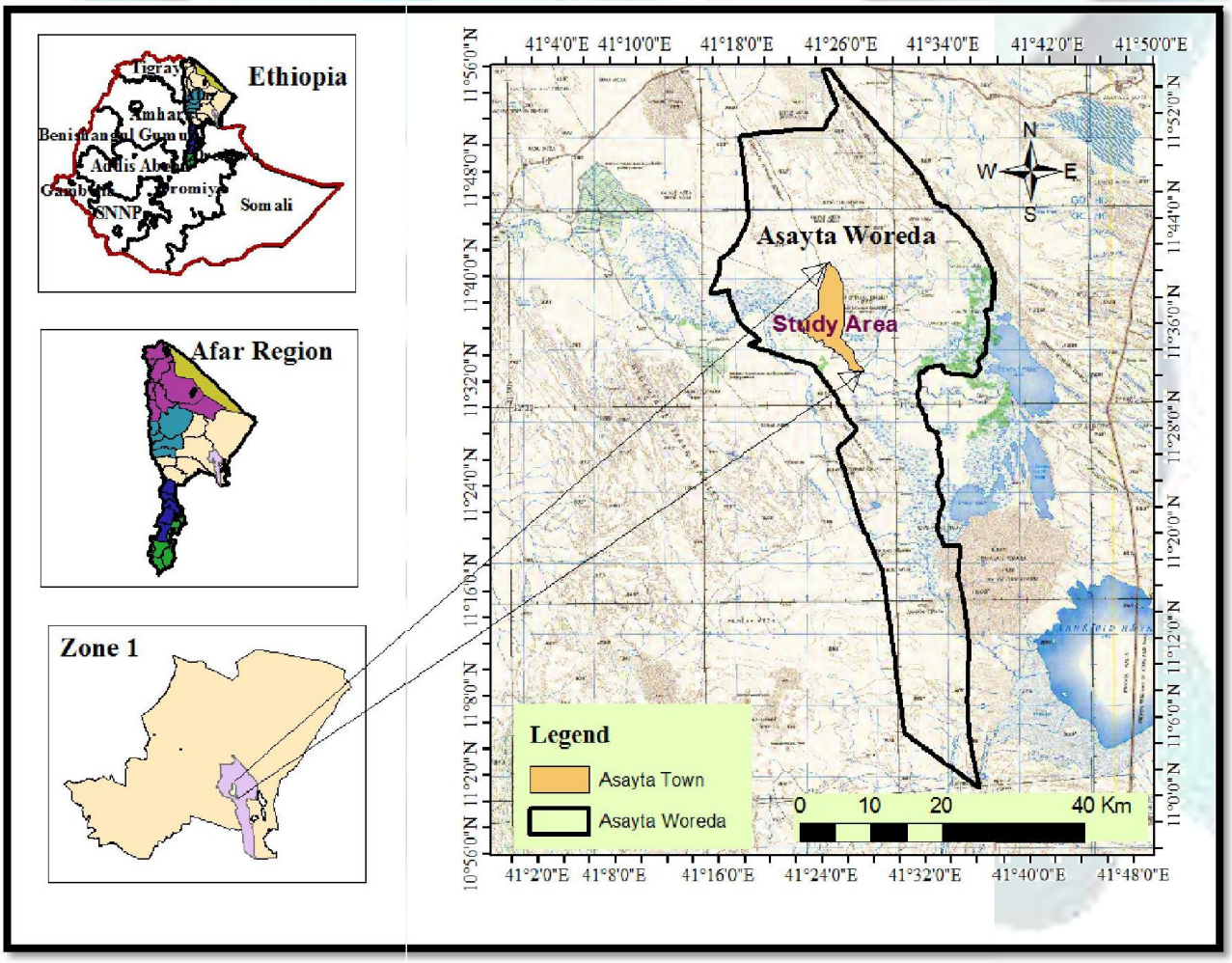

Figure 1: Map of the study area.

Source: GIS Data Ethio-GIS 2004 & CSA 2007

3.1.2. Relief and Geology

Afar region is flat land with altitude decreasing towards the north eastern part. 35.47% of the region has an elevation less than 400 meter above sea level whereas 13.09% has an elevation above 900 m above sea level. Most of the region's area range from 400-900m above sea level. Specific areas such as Danakil depression and Afdera fall below 126 m below sea level. The region spreads from hilly escarpments at the foot of the Ethiopian highlands in the west, to deserted basins surrounded by volcanic lava flows in the east. Active volcanism and geothermal phenomena are an expression of the ongoing rifting process (ANRS, 2010).

Asayta town is bounded by a fault ridge in the west running along north-west direction followed by a flood plain and the course of Awash River that creates an excellent panoramic view when it is seen from the top of the ridge towards the flood plain. The river limits future expansion of the town in that direction. Volcanic rocks make quite a large areal coverage in the study area in particular, and in the Central Afar/Afar Depression in general. Prominent topographic – heights, including ridges and horsts, are covered in most cases by volcanic rocks that vary in their composition and their geomorphologic pattern. Older volcanic crop out at the foots of the major escarpments that border the Main Ethiopian Rift; whereas the younger volcanic are expressed by fresh lava flow and central shield volcanic structural elements (ANRS, 2004).

The geology of Asayta and its surrounding is part of the Main Ethiopian Rift system, which is dominated by Quaternary Central Volcanic strata underlain by Quaternary Sediments. The Quaternary Central Volcanic complexes have produced peralkaline lavas and pyroclastics. Most of the volcanoes recent stages of activity are marked by obsidan flows, pumice, and ignimbrite, tuff and scoriaceous basalt eruptions. In general, the major rock units that built the land surface and near surface of Asayta town and its surrounding are obsidian pitchstone, pumice, ignimbrite, tuff, scoria, vesicular basalt, trachytes and rhyolites. These volcanic rocks are generally underlain by undifferentiated alluvial, lacustrine and beach sediments (ATM, 2011).

3.1.3. Soil

The soil formation of Asayta area is originally of two groups: the first one is that of lacustrine origin while the second is that of alluvial type. Soil of lacustrine origin covers the plain surface of the town and a wider portion of northern, northwestern and northeastern part. This soil type is composed of fine grain particles of silt, sand and clay which also shows eolian nature and usually affected by wind erosion. Soil of alluvial origin covers all over the western, southern and southwestern part of Asaita town and this further extends towards Afambo and the areas covered by Awash River valley. *Eutric Fluvisols* and *Lithic Leptosols* account for the majority of the soil type of Asayta *wereda* with 37% and 36% coverage respectively. *Haplic Solonchaks* and *Sodic Solonchaks* are also soil types that are found in Asayta *wereda*. Mineral resources that include potash, sulphur, salt, bentonite, gypsum and other different construction materials exist in the study area which could be good areas of investment (ANRS, 2004).

3.1.4. Drainage

The town is found near the Awash River basin. The city lays relatively at a higher elevation of 4 to 12 meters above from the Awash River. Awash River is the only river in Asayta which is used as source of water both for human beings and animals. The study area being located in the Main Ethiopian Rift system has defined hydro-geological characteristics. The hydro-geological characteristics of the Asayta area can be described based upon the geologic, topographic and climatic conditions of the interest area. In the general study of "recharge-discharge conditions" of the country, the study area is included in Region Four where the recharge to the groundwater from rainfall is estimated to be less than 50 mm/year. The recharge from rainfall can be further described as moderate while recharge from runoff is moderate or high and discharge from the groundwater in the area can be generalized as moderate (BoFED&NPO , 2005).

3.1.5. Climate

Asayta town is one of the towns in Ethiopia located within the rift valley system. Its location coupled with low altitude, makes it to have warm temperature. The temperature greatly varies among seasons, and the months of January and December are relatively cold months whereas May, June and July are the hottest ones. Accordingly, power consumption in these months would be higher for different purposes and thus concerned bodies should be aware of avoiding power shortage during these months. *Bereha* is the dominant agro-climatic zone covering 99.33% of the region with an average temperature greater than 27.5C° and an annual rainfall ranging between 500mm to 1000mm which is not favorable for rain fed agriculture (ANRS, 2010). Table 1 shows average monthly temperature of the town from 1999-2008.

Table 1: Maximum and minimum temperature of Asayta town for the years 1999-2008

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max.T°(C)	32.7	34.4	36.6	34.8	41.7	42.8	41.1	39.3	34.6	37.3	34.9	32.7
Min.T°(C)	20.5	21.0	22.9	25.1	27.2	28.3	27.9	26.2	27.1	24.5	22.3	20.6
Average	26.6	27.7	29.8	30.0	34.5	35.6	34.5	32.8	30.9	30.9	28.6	25.7

Source: ANRS, 2010

Rainfall is bi-modal throughout the region with a mean annual rainfall below 300 mm. The region receives three rainy seasons. The seasonality of Afar region is by and large determined by the timing, availability, and performance of the rainfall. The main rain, *Karma* accounts for most of annual rainfall occurring from mid-June to mid-September. This is followed by rainy showers in mid-December called *dada* and a short rainy season during March-April called *sugum*. In terms of mineral resources, Salt, Potash, Sulfur, Manganese, Bentonite , Aluminum, Marble, Gypsum and Petroleum are potential major resources of the region (Getachew, 2004).

