

# Challenges of Domestic Water Supply in Injibara Town, Ethiopia

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## Abstract

This study assesses the major causes and challenges of inadequate quantity and quality of domestic water supply in Injibara town. Study area has the problems of insufficient domestic water supply in both quantity and quality and also distribution system has the major challenges on consumption of water supply. Therefore, the data are collected from study area, which are primary and secondary data by using interview and from various sources. Data analysis of this studying is using frequency analysis by using four phases, which are coding data, discovery of themes, organizing and defining data by code and interpretation of results. The results of this study show that existing water supply has multidimensional problems, such as lack of money and fund, the rapid growth rate of population, loss of water by leakage and lack of power to pump. The current demand and supply of domestic water supply is not balancing with numbers of town population, which is only 28.6% but 71.4% of total communities cannot gate adequate domestic water supply every day. Majority of the town communities use daily domestic water supply from unsafe and unprotected alternative water sources to fulfill their daily water demand from far distance almost 85.8% of total town communities. In study area There is no coordination, participation, and awareness of the population about the aim of water supply for their life by using water direct or indirect. Totally this study concludes as the existing domestic water supply is inadequate for all town communities at current time. This paper recommended that redesign all components of water supply schemes starting from population forecasting up to distribution systems.

**Keywords:** Access of water; demand; distribution; production; Water supply; water tax; Injibara town

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## 1. INTRODUCTION

Water is the most fundamental need for all living things like human, animals, and plants, without its existence, will impossible on land for all living things. Along with air, water is the most necessary source for survival on the earth (Kumar and Desta, 2018).

The flexible arrangement of sufficient and safe drinking water is the most important of every single person (Arturo et al., 2017). And furthermore, adequate measure of potable water supply is one of the essential urban administrations, which significantly influences the financial development of city or towns and the social aspects of individuals. Therefore, many urban areas in the world are challenging difficult problem of water supply deficiencies. This problem is common in a large portion of underdeveloped countries, as well as Ethiopia, which is particularly most markedly unpleasant and multidimensional ways. "All resources that nourish life owe their existence to water" from the smallest algae to the huge mammals along with everything they live on, feed on and make possible their breeding are the creations of water (Kabiso, 2015). Thus, all people of their stage of development, economic and social conditions depend on access to drinking water supply quantity and quality must be equal to their basic needs for their day to day activities.

Water is increasingly recognized as the main cause in economic development, social and reduction of poverty (Haziq and Panezai, 2017). In contrast to that, the role of water is not only focused on its central role to achieve the goal on environmental sustainability and on the way to meet the target on water supply, sanitation and hygienic, rather centered to other developmental activities (Alua et al., 2019).

Water is the most essential for all public services throughout the world. It is most important for life next to oxygen (Rathnayaka et al., 2016). Anything that affects the provision of water supply, therefore, tends to disturb the survival of humanity and their life. Water is the basic need for human being welfare. Adequate domestic water supply is an entry point to sustainable development by the economy and social aspects. However, in most developing countries have limited access to water quantity with poor water supply, hygienic and sanitation is extending the poverty, like Ethiopia.

Even though, Ethiopia is a country with high surface and groundwater potential that has twelve major river basins, including the Blue Nile and eleven significant lakes, which makes the country the "Water Tower" of East Africa (Kassa, 2017). However, access to safe local water supplies, hygienic and sanitation benefits in several parts of the country is among the least in Sub-Sahara Africa. Specially in studied town. But the primary drinking water supply for the study town was spring source is referred to locally name as sutang spring developed in 1985. This source is the primary source of the town for a long time with good quality and still used to for a few town communities. After some decayed drilling two additional boreholes during 2015, this source is the main source of the town before four years and up to now, but not enough or fit the present town community demand of water

supply and there is not quality.