3.1.6. Land use and land cover

In Asayta *wereda* the major land use and land cover categories include intensively cultivated area, exposed sand and salt, exposed rock surface and marsh land. On the other hand Dubti *wereda* has land use/land cover feature of intensively cultivated land, exposed sand surface, and exposed rock surfaces. Wet lands and marsh lands are also important land use types in the area (Afambo, Dubti and Asayta). These land use types have strong climate change mitigation role and thus they should be protected from improper land use (ANRS , 2003).

The land use of the Asayta town has been made by classifying the land use in to seven major categories namely: residence, commerce, administration, social services, transport and road, industry and special function which incorporates water bodies, open spaces, historical and archeological sites, and areas affected by natural hazards, etc. The total existing area of the city covers about 1829 hectares (18,290,132 square meters) including the non-built up area, of which only close to 392 hectares or 21 percent is built-up and the remaining 1437 hectares of land or about 79 per cent is non built-up area (ATM, 2011) .

3.1.7. Vegetation and Wild animal

Although there are no dense forest areas, woodlands and shrub lands are, however, the major vegetation covers in the study area. These vegetations include riverine and some natural forests, and these are vulnerable due to the dry climatic condition of the area. Thus, they have to be properly protected from deforestation or forest degradation because forests play greater role in climate change mitigation through carbon sequestration. On the other hand, the wild animal found in the *woreda* includes Abyssinian wild Ass, Oryx, Hyena, Fox, Monkey, Crocodiles, Greater kudu and wild cat (ATM, 2011).

3.2. Socio-economic Condition

3.2.1. Population

At regional level, the population size of Asayta town formed close to 9 percent of the total urban population in the region. In 1984 when the first population and housing census was conducted at national level, the population size of the town stood at 6,921. In the second national census which was carried out ten years later in 1994 the population size of the town grew to 15,475. The third national census which took place recently in 2007 resulted in a population size of 16,052. (CSA, 2008)

The overall dependency ratio estimated for the town lies below the lower boundary of the interval for African countries (80-100). Asayta woreda has diverse population with 75% Cushitic families of Afar Af speakers and the rest 25% belongs to non Cushitic families of which the major belongs to Semitic family, particularly Amharic, 18 % and Tigregna 7 % language speakers. An overall sex ratio of the woreda was 101.2 male and 100 female in urban area and 103.3 male per 100 female in rural areas (BoFED&NPO , 2005).

Regarding the distribution of the population by religion, the 1984 census data indicate more than half (60%) of the population to be followers of Islamic religion. The 2007 census indicate that 95.1 % of the population follows Islamic faith, 4.6% of the people are orthodox Christians and the remaining 0.2% and 0.1% are protestant and Catholics (ANRS, 2010).

3.2.2. Social services

In comparison of other regions in the country, Afar region is one of the least developed region in the access of social services. In the Region, there are 397 primary schools, 17 Secondary School (grade 9-10), 4 preparatory (grade 11-12), One Teacher Education College, Two TVET in the years 2009/2010 and one governmental university (ANRS, 2012).

In Asayta woreda there are 10 primary schools (both first and second cycle), One preparatory school, One College of Teacher Education and One TVET. Totally 3477 students, of which 1546

and 1931 were respectively first and second cycle primary school students, were enrolled in the two primary schools in the town in year 2012. In terms of sex, male and female constituted 58 and 42 percent of the total enrollment, respectively. Therefore educational coverage of the *woreda* is improved to 72 %. Regarding health service there are also one hospital , six governmental clinics , four private clinics and seven drug vendors located in the *woreda* However, like in almost all of the towns in the country the level of health status in the Asayta town is poor which is due mainly to low levels of income of the population, low education level (especially among women), in adequate sanitation facilities, a high rate of migration, and poor access to health services which have contributed to the high burden of ill-health in the town (ANRS, 2003).

3.2.3. Economic activity

3.2.3.1. Animal husbandry

Afars have two major livelihoods; Pastoralism and agro-pastoralism. Around 90% of the life of population of the region depends on the livestock resource. This is substantiated by CSA's Sample Survey Reports of 2003 and 2004 which estimated the total livestock population of the region to be about 10,107,387. Of those, 2,336,483 are cattle, 4,267,969 are goats, 2,463,632 are sheep, 52,016 are camels and the remaining 187,287 are pack animals. From this data it can clearly be seen that the region is highly endowed with livestock resource, which has not fully been used to its potential to generate wealth and employment. When one evaluates the distribution of this population across zones, Zone 1, the zone in which the town of Asayta is found, has the highest share from the total regional livestock population, which is 28.58% (BoFED&NPO, 2005).

3.2.3.2. Crop production

It has been repeatedly described that the town is established along the course of the Awash River. This gives the town a comparative advantage over any other town to be an ideal place for agricultural investment. In the study area the majority of crop cultivation activity takes place through irrigation. This is because rain fed agriculture in this region is a risky business as the amount of rainfall in the region is small. In this regard, only 10,307 (<20%) hectares of land are under rain fed agriculture mainly in Zone 2 and 3 of the region. Even though the Awash River has still a huge potential for irrigation (which has the potential of irrigating an area of about 165,545 in middle and lower Awash regions) only 41,612 ha of land is under cultivation by the government and private investors (ANRS, 2010).

Asayta *wereda's* mainly produces cotton and maize which is the staple food for the population along with milk. But, there are also other crops like sorghum, sesame, date palm as well as fruits and vegetables that are being produced in the region. The area of land which is covered in the study *wereda* by these crops and others is about 15,000 hectares, though the *wereda* has still unused potential of 25,000 hectare. The main crops cultivated in this region are maize, cotton, sorghum, fruits, vegetables and date palm. Though there is variation in the productivity of these crops across the region, the productivity is still low in the study region (ANRS, 2010).

3.3. Research Design

In this study, cross-sectional survey method was employed in order to show the urban water supply problem in Asayta town. The reason why cross sectional survey method was used that to describe the data and characteristics about what is being studied in its current status. Descriptive research includes surveys and fact-finding enquiries of different kinds. Basically survey method helps to obtain first hand information from small samples representing large size population and also enables the investigator to have access to multiple methods of collecting information. Therefore this type of design is appropriate as investigator was assessing urban water supply and consumption problem in the town.

3.4. Sources of Data

The investigator used both primary and secondary data sources to generate appropriate information for the study. The primary data was collected from a sample of urban household heads through questionnaires. It was also collected from Asayta town water service office through questionnaires and interviews prepared for the study. The secondary data which was gathered from secondary sources included publications, reports and journals.

3.5. Sample Size and Sampling Techniques

In Asayta town there are two kebeles , namely kebele 01 and Kebele 02 . Both kebeles were included since the problem of water is observed at both kebeles. The sum of total households of the two kebeles is 2164. The total households of Keble 01 are 983. From kebele 01, 89 household's heads were taken proportionally for the study. Similarly 108 house hold heads were taken from 1181 total households of kebele 02. The sample size of this study was determined by considering the following formula.

$$n = \frac{Z^2.p.q.N}{e^2(N-1)+Z^2.p.q}$$ (Kuthari, 2004)

Where N= Size of population (house hold size)

n= Size of sample

e= 0.02 acceptable error

z = 2.005 - standard value at a given confidence level

p = 0.02 sample proportion

q = 1- .p

Thus, $n= \frac{4.02\times02\times.0.98\times2164}{0.0004\ (\ 2164\text{-}1)+4.02.02.098} = 197$

Based on the result of the above formula the sample size of this study is 197. Simple random sampling techniques was applied since this method of sample selection could give each possible sample combination and equal probability of being picked up the entire population to have an equal chance in the sample . Table 2 shows that the total number of HHs and Respondents.

Table 2: Total number of households and sample respondents

Town	Kebeles	Total HHS	Sample Size	Sample %	Sampling Technique
Asayta	01	983	89	45.17	Random
	02	1181	108	54.83	Random
Total	2	2164	197	100	

Source: CSA, (2008)

3.6. Instruments of Data Collection

One of the main steps in conducting a research is to collect data that enable a researcher to reach suggested solutions for the problems identified. In this study questionnaire, interview, and document analysis method were employed depend on the situation in which they were applied.

3.6.1. Questionnaire

Questionnaire was the major data collection instrument being used in this study. Questionnaire is considered as the heart of a survey operation. Thus, the investigator paid attention the wordings of questions since reliable and meaningful returns depend on it to a large extent. Since words are likely to initiate responses, familiar words to all respondents were employed. It was prepared to validate the information gained through documents and interview. In addition, it helps the investigator to get the information that could not be obtained through interview.

The base for the preparation of final questionnaire in which the pilot survey was employed at forty five households from the two 'Kebeles'. The pre-testing of the questionnaire actually helped in the administration and implementation of the actual survey and in restructuring the questionnaire format and content. For the questionnaire 197 sample households were selected based on simple random sampling technique. The questionnaire consisted of both close-ended and open-ended question. The items in the questionnaire were first prepared in English based on review of related literature. Then they were translated into local language. So that respondents cannot misinform the researcher because of language barrier.

3.6.2. Interview

The second data collection instrument in this study was interview. It allowed the investigator to provide supplementary question when needed. Most of the questions were focused on the availability, distribution mechanisms and consumption of water supply in Asayta town. From Asayta town water service office technique fifteen employers and experts were selected for this interview since these employers could give significant information for the investigator about the production, distribution and consumption of water in the town.

3.6.3. Document Analysis

The third data gathering instrument which had been used in this study was document analysis. Documents are significant sources of data in many areas of investigation. In this study, reports, publication and proceedings were gathered from governmental organizations such as Afar regional water resource bureau and Aysayta Town water Supply Service Office which could provide essential information about the water coverage, consumption and distribution of the region. It was employed to consolidate the information gained through questionnaire and interview.

3.7. Methods of Data Analysis

Data analysis is one of the most important aspects of the study. Because it is the principal mechanism by which raw data are transferred into usable information for communities and other decision-makers. After gathering the data, relevant statistical methods of analysis were used in order to come up with the appropriate result. Data editing, coding, and verification were undertaken for the sample household heads surveyed. Data was checked for inconsistencies, missing data and carelessness. The unwieldy data was necessarily condensed in to a few manageable groups and tables for analysis.

Thus, the investigator classified the raw data in to some purposeful and useable categories. Descriptive statistics was used to analyze data to draw understanding of the result of the study. Relevant statistical methods of analysis were used in order to come up with the appropriate result. The descriptive statistical tools like ratios, percentages, arithmetic means, cross-tabulation, pie chart and bar graphs were used in condensing the data for the purpose of analysis and interpretation. Also both qualitative and quantitative approaches were employed in the research. Socio-economic and demographic characteristics were analyzed and compared with the countries average .On this basis descriptive statistics such as mean and percentage were used in situation analysis of the study area

4. RESULTS AND DISCUSSION

This part of the thesis deals with the presentation, analysis and interpretation of the data collected from the respondents through questionnaires and interview. This chapter is broadly classified in to nine sections. The first section focuses on describing the personal characteristics of sample respondents such as age, sex, marital status, and household size. The second section emphasized on socio economic characteristics of sample respondents such as educational background, occupation, and income. While the third section, particularly emphasizes on identification of information related to water source, production, coverage, and distance from the source. The fourth section is about distribution of water and five is about consumption of water. Frequency of interruption included under section six and water tariff setting under section seven. While water supply problems are included under section eight and the cause of water supply problems included under section nine.

4.1. Characteristics of Respondents

As indicated in Table 3 from the total sample respondents (197), 77.15 (152) were male and 22.85(45) were female. Age of the household members ranges from15 to 60 years old. Of which 2.5 percent are aged between 15-19, 34.5 percent are in the age group 20-29 years, 26.3 percent are in the group 30-39 years, 15.2 percent are 40-49 years, 15.2 percent include 50-59 years and the remained 6.3 percent are aged above 60 years. Of the total sample respondents 66.5 percent were married, 16.2 percent were single and 17.3 percent were divorced. Table 3 indicates that the characteristics of respondents regarding sex, age and marital status.

Table 3: House Holds sex, Age and Marital Status

		Frequency	Percentage
	Sex of the respondents		
	Male	152	77.15
	Female	45	22.85
	Total	197	100.0
	Age of the respondent		
	15-19	5	2.5
	20-29	68	34.5
	30-39	52	26.3
	40-49	30	15.2
	50-59	30	15.2
	>60	12	6.3
	Total	197	100.0
	Marital Status		
	Married	131	66.5
	Single	32	16.2
	Divorced	34	17.3
	Total	197	100.0

Source: Field survey, 2014

4.2. Socio Economic Characteristics

4.2.1. Household Size

Family size here is refers to the total number of family members in the household. The average household size of the study area was 4.6 which were below the national average household size 4.9 people per household .The largest household size in the survey was 10 and the smallest was 1.

There is also a household size difference between respondents. As indicated in table 4 , 8.1 percent of the respondents have household size of 1, 12.2 percent have 2, 15.7 percent constitute 3, 19.3 percent include 4, 13.7 percent have 5, 8.6 percent constitute 6 , 7.1 percent include 7, 6.1 percent have 8, 5.1 percent have 9, and 4.1 percent constitute 10.

Table.4. Household size of Sample respondents

S.N	Household Size	Frequency	Percentage
1	1	16	8.1
2	2	24	12.2
3	3	31	15.7
4	4	38	19.3
5	5	27	13.7
6	6	17	8.6
7	7	14	7.1
8	8	12	6.1
9	9	10	5.1
10	10	8	4.1
Total		197	100.00

Source: Field Survey, 2014

4.2.2. Household Education, Occupation and Income

The survey result also revealed that 9.2 percent of the sample household heads were unable to read &write and 13.2 percent of the respondents can read and write. 20.8 percent are completed primary education (1-8 grades) and 25.4 percent are those who are completed their secondary education (9-10 grade).Certificate and diploma holders constitute 11.7 and 11.2 percent respectively. Whereas, the remaining 8.1 percent of house hold heads are degree holders and above. As indicated the highest percentage were covered by those who are completed their

secondary education. This implies that the expansion of higher education is still at its lowest level in the study area. Table 5 indicates that the educational status of the respondents.

Table.5.House Holds Educational status

S.N	**Educational Status**	Frequency	Percentage
1	Unable to read and write	18	9.1
2	can read &write	26	13.2
3	Primary (1-8)	41	20.8
4	Secondary (9-10)	51	25.9
5	Certificate	23	11.7
6	Diploma	22	11.2
7	Degree and above	16	8.1
	Total	**197**	**100.0**

Source: Field survey, 2014

Regarding occupations, the sample household respondents have different occupations. These include farmers, businessman, government employers, and NGO employers, daily laborers, retired and other. As indicated under table 8, out of the total 197 sample households 12.2 percent are farmers, 19.8 percent are business man, 27.9 percent are government employers those constitute the highest percent of sample respondents. Whereas, daily laborers constitute 14.2 percent of sample respondents. The remaining 5.1 and 3.0 percent are retired and others respectively, those who are depend on the others income to survive.

Concerning the income of sample households 18.8 percent of households earned less than 500 birr monthly and 24.4 of them earned between 501 to1000. On the other hand 21.8 and 19.8 percent earned 1001to 1500 and 1501 to 2000 respectively. While 14.2 percent of them included under >2001 groups .The remained 1.0 percent is unknown income. Table 6 shows that the various types of occupation and the income of respondents.

Table 6: Occupation and Income of Respondents

	Occupation	Frequency	Percentage
1	Farmer	24	12.2
2	Business	39	19.8
3	Government employer	55	27.9
4	NGO employer	35	17.8
5	Daily laborers	28	14.2
6	Retired	10	5.1
7	Other	6	3.0
	Total	**197**	**100**
	Income		
1	<500	37	18.8
2	501-1000	48	24.4
3	1001-1500	43	21.8
4	1501- 2000	39	19.8
5	>2001	28	14.2
6	Unknown	2	1.0
	Total	**197**	**100.0**

Source: Field Survey, 2014

4.3. Source of Water

The source of water supply for urban community of Asayta is groundwater source when this study was conducting in 2014. A total of three potential boreholes have been drilled within the town at different times of which two deep water wells (BH. No.1 & BH No.2) are functional and located at the northern end of the town. According to Asayta Town Water Supply Office, these wells were drilled at different time/year and have different capacity, i.e. BH. No.1 in1993 G.C. and it has a total depth of 80mt. and water discharging capacity of 30m3/hr; while BH. No.2 in 2006G.C has a total depth of 75mt. and has water discharging capacity of 38m3/hr. Thus, the source of water for Asayta town is from these two boreholes of three potential boreholes at different times. Table 7 indicates the quality, turbidity and status of water of the two boreholes in the study area.

Table 7: The Existing water supply source of the town

Parameters	BH.No 1	BH.No 2
Turbidity	3.05	2.76
Temperature	36.1°	38.7°
Potential of hydrogen	8.29	8.11
Depth	80m	75m
Total dissolved solid	1180	885

Source: ATWSSO, 2013

According to the information obtained from the survey, the water providing by the office is unable to cover the current growing demand of the town. Additionally the Total Dissolved Solid/salinity of BH.No.1 is higher than the required amount while that of BH.No.2 is better than Bh.no .1. The higher salinity content of both bores is the other problem other than the distribution. The other problem observed with urban water supply system is that the pipe line distribution system is not orderly aligned in most cases, and this may result in big loss of water. Therefore, the distribution system needs improvement. The problems are because of the fast expansion of the town, population growth, the beginning of national project in the study area Tendaho sugar factory have increased the demand of water. Figure 2 indicates the number of customers in Asayta town.