### Objectives of the Study

General aims of this studying are to assess the major challenges and causes of inadequate quantity and quality of domestic water supply in studying town. Its specific objectives are:

1. To assess the main improve sources of domestic water supply in studying area
2. To examine the relationships of demand and supply of domestic water
3. To examine water coverage and distribution system of water supply
4. To identify the major causes and challenges of town water supply system
5. To identify tariff of water and its equality for all communities of the town
6. To assess interaction between water supply and sanitation in studying area
6. To assess the coordination and participation of community from water supply with WSS

## 2. METHODOLOGY OF RESEARCH

### 2.1. Description of the Study Area

The study was conducted at Injibara Town, Amhara Regional State of Ethiopia. Its location is southwestern portion of the region and north western portion of the country, Ethiopia. It is around 447 km far from the capital city of Ethiopia, Addis Ababa and 118 km from Bahir Dar, the capital city of Amhara Regional state. Geographically, Injibara is found in 10°59'N and 36°55'E longitude. The highest and lowest height of Injibara are recorded to be 3000 m.a.s.l and 2540 m.a.s.l respectively (Zewditu, 2017). As indicated by the town's organization the total area of the city was 28.3 km<sup>2</sup>. It is isolated into five urban kebeles under the town organization; these are 01, 02, 03, 04 and 05 kebeles(closers). The present improvement plan for Injibara town was set up in 2004 by the National Urban Planning Institute. The improvement plan demonstrates areas that are assigned for housing, commercial, industrial and administrations of organizations. Location of the study area is shown in Figure 1.

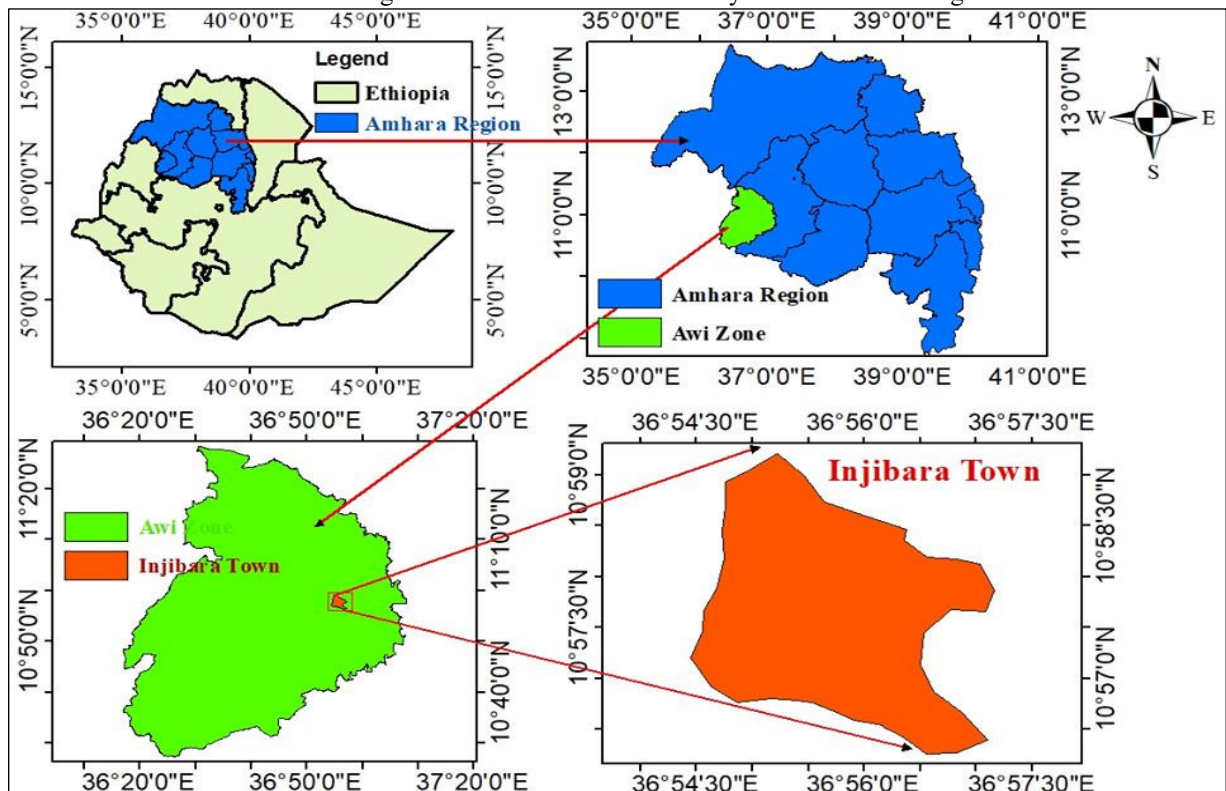


Figure.1: Map of Ethiopia, Amhara Regional State, Awi Zone and Injibara Town

### 2.2. Methodology

Descriptive method and qualitative technique used in this study suggests that every House Holders (HHs) answer and the significant data was collected through questionnaire and interview depends on current water supply situation in the study area and on variables that suggested the arrangements of protected and sufficient water supply and furthermore this study strategy would have to gate an appropriate description of the present condition of domestic water supply consumption in study town.