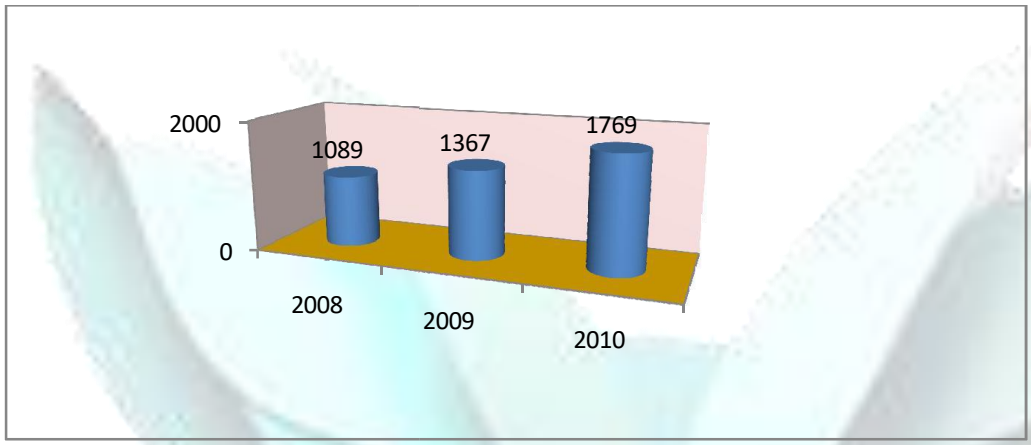

Figure 2: The number of piped water customers in the study area

Source: Field survey, 2014

As indicated in figure 2 the number of piped water customers has increased from year to year. This means that when we observe the number of customers of 2008 and 2010, 680 water users were added on the pervious customers who are the challenges of the office to provide adequate water for the town with only two functional boreholes.

4.3.1. Production of water

The production of water depends on two boreholes, all of which are integrated to one water supply system and are administrated by Asayta town water service office. The gross water production capacity of these boreholes is 16 liters per second (l/s) or 784,000 l/day (784 m^3 /day) in 2013 and working for 13 hours per a day. There is a difference in water production in two main seasons. Currently on average 692 m^3 of water pumped to the town during the hot season and 824 m^3 at the cold season. Generally, Water production depends on yield, operation time and number of wells on operation.

According to the survey data limited number of boreholes, operation time of wells, the high percentage of water loss has further reduced the actual amount of water supply to the lower level. Table 8 indicates the production, consumption, and water loss of three years of Asayta town.

Table8.Water production and consumption of Asayta town.

Year	Production/m^3/year	Consumption/m^3/ year	Water loss m^3/year	Population	Per capita water consumption/ m^3
2010	272,160	254,145	18 015	17110	14.85
2011	279,140	260,122	19 027	20376	12.77
2012	286,160	265,102	21058	22548	11.75

Source: ATWSSO, 2014

As per the official data given by ATWSS office consumption of water in Asayta town increased from 254,145 meter cube in 2010 to 260,122 meter cube in 2011, the difference was 5977meter cube. The production and distribution systems of the town's water supply are generally inefficient and tied up with serious problems. As regard to this problems the respondents both from households and ATWSO society identified incompatibility of the supply with population growth and the expansion of the town; frequent interruption of the supply specially in hot season and the limited capacity of WSS office in terms of technical personnel, finance, materials such as machines, equipments, spare parts and fittings etc. as the major problems among others. So, the inhabitants are using water from nearby rivers and traditional hand- dug wells. Table 9 depicts the response of respondents upon their satisfaction on the water delivery.

Table 9: Satisfaction Level of Water Supply Service of Asayta town based on House hold

Sr/no	Existing water supply is	Number of respondents	Percentage of respondents
1	Very satisfactory	6	3.0
2	satisfactory	8	4.0
3	unsatisfactory	174	88.3
4	Non-respondents	9	4.7
Total		197	100.0

Source: Field survey, 2014

4.3.2. Water supply in Asayta

Tapped water was introduced into the town in the 1985G.C in the time of military government as a well was drilled near the river. Three years later, another well was drilled from which the town has got supply of water to this day. The scheme serves the two kebeles of Asayta town and the source of water for the existing water supply system is underground water. Water is stored in the reservoir by the power of pumps and is distributed by gravity during high consumption hours of the day

The system of water distribution, from service reservoir, is by gravity. More than 45% of the distribution pipe network has a diameter of less than one inch, which resulted, lose of head and subsequently reduce the pressure of water flow in the pipe. As per the monthly water consumption record, average daily water consumption is 784 meter cube. The town water supply have been started to serve the population of Asayta town and the surrounding village but, it faced some difficulties to transport the water from the source to the users because during the hot season the water decreased from the sources..These create problem to store the water in the reservoir during the day time. So that by storing the water during the night time and distributed to the community at the day time.

The annual water production is about 318, 240 meter cube in 2013. This amount of water does not fulfill demand of the community in urban areas and the people are forced to fetch water from Awash River by using animals or getting water from private water seller's .It exposed the community for different problems like unwanted or unplanned expenses and health problem. Due to shortage of water from the source the daily question of the community did not get answer. Additionally expansion of the town, population growth, and construction of Tendaho sugar factory around the town increased demand of water, Moreover, continuous break down of pipe lines because 0f their longtime services aggravated the problem of urban water users.

4.4. Distribution of Water

As indicated by Assefa (2006) the type and efficiency of water supply system greatly affects the rate of household consumption. Distribution work starts from the point of water production, where water is produced and made ready to be used. Then, through large networks water is distributed to end users. The process of distribution in Asayta town starts from the place of production or the source of supply from the boreholes. Both the boreholes are working by electric power. Though the electric power is working by hydropower, the energy sources of water supply are not reliable and power cut may occur.

The raw water is drawn off from each borehole and then pumped through rising into the booster pumping station (BPS). From there, the disinfected water by chlorination is conveyed to an elevated reservoirs, 15m high with a volume of 200 meter cube, located about 1.2km from the BPS.. Obviously, the importance of reservoir as part of the distribution system is to guarantee a continuous supply of water at the time of interruptions in the process of production. This indeed, depends on the number and capacity of reservoirs and on the relative ground elevation where they are situated, if water is to be distributed by gravity. Figure 3 depicts the feature of water reservoir in Asayta.

Figure 3: Water reservoir in Asayta

Source: Field survey, 2014

The water supply system of the town consists of two reservoirs. Both reservoirs are found in Western part which is 700 meter from the main Asphalt road that has 200 meter cube capacity. From there water is distributed to the different parts of the town through pipelines of different sizes. Finally, the water reaches the consumers in two types of water supply systems, viz. meter connection and public water points or stand pipes. Figure 4 shows the different types of water source in the study area.

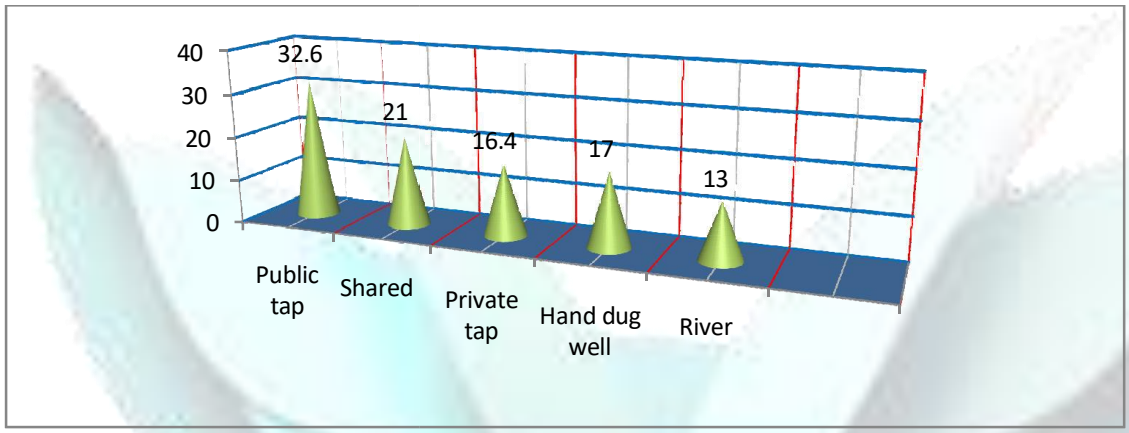

Figure 4. Household Water Source

Source: Field Survey, 2014

As indicated in Figure 4 of the survey households of 197, 32.6 percent obtain water from public tap, 21 percent shared or get water from their neighbor, and 16.4 percent obtain water from private tap while the rest 30 percent used hand dug well and river respectively. Thus as it can be understood from the data When households are unable to get private meter connection or private tap they are forced to use the alternative water supply sources that is public standpipe, hand dug well and river which expose the residents to different health problems, wasting time, and other problems. Most of the time consumers prefer these sources rather than water vendors/sellers, because they are relatively cheaper.

4. 5. Consumption of water

4.5.1. Coverage of Water

Most of those inhabitants who do not have access to the piped system draw their water from private hand dug wells or collect from rivers or buy from vendors who collect water from nearby river on donkey back or buy from their neighbors or somewhere else who have their own private connection and selling it at higher price. Table 10 indicates the number of people using public fountains.

Table 10: Global Standards in relation to time, distance, quantity of water and health Concern

Time spent to fetch water	Distance travel to fetch water	Quantity of water consumed	Water supply accessibility	Level of health concern
More than 30 minutes	More than1000m	Below 5 l /c /d	No access	Very high
5 to 30 minutes	Between 1000m and 100m	20 l /c /d	Basic access	high
Within 5 minutes	Within 100m	50 l/ c/d through one tap on plot	Intermediate access	low
Water supplied through multiple taps continuously	Water supplied through multiple taps continuously	100 l/ c /d and above	Optimal access	Very low

Source: UNDP, 2006

Both category of respondents (Household water consumers and ATWSSO officials and employers) agreed that the level of scarcity all over the town is different from kebele to kebele. The peoples who are living in kebele 02 are suffered more than who are living in kebele 01.Among the total sample respondents of 197, more than half of them are from kebele 02.From kebele 02 the researcher have been selected 108 target respondents of which 60 of them don't have access to pipe water only 48 households have pipe connected to their home. The total sample respondents from kebele 01 are 89 of which 53 of them have pipe connected to their home and the remained 33 households don't have pipe connected to their home. Whereas the pipe stand pipes also small in number and doesn't seem with the number of population. Additionally the public stand pipes are not stand on equal interval (distance) to the settlement.

The study conducted by Assefa (2006) in Asosa town also revealed that the spatial extension of pipeline over any settlement area is surely a pre-condition for supplying the community with piped water. The efficiency of water supply is therefore, determined primarily by the density of pipelines which are in turn influenced by other socio-economic and physical factors.

Among these factors, the number and spatial distribution of public water points, regularity of water supply and income level of the community are the major ones. The type of pipe line in the study area is GS (Galvanized) pipe line .Because of salinity of the water, these pipe lines are easily damaged with in short period of time. According to the survey data, one of the cases for the inefficiency of the services is that the absence or shortage of modern plastic pipe lines, the presence of the old age of these steel galvanized pipe lines and the out dated design of the pipe line .In addition to that the spatial extension of pipelines is confined to some parts of the town.

The other issue in relation to pipe line connection is that house connection pipe line .Distributing water through house connection is obviously the most convenient system of water supply for households. However, because of financial and other socio-economic factors the rate of private meter connection for household service in Asayta town is very low. Table 11 depicts that the response of respondents upon their pipe line connection.

Table 11: Number of Sampled HHs without and With Meter Connection

Sr/no	Type of meter connection	Number of Respondents	Percentage of respondents
1	private	38	19.7
2	shared	67	34.0
3	Without PMC	92	46.3
Total		197	100

Source: Field Survey, 2014

As it is indicated from table 11 above, out of total sample households only 19.7 per cent of these households have private meter connection and 34.0 percent of the total households have shared meter connection. However, 46.3 Percent of the sample households are without private meter connection. This indicates that high variation in number of households with and without meter connection shows there is no equity of access to potable water supply. The second implication is that available water is distributed to few numbers of the community in large amounts rather than administering to the majority of the community in small amounts.

4.5.2. Distance to get water

In accordance with Challa (2011) and various researches, distance is one of the determining factors to affect accessibility of water both in rural and urban area. It means that when they are travelling more and more distance they exposed for more economic problems like additional cost to travel the water and wastage of time. According to standard set by water and energy ministry of Ethiopia allow rural communities to get 15 liters of water within a radius of 1.5 km and urban areas 20 liters with in 0.5 km. But, the result obtained from the observation disproved the standard set by water and energy minister of Ethiopia. Table 12 indicates the distance of water from the source in the study area.

Table.12. Distance of water from the source

S.N	**Distance from the source**	Frequency	Percentage
1	< 1km	47	23.88
2	1-2KM	59	29.94
3	3-4KM	52	26.39
4	>4KM	39	19.79
	Total	197	100.00

Source :Field survey,2014

As indicated in Table 12, many of households travelling nearly more than one kilometer to get water. When they were asked of the average distance travelled to fetch water 19.79 percent said they travelled greater than 4 km, 26.39 percent travelled between 3 to 4 km whilst 29.94 percent travelled between 1 to 2 km before fetching water for their households, 23.88 percent travelled less than 1km.

The result obtained from the sample respondents indicate that majority of them are travelling more distance and waste time, this implies that location of water sources and its distance from home affects household per capita water consumption. Households who are fetching water from long distances spend much of their time, which could have been used for other purposes and affect the economic performance of the community.

4.5.3. Water consumption in the study area

The first and the most influential factor that affected water consumption of urban inhabitants in Asayta town is the nature of the source of water with respect to availability. The main sources of water for Asayta town are private hand dug wells, private connections, public water points and river. Unclean water and lack of sanitation are the destiny of poor people across the world. Lack of hygiene affects poor children and families first, while the rest of the world's population benefits from direct access to the water they need for domestic use. Table 13 can show household consumption in Asayta town.

Table 13: Purposes of house hold consumption

Sr/ no	Types of consumption	Frequency	Percentage
1	Drinking & cooking	89	45.2
2	Washing clothes	37	18.8
3	Bathing	45	22.8
4	House Cleaning	26	13.2
Total		197	100

Source: Survey Data, 2014

From the table 13 above it can be observed that households are using water for different functions. Out of the total house holds 45.2 percent of sample households use water for drinking and cooking and 22.8 % for bathing. This implies that as the study area is located in the Arid part of the country most consumption of the water is priory covered by drinking and secondly by bathing. The rest 18.8 and 13.2 percent are covered by washing clothes and house cleaning respectively.

In similar way Yilma (2005) also indicated that the consumption of water is usually higher in hot seasons, with no rain and hot temperature in the arid area. The high water consumption in hot climate is caused by increased bathing and drinking more water than in cool climate. In addition to this in the hot season of Asayta , the dusty wind which comes always from the western

direction with high amount of dust and soil particle is increasing and become a great challenge for each house hold in the town especially in May and June. Thus people in the study area need more water for bathing and cleaning house because of its dusty nature of the surrounding town. Table 14 indicated that the house hold consumption of Asayta town

Table.14. House hold water Consumption of the study area

S.N	Water consumption per/liter/day	Frequency	Percentage
1	< 20	25	12.69
2	20- 40	66	33.50
3	60 -80	42	21.33
4	100-120	28	14.21
5	140-160	20	10.15
6	> 160	16	8.12
	Total	197	100

Source: Field survey, 2014

As it can be observed from Table 14, 12.69 percent of the households used less than one *jerican* (< 20 litter) of water per day for their daily consumption , 33.50 percent of the households use more than two *jerican* (40 to 60 liter) water per day, 21.33 percent use more than three jarican (60 to 80 liters) per day whilst 14.21 percent used more than five *jerican* (100-120) per day and the remained 10.15 percent use more than seven *jerican* (140-160*)* and 8.12 percent used more than eight *jerican* (> 160) of water per day.

In relation to the above discussions respondents were asked for about the adequacy of water which was delivered to their house hold. 6.1 percent of them reported very good, 5.1 percent responded good, 6.6 percent satisfactory and 82.23 percent reported poor. This implies more than three- fourth of the respondents had no adequate water for their daily consumption and are not satisfied with the water supply of the town. Figure 5 depicts the adequacy of water.

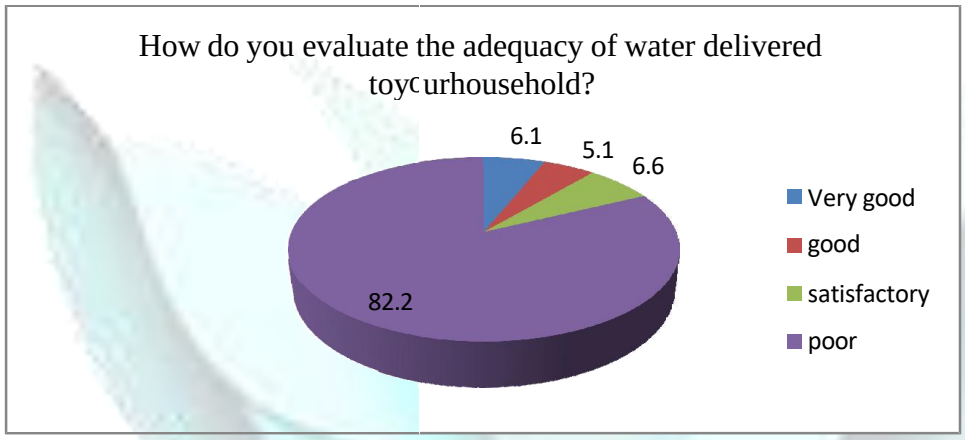

Figure 5.Adequacy of water for household

Source: Field Survey, 2014

An increase in income has lead HHs to have more water demand related with change in the life styles of better off HHs is a signal for water supply office in that increase in come leads to more water demand. Considering the GDP growth rate of the country in 2008 (11.3%) continues for the coming years, and assuming that income grows proportionally, the current demand for water would double within 8 years or by the year 2020, there would be around 100% increase in water consumption, considering other things constant.

The sample households consume water from private connection and incur averagely Birr12.6 for their water expenses monthly since they consume averagely 1.5 *jericans* per day or 32 l/d/c and pay the price set by the Board which is a progressive rate. The households using water from public fountain also incur averagely Birr 7 for their water expenses monthly since they consume averagely 1 *jerican* per day or 25 l/d/c and pay the price set by the Board (0.1Br), which is flat rate for all consumers, assuming that the households do not consume water from vendors. However, when they consume from water vendors the minimum price for traditional hand dug well is 0.20, from private meter connection is 0.30 and from those who sell collecting water from river by donkey is 0.50, the average being 0.30 per *Jerican*.