### 2.3. Data Source and Type

There are two types of data for this study. These are primary and secondary data sources. Primary data was collected from Injibara town water supply and sewerage offices, municipal office of the town, health center and woreda water and mine energy office and some peoples from different working places especially Hospital, college and university in the town. The numbers of sample are 16, this is show below Table 1.

**Table 1:** From choice of respondent official institution for interview

No	offices from where K1 were selected	officers	Selected Sampled
1	Injibara water supply and sewerage services	42	4
2	Banja woreda water and mine energy offices	37	4
3	Banja woreda municipal offices	32	3
4	Banja woreda Health sector	48	5

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

### 2.4. Methods of Data Analysis

After completion of data gathering, coded, arranges, explain, interpreted correctly and describe accurate techniques by using table and percentage were used as methods for data analysis of both descriptive and qualitative methods. Moreover, qualitative information was gathered through open semi-structured and structured interview. Generally, Data analysis of interview questions are analyzed by using four phases. These are coding data, discovery of themes, organizing and defining data by code and interpretation of results.

**1. Coding Data:** After the completion of the interview data, the information got from the members was broke down and isolated into important parts and which make up a critical segment of their significant, were named and coded. Next this information was coded, a code list was shaped and it was utilized as a key rundown for analyzing and altering this information. At that point, the coding key and meeting transcripts were perused independently by individual analysts, and "agreement" and "contrast of assessment" issues were talked about and fundamental plans were made.

**2. Discovery of the Themes:** By this phase, the codes established in the stage of encoding were gathered underneath certain groups and themes were recognized. In this study there are seven total dimensions to determining the existing condition of Injibara town domestic water supply and its major challenges and also possible solution of its for future times in the town.

**3.Organizing and Defining the Data by the Codes and Themes:** By this phase, the views of the applicants were described in a language easily understood by the reader and ideas were offered to the reader direct. References were utilized to figure out which talk with notes are claimed by which member and meeting notes were given in quotes. At that point, the proprietors of the meetings were shown in enclosures.

Example-1:"....."(G:W(4)) W: Water supply and sewerage offices

Example-2:"....."(G:H(5)) H: Health center

Example-3:"....."(G:M(3)) M: Municipal offices

Example-4:"....."(G:WR(4)) WR: Water resources and mine energy offices

**4.Interpretation of Results:** At this phase the answers explained and introduced in deeply were constructed and give to researcher in proper way. Gathered data were interpreted through the phases needed by qualitative research methods and a number of results were distribution.

## 3. RESULT AND DISCUSSION

This section mostly focusses on data that has been collected by using interview questions. This interview questions were applied to four selected offices in study area. These offices are water supply and sewerage offices, health center, municipal offices and water resources and mine energy offices of Injibar town in Ethiopia. The results and discussion this data is depends on improved domestic water supply, the relation of demand and supply of domestic water, access of domestic water supply, challenges and causes of domestic water supply, interaction of water supply and sanitation and water borne diseases in study town.

**DIMENSION I:** How many households have access to improve water sources?

In this segment, the answers and clarifications of analysis results of the data gained from interviewers, answers of the above question are show below Table 1.

**Table 1: Access of Improved Water Supply**

Themes	Participants Status		
	Ethiopia (Injibara WSS office)		
	Total number of participants	Number of Participants Who Answer Questions	%
5450	4	1	25
5223	4	2	50
5924	4	1	25
<b>Total</b>	<b>4</b>	<b>4</b>	<b>100</b>

First person answer the first question, “general there is no access of improved water supply for all number of the communities, but some households using improved water supply for some time in a week because the systems of town water supply is intermittent system due to lack of adequate amounts of water quantity and quality in the town, then from total households only 5450 households are used improved water supply (I: A (1))”.