This raised the expense for those who use 4 *jericans* per day to 18.74 Birr given the fact that interruption of water occurs two days per week resulting in rise of consumers of public water points to Birr 16.2, the difference being Birr 4.1 and 7.2 respectively per month. Thus, the alternative sources should be developed to overcome this problem. The options that might be set include: spring development at different directions of the town, protecting river water from contamination such as fencing the river water collecting points, chlorinating traditional hand dug wells, promoting the advantage of containers during unexpected interruption etc. among other options that can be set.

The survey result of this study also shows the monthly average household income is 1,250 birr and water consumption is 1.5 *jerican*/HH/day on average. The average household size is 4.6. For the households with this characteristic the water tariff set is not fair especially for the poor segments of the people. The variation in access to potable water can be well described by the per cent age of households based on occupation. Government employees scored 27.9 per cent of the total sample HHs in consuming water from pipe water. Others included businessmen, 19.8 per cent, daily laborers 14.2 percent, farmers 12 per cent and NGO employer 17.8 percent. This implies communities with better income can afford the price and have more access to water supply service. Table 15 shows that water consumption, house hold income and expenditure.

Table 15: Water consumption, household income and expenditure in the study area

Variable name	Asayta town(2010)	Low-income area	Middle-income area	High-income area
Total population	17,110	5,652	4,802	6,656
House hold sample size	197	68 (34.52)	59 (29.95)	70 (35.53)
Monthly Average income	1250.00	521.64	963.25	1642.00
Average consumption of water /month m3	2.55	1.98	3.57	4.15
Average water expense / month (ETB)	16.31	12.44	15.20	17.77

Source: ATWSSO, 2013

4.6. Frequency of interruption

In Asayta town Water supply could is interrupted repeatedly because of different reasons. Power failures can cause complete interruption in the water supply system and then less consumption. As the seasonal temperature varies greatly in the region, power consumption rate of Asayta town greatly fluctuates between seasons. The consumption is low during relatively cold season (October-March) and high consumption is registered during the hot seasons (April-September). This may be because of high demand of power for refrigerator, ventilator and other devises in the hot season of the area. Thus, water is unable to store in the reservoirs because of this interruption of electric power repeatedly. In addition to this there are also other factors mentioned as a reason for water interruption in Asayta town. These includes continuous break down of pipe lines by illegal house construction in the town due to the unplanned or uncoordinated plan of activities of the municipality.

In similar way, Zegye Zagie (2010) also described that the other factors which affect the supply of water are the presence of very old pipe lines, shortage of stand by generators when there is unexpected power interruption and the shortage of spare parts. When such complete interruption occurs, the households faced different challenge. Table 16 indicates the condition of interruption in the study area.

Table 16. Condition of Water interruption

S.N	Water flow time	№ of private user	%	№of public users	%
1	Once in twoweeks	9	4.5	5	2.6
2	1-2 per week	17	8.6	14	7.0
3	if, 3-4 per week	40	20.3	53	26.9
4	5-7 per week	51	25.9	49	24.8
5	Seasonally	67	34.2	69	35.0
6	Non-respondents	13	6.5	7	3.7
	Total	197	100	197	100

Source: Field Survey, 2014

As it is observed from Table 16 the frequency of interruption occurs more seasonally (varying between" bega" and "kiremt") but the situation is better in summer season due to more availability of water from its sources. Among the total private pipe water users 4.5 percent of the respondents have access to pipe water once in two weeks, 8.6 percent 1-2 days in a week, 20.3 percent gets water 3-4 days in a week. Whereas 25.9 percent of the respondents have access to pipe water 5-7 days in a week, 34.2 percent responded seasonally and the rest 6.5 percent are non respondents because they are users of public water points.

Among the public users 2.6 percents are get water once in two weeks, 7.0 percent 1-2 days in a week, 26.9 percent 3-4 days and 24.8 percent 5-7 days in a week, 35.4 percent responded seasonally and the remained 3.7 percent are non respondents because they are private water users and have access to pipe water either in their home or near to their compound. People wait for too long at the source for turn to fetch water. More than 50% of people in Asayta town wait nearly 1

hour before they can fetch water because the particular time of water flow is not known during the days.

For this reason people have to wake up so early in the morning and queue with their jarican for water from any public tab nearest to them, then get back to their home to wait whilst doing other things. Figure 6 shows that the private water vendor and public water point in the study area.

Figure 6 : Private water vendor &Public water point respectively in Asayta

Source: Field Survey, 2014

4.7. Water Tariff Setting

Water use practices and willingness to pay for water services in urban areas depend highly on household income. Senegal‘s water tariffs are the highest in West Africa, largely because water resources are located at a distance from water consumption centers, especially in Dakar. The tariff in Senegal also includes a cross-subsidy for poor consumers and it covers three categories of local subscribers based on consumption (0-20 m^3, 20-40 m^3, and over 100 m^3 per two-month period), and favor conservation: a „social rate applies to the lowest level of consumption,

whereas between 20-100 m³ results in a full rate, and a "dissuasive" rate applies to consumption greater than 100m³ (Makin, 2004).

For Tunisia, the potable water tariffs (excluding fixed costs) were found to be: Average -US$ 0.45/m³, minimum US$ 0.12 /m³, maximum US$ 0.74/m³, which is higher compared to those of the water supply systems under study. In cities such as Windhoek, Namibia, which are located in water stressed regions, water management is a task and a Water demand management (WDM) strategy to meet the objective of using limited water resources as efficiently as possible and, when combined with block tariffs, it is being used to ensure equitable access to water (Makin , 2004).

The existing water tariff in Asayta town includes two water tariff systems. One is the uniform tariff rate for the public fountain and another blocked tariff with progressive rate individual consumers having service connection. For private pipe connection users the price set as 1.50 birr/ m^3 for those who can consume 0-5m^3 of water. For those who can consume 6-10m^3 the price set is 2.50 birr. For 11-30 m^3 of water pay 3.40 birr. 25 birr. Finally, for those who consume more than 30 m^3 is 4.20 birr.

The amount that households pay for a 20 liters or 1 *jerican* of water varies from place to place and season to season depending on the level of scarcity of water and the demand for water by the people from a particular owner of a reservoir or a big tanker or vendors. The difference in price indicates that communities are taking water from different sources based of their income, short distance to the water source and water availability. The difference in water source makes difference in water price. For example those who are fetching water from public water points are asking to pay 0.10 cent only that is a lower price compared to the private sources.

In agreement with Meseret (2012) the study conducted in Simada district the price set by private owners are differ place to place and home to home because they don't set fixed price. Majority of tanker owner are selling water by 3 birr during dry seasons and others may ask 2 birr or 1 birr for one *jerican*/20 liters / of water. Average water price of the area is 1.50 birr, which is not affordable. Table 17 shows the price of water paid per one *jerican.*

Table 17 .Cost of Water per *jerican*

S.N	Water cost per *jerican* / 20 liter	Frequency	Percentage
1	3 birr	67	34.1
2	2.50 birr	28	14.2
3	1.50 birr	29	14.7
4	1 birr	58	29.4
5	Non - respondents	15	7.6
	Total	197	100

Source: Field Survey, 2014

According to the result of survey, the sampled HHs had given their comments on the water price of Asayta town. Out of the total sample households 73.1 per cent commented the price set is expensive especially for private pipe connections. Other 13.2 percent commented the price as fair may be for those who pay less when they consume more. 8.1 percent reported that the price was cheap and the remaining 5.6 percent are non- respondent. Table 18 reveals that the comments of the respondents concerning the existing water tariff.

Table 18: Respondents' comments on the existing water tariff

Responses	Frequency	Percentage
Cheap	16	8.1
Fair	26	13.2
Expensive	144	73.1
Non-respondents	11	5.6
Total	197	100

Source: Field survey, 2014

4.8. Problems of Water Supply

Both category of respondents (Household water consumers and ATWSO officials and employers) confirmed that there were problems associated with water supply system in the study area. There are limited numbers of boreholes with limited potential yield. The supply decreases more during the dry season. In addition to this, there is frequent interruption of the supply, which reduced the actual production to be less than the expected amount. There are no mechanisms developed to solve these challenges. Even the existing different sources of water are not synchronized to modern water supply. The rate of meter connection and the spatial distribution of public stand pipes or water points do not meet the demands of the community. When we see the spatial distribution of public stand pipes in the town only four are found in kebele 02, of which one is non functional whereas six public water points are located in kebele 01, in which relatively less number of people are living.

Similarly Chala (2011) reported the shortage of water supply, high cost of piped water connection, length of process during connection and frequent interruption in Ambo town. Assefa (2006) has also reported the difficulties in availability of potable water supply in Assosa town of Ethiopia. The town was unable to meet the demand and supply. The root causes for this was institutional, financial, human and material resource constraints. There was found to be a difference in distribution/supply of water in the town.

According to the survey data limited number of boreholes, operation time of wells, the high percentage of water loss has further reduced the actual amount of water supply to the lower level.Inadequate supply and poor quality, the physical distance of housing units from water point, unreliable distribution due to weak pressure and frequent interruption limited water consumption of the households in Asayta town. As showed on Figure 8, 84.8 percent of the households indicated problems with the water supply system in their areas. 6.6 percent of them said there were no problems but the remained 8.6 percent reported they don’t know. Figure 7 shows that the responses of comments regarding the problem of water in Asayta town.

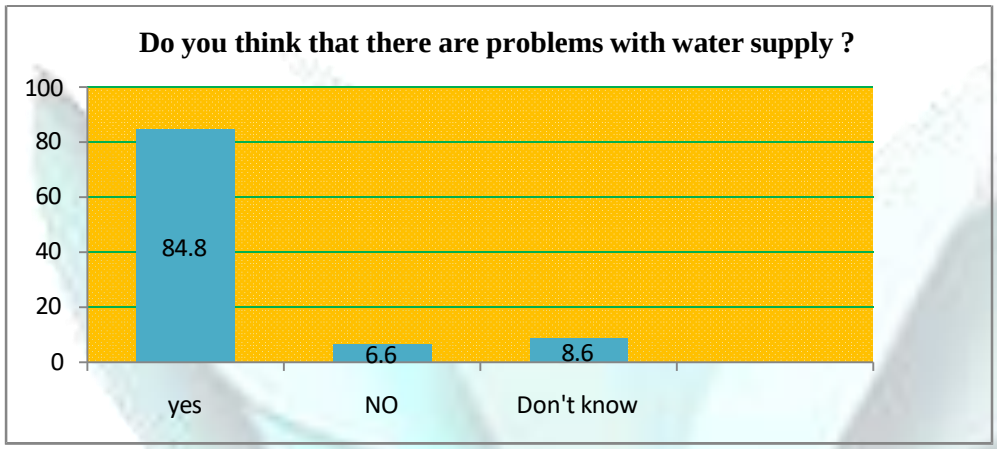

Figure 7: Problem of water supply

Source: Field Survey, 2014

4.9. Causes of Water Supply problem

Factors which constrain the water supply and sanitation sector are insufficient financial resources, inadequate institutional arrangements, inadequate human resources, Lack of sector coordination, Lack of political commitment, insufficient community involvement, inadequate operation and maintenance, and Poor hygiene education.

Cause of water supply problem in the study area are several, according to listed in Table 19 the respondents reported the causes of the problem. 28.9 percent of the respondents were agreed that one of the major causes of the water scarcity in the study area was due to the growth in the number of town dwellers. 24.4 percent of them were suggested the cause was shortage of modern pipe lines and maintenance problems. 20.3 percent reported that the cause for the problem was shortage and low commitment of technical workers. While the same 16.8 percent has saying distance of the water from the source aggravated the problem because during the break down of pipes occur experts take more time for maintenance. On the other hand 9.6 percent responded that they faced water shortage because of the land escape of the town. Table 19 indicates the causes of water supply problems in the study area.

Table.19. Causes of water supply problems

S.N	Cause of water problem	Frequency	Percentage
1	Increase in the number of the town dwellers	57	28.9
2	Shortage of pipelines and maintenance problems	48	24.4
3	Shortage of technical workers	40	20.3
4	Distance from the source	33	16.8
5	Land scape of the town	19	9.6
	Total	197	100.0

Source: Field survey, 2014

The study conducted by Yewondwossen (2012) in Amahara region also indicated that the single most influential factor related to the sustainable provision of basic water and sanitation services is that of poverty. The lack of availability of basic services is a primary measure of poverty and poverty is the primary obstacle in the provision of basic services.

The other major cause of the organizations is problem to handle and use the material and money properly .For example they have financial support from different sources like non-governmental organization such as Afar Pastoralist Development Agency (APDA) and from federal government of Ethiopia .Additionally, they collected money from the communities in order to improve water supply of the town. From all government employers they got their monthly salary and from others according to their income they earned. But now there is no any visible change which is made for the communities. As usual peoples are travelling long distance in order to fetch water from Awash River which is found on the out skirt of the town.

On the other hand the limited amount of water which reached to town is not properly stored and distributed to the community instead flow on two sides of the main asphalt road and different corners of the town. In addition to this when the broke down of pipes occur it may not get urgent solution from the concerned body it takes three to four days and leads to water loss.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary

This study has been conducted to assess the urban water supply and consumption problem in Asayta town, Awssiresu Zone of Afar Regional state of Ethiopia. Major sources of water in the study area were public water fountains, private connection, hand dug well and river.

The existing production of water from the two Boreholes is inadequate to satisfy the growing demand of the community. The gross water production capacity of these boreholes is 16 liters per second (l/s) or 784.000 l/day (784m^3 /day) in 2013. The water consumption per capita in 2010 is 14.85, in 2011 is 12.77 and in 2012 is 11.75. There was a difference between consumption and production in the study area that caused deficiency in the water delivery system.

However different efforts are made by communalities in order to solve and improve the water supply of the town but, observable differences are not made. In addition to this, continuous break down of the pipe lines become common problem for the town and affect the distribution of water from source to reservoirs.

A sampling procedure was employed to select 197sample household, out of which 108 of them were from kebele 02 and 89 of them are from kebele 01.The respondents were selected from two kebeles based on probability proportional size to simple random sampling techniques.

Structured questionnaire was used to collect primary data from the sample respondents. In addition, interview and document analysis were made in order to get more accurate and reliable information. The source of water supply for Asayta town is from underground water. The boreholes are located at northern end of the town and feeding the water supply system by gravity. The scheme was built in around 1985G.C by the previous military government of Ethiopia with the aim to solve the problem of water in the area.

Major identified problems in the study area were limited number of boreholes and reservoirs, operation time of the wells, frequent interruption of water supply , incompatibly of the supply with the demand and high percentage of water loss that are caused by the growth of population in the study area, shortage of technical workers and their weak commitment , the distance of the water source from the housing unit , financial constrain, low priority given to the issue, lack of institutional coordination, and lack of awareness creation.

5.2. Conclusion

This study tried to assess the availability, production, need , consumption and with the respect to the implementation, functionality and utilization in delivering water supply services for urban residents of Asayta Town.

Analysis of descriptive statistics has shown that 32.6 percent of the sample respondents are public water users, 21 percent of them are sharing water with their neiboughr, 16.4 are private users, the rest 17 percent and 13 percent of the respondents are using river and hand dug well respectively. This indicates that more than half of the respondents are without private connection and using public water points and other sources.

Whereas public water points are not located with equal distance to their houses and it is few in number when compared with the number of users. Additionally they did not get water with in a distance of 0.5 and 1.5 kilometers for urban and rural areas respectively as recommended by water and energy minister of Ethiopia.

Asayta town is facing problem of safe and adequate water. This problem is manifested in that there are residents that are not connected to the pipe line, residents who are connected to the pipe line get water on a shift basis, substantial amount of residents are users of unprotected sources especially river water by spending high energy and time, or many residents buy water from private sellers paying expensive water fee.

Regarding the volume of water supplied to the community of Asayta town per person per day, it was found out that about 32 liters per person per day was supplied for washing, cooking, drinking and cleaning in 2012. Although the figures fall below the UN recommended 50 liters per person per day as the absolute daily minimum amount of water a person needs, and below standard set by water and energy minister of Ethiopia 20 liter per person per day with in a distance of 0.5 kilometer for urban and 1.5 kilometer for rural areas.

The finding of this study also revealed that scarcity of water in the area are caused by increase in the number of the town, shortage of pipelines and maintenance problems, shortage of technical workers and their low commitment, and increased demand of water in the area .In addition to this construction of Tendaho sugar factory increased the demand of the water. Lastly lack of responsibility from Asayta town water supply office and shortage of trained personnel are included among the major causes of the problem. Generally Asayta town water supply office is not in the position to tackle the problem faced by the society.

5.3 .Recommendations

To reverse the existing inadequacy and inconsistency of water supply and to ensure the well being of the residents of Asayta town the following issues should be considered.

- **Active involvement of the town residents:** though the local government of Asayta town has made efforts to tackle the problem, it cannot be realized without active participation of the people at all levels of water supply program and allow private sector involvement in different components of water supply service such as provision of pipes, meters, equipments, machines etc. In addition to this, NGOs should take part in the rehabilitation of already constructed projects to minimize financial burden of the mandated agency, ATWSS office.

- **Finding alternative water sources**; Asayta town gets water form two boreholes only that are not matched with the growth of the population of the town. Besides, the source is only from underground water which is characterized by decreasing water table, especially

during peak dry season, the amount of production is not adequate even for those who have access to it. So, the responsible parts or bodies of the local government have to find alternative water sources to solve problem of the community. For example it is better to conduct a study to bring water from Awash River which is found at the distance of almost one km from Asayta town.

- **Fair distribution of water source:** public water points and pipes ought to be evenly distributed in order to address the problem of the people in Asayta town. Moreover, installation of additional public water points would narrow down the gap between demand and supply by taking into consideration of the number of people, density and distance between water points. Additionally to reduce the total salinity content in the urban water supply of Asayta it is better to pump more water from BH.No.1 and less from BH.No.2 to the water reservoir and supply the mixture of water from both wells. The third water well which currently is not in use must be connected to the system as soon as possible ;

- **Immediate replacement and maintenance of currently using pipe lines;** all water supply system of Asayta town needs expansion and improvement: washing and developing existing wells, maintenance and rehabilitation of distribution systems that include water reservoirs, pipe lines and fittings**.** Break down of pipe lines do not get fast solution from the ATWSSO and leads to water loss. So, it has to get quick maintenance when the problem is happen and old pipe lines have to be changed by modern plastic pipelines to reduce unnecessary water loss, water shortage and increase availability of water and solve societal problem;

- **Improving the capacity of Asayta Town water Supply Service Office;** ATWSSO Should be capacitated by well educated and skilled manpower and also materials. In order to cope with modern technology and successfully do their responsibility, the whole staff in general and technicians in particular should get trainings at different levels. The stake holders of the town and the *woreda* water supply should integrate and carry out their respective duties to strength the ATWSSO with adequate and skilled human power.

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7. APPENDICES

7.1. Appendix I. Questionnaire for the General Public

Haramaya University

School of Graduate Studies

College of Social Science and Humanities

School of Geography and Environmental Studies

Questionnaire for household survey

Master Thesis Topic: Assessment of Urban Water Supply and consumption in Asayta Town, Awsiressu Zone, Afar National Regional state, Ethiopia

The purpose of this study is to generate relevant information on assessment of urban water supply and consumption in Asayta town. The information you provide will be treated as strictly confidential and used only for this academic purpose. Your cooperation and willingness to respond to questions is important for the success of the study. Therefore you are kindly requested to give complete and reliable responses to all the questions.

Thank you for your valuable Time.

Section A: Background Information

1).Kebele (1) Kebele 01 (2) kebele 02

2). Sex: (1). Male (2). Female

3). Age: (1). 15 – 19 (2). 20 – 29 (3). 30 – 39
(4). 40– 49 (5). 50 – 59 (6) .60+

4). Marital Status:
(1) Married (2) Single 3) Divorced

5). Family members in age: age (in years)

(1). 15-19 (2). 20-29

(3).30- 39 (4).40-49

(5). 50-59 (6). > 60

6). What is your level of education?

(0). Can't read and write (1). Can read and writes (2). Primary (3). Secondary

(4).Certificate (5). Diploma (6). Degree (7). Beyond first degree

7). What is your Occupation?

(1).Farmer (2) Businessman (3).Government employer

(4). NGO employer (5). Daily laborers (6). Retired person 7) If other (specify)

8) .What is your monthly household income?

(1) <500 (2) 501- 1000 (3) 1001- 1500

(4) 1501- 2000 (5) >2000

Section B:

9).What type of water sources are you using?

1) Private tap 2) Public Tap 3) Shared 4) Hand dug Wells (Ellas) 5) River

10). How far is the water source from your home? Please specify in kilometers

1) < 1 km 2) 1- 2km 3) 3-4km 4) >4 km

11). If you use pipe line water, do you have pipe connected to your home?

1) No 2) Yes

12). How many times do you get water in a week?

1) Once in a week 2) 1-2

3) 3- 4 4) 5- 7

13). How many liters do you consume daily on average ?

1) 20-40 liters 2) 60- 80 liters

3) 100- 120 liters 4) 140 -160litres 5) > 180

14). In which season does you consumes much water?

1) Hot Season 2) cold season

15.) For which purposes does the consumption increase?

1) Drinking and cooking

2) Washing clothes

3) Bathing

4) Cleaning house

16). What do you say about the water tariff (prices) in Asayta town?

1) Cheap 2) Expensive 3) Fair

17). Do you see water amount difference in your tap due to seasonal difference?

1) Yes 2) No

18). In which season does the water amount decrease?

1) Hot season 2) cold season

19) If you do not use tap water from the system, why is it?

1) There is repeated interruption of the system
2) To save water expense
3) There is no a nearby pipeline
4) Mention if there are other cases

20). Who collects water in your home?

1) Boys 2) Girls
3) Wife 4) Husband

21). Do you have to take a lot of time to collect water?

1) Yes 2) No

22). How long does it take to collect water?

1) < 1 hour 2) 2-3 hours 3) 4 hours 4) > 4 hours

23). How do you evaluate the water supply in Asayta town?

1) Very satisfactory 2) satisfactory 3) unsatisfactory

24). If your answer is 'unsatisfactory' in item no 23, Where do you go to get water?

1) Storing water 2) buy from private taps

3) Fetching from River 4) Mention if other

25) If you have no water connection, why is it?

1) Because of shortage of money
2) Because of deficiency of service delivery in the water service office
3) Because of water shortage in the town
4) Because there is alternative water source

26). How much do you pay for one container (Jerican) if you fetch from long distance ?

1) 1 birr 2) 1.50 birr

3) 3 birr 4) > 3 birr

27) How do you evaluate piped water delivered to your house hold?

1) Very good 2) good 3) Satisfactory 4) poor

28).Do you think that there are problems with water supply in Asayta town?

1) Yes 2) No 3) Don't know

29). What are the major causes of the water delivery problems?

1) Increase in the number of dwellers
2) Shortage of pipe lines and maintenance problems

3) Topography (landscape) of the town

4) Low commitment of technical workers

5) if other, mention

30). what impacts do you see due to the water supply problem in the town?

1) Unplanned costs due to interruption water

2) Water born diseases because of unsafe water

3) Girls and boys waste their time in search of water

4) Mention if other

31). What solutions do you recommend for the problem?

Thank You for your valuable time.

7.2 Appendix II. Questionnaire for ATWSO Finance and Administrative staff

Haramaya University

School of Graduate Studies

College of Social Sciences and Humanities

School of Geography and Environmental Studies

Questionnaire for ATWSO Finance and Administrative staffs

Master Thesis Topic: Assessment of Urban Water Supply and consumption in Asayta Town, Awsiressu Zone, Afar National Regional state, Ethiopia

The information you provide will be treated as strictly confidential and used only for the academic purpose your cooperation and willingness to respond to questions is important for the success of the study. Therefore you are kindly requested to give complete and reliable responses to all the questions.

Thank you for your valuable Time!

1. Do you think that there is improper use of water from the customers (public) side?

   1. Yes 2. No

2. What do you say about water availability and supply in Asayta town ?

   1. Very good 2. Good 3. Satisfactory 4. Poor

3. Which of the following water facilities are used by the house holds or communities in the area?

   1. Boreholes 2. Piped water 3. River 4. Rainwater harvesting

4. How do you evaluate the water coverage in terms of facilities?

   1. Very good 2. Good 3. Satisfactory 4. Poor

5. Who is responsible for the construction of the facilities?

   1. Government
   2. The residents
   3. Aid organization

6. Is there a prominent demand growth in the number of customers?

   1. yes 2. No

7. If your answer is 'yes' in item no 6, how is the increments from 2008 – 2012?

8. Do you think that the water supply service of the town is profitable?

   1. Yes 2. No

9. If you answer is no , what are the causes of for its low-profitability?

   1. High maintenance cost
   2. Low income from monthly water fees
   3. Little support from Regional water Bureau

10. What is the current (2014) official tariff /price per meter cube of water supply services in Asayta town?

_____

_____

11. Is the current tariff sufficient to recover costs such as operation, maintenance, and replacement costs?

1. Yes 2. No

12. Does AWWSO receive financial support from the government?

1. Yes 2. No

13. What amount of the yield is in pipeline daily, monthly and annually?

_____

_____

14. Is there growth in the amount of water production (yield) from time to time? Please specify in the recent years?

_____

15. How do you evaluate the financial management of ATWWSO?

1. very good 2. Good 3. Fair 4. Poor

16. How are the funds managed? Please explain

_____

_____

17. Do you think that the current water supply satisfy the consumption (demand) of the people?

1. Yes 2. No

18. If your answer is no, what are the major causes of the problems?

1. shortage of budget
2. The growth of urban dwellers in the town
3. Repeated failure of electromechanical equipments
4. Low water amount

19. What infrastructure development mostly interrupts the water supply?

1. Road construction
2. Electrical power
3. Illegal house construction
4. Tele communication

20. How do you evaluate the capacity of the technicians in the water office?

1. Very good 2. Good 3. Fair 4. Poor

21. What are the major causes for technical failures?

1. Old age of the fittings
2. Old age of the pumps

3. The shortage of modern water tubes such as plastic tubes

23. What measures does the water service take for power inconsistencies?

1. Stand by generator
2. Manual generator
3. no measurement at all

24. What do you recommend for the water supply and consumption problems of Asayta town?

Thank you for your cooperation

7.3. Appendix III. Inteview Guides for ATWSO technical employers &experts

Interview Guides for ATWSSO technical employers and Experts

Master Thesis Topic: Assessment of Urban Water Supply and consumption in Asayta Town, Awsiressu Zone, Afar National Regional state, Ethiopia

1. When was the whole water system constructed?
2. Which water facilities are used by the house holds or communities in the town?
3. What amount of the yield is in pipe line daily, monthly and yearly from 2010-2012?
4. How many pumps are there and what are their average pumping hours?
5. Does the yield of water vary through different seasons?
6. Does the variation have relation with temperature change pattern? If yes please explain
7. How many distribution zones are in the system?
8. How many connections and public fountains are in the system?
9. How are decisions made for extending connections?
10. Is the water available enough to meet the demand of customer's consumption?
11. How do you see the quality of water you are using?
12. What are the major operation and maintenance problems?
13. What infrastructure development mostly interrupts the water supply?
14. What measure does the water service take for power in consistencies?
15. What do you say about the profitability of the water service?
16. What are the major causes for technical failures?