Second person answer the same question, “in the town totally there is no adequate amounts and safe domestic water supply system for all town households at currents time because there are the main challenges starting from sources of ware up to distribution system on existing water supply system, some of challenges are rapidly growth of population, reductions of water production at sources, interruption of water, power problems and budge shortages. Therefore, the improved water users less than half of the total households, these are 5223 (I: K (2))”.

Third person answer the same question, “ from Injibara town there is not adequate water supply system, because most community can fetch daily demand from alternative water sources which are unprotected and unsafe such as river, spring and traditional hand dug well, but some people get their domestic water from improved sources once, twice or three time in a week these households are almost 5924 households from total 13601 households of the town which are less than half of total households (I:D(1))”.

According to Table 1, less than half of total number of town households uses improved water sources but not gate always they are get once or twice a week due these reasons more than half of the total households are not used improved water system because the existing water supply system is not good quantity and quality for all households in study area. Most communities of the town supplying their daily water requirement from unsafe alternative water sources such as river, spring, traditional hand dug well and other sources from far distances, this affects their time and energy and also reduction of their productions and developments.

Demand and supply of town is not match with number of total households in town that means demand is more than supply of the town water. Because the numbers of town population are rapidly increasing rapidly with time, therefore 50% of interviews said most households fetch water from unsafe or unprotected sources to meet their daily needed of domestic water supply.

**DIMENSION 2:** What do you think the demand and supply condition of improved water supply to the households? The answers of the above question are show below Table 2.

**Table 2: Existing water demand and supply conditions**

Themes	participants status		
	Ethiopia (Injibara WSS office)		
	Total number of participants	Number of Participants Who Answer Questions	%
It is very hard	7	5	71.43
It is good	7	1	14.3
Not match with no of HHs	7	1	14.3
<b>Total</b>	<b>7</b>	<b>7</b>	<b>100</b>

First person answers the second question, “demand and supply condition of improved water supply is very hard, because they are not match each other. In town the numbers of population is increasing very fast without redesign of water supply system, due to this reasons high amounts of water demand is required to meet their daily consumption but there is not adequate amounts of water supply in the town starting from before 15 years up to now, therefore demand and supply of improved water supply of households are very hard condition still now because there is no any redesign the systems (I: B(5))”.

Second person answer the same question, “the existing condition of water consumption and supply is good but it is not meet the whole numbers of population in study areas because there are not continuous flows of water supply system (I:M (1))”.

Third person answer the same question, “the town water demand and supply is not matched with numbers of total households of the town starting from more years ago because the numbers of households and population is increasing rapidly time to time without any types of redesign, this causes shortages of water supply in town every day, due to this reasons most households fetch daily water consumption from unsafe water sources (I:H (1))”.

According to Table 2, the existing conditions of water demand and supply is very hard because 71.43% of sampled interviews are explained. Greater numbers of households are fetching daily water consumption from alternative sources of water which is unsafe and from far distances because the existing water supply is not match

with numbers of current population of the town. These causes a number of challenges on town community such as loss more time to collect water, energy and also affects their productivities, especially women and children because, they are fetching domestic water supply for different activities from both piped water and alternative water sources from far distance every day in study town. Totally there is not balances of improved water demand and supply with existing numbers of total households and total communities of town, because the numbers of population increasing every time but the water demand and discharges of water is decreased every time by different mechanism, especially in winter seasons.

**DIMENSION 3:** Is the available water supply access and safe?

Answer of this question is show below Table 3, which is answered by interviews of offices

**Table 5.3:** Available water suppl accessible and safe

Themes	participants status			Number of Participants Who Answer	%
	Total number of participants	Number of Questions			
No, b/c it is not safe	7	6			85.8
yes, some times	7	1			14.2
<b>Total</b>	<b>7</b>	<b>7</b>			<b>100</b>

First person answers the third question, “totally there is not access of safe drinking water supply in and around the study area because most of time the town community fetching water supply from river and spring which is unprotected sources due to this reason most people are affected by water borne, water related and water washing diseases (I:D (6))”.

Second person answer the same question, “the available access of safe drinking water is safe in some portions of town because their elevation of topography is suitable flows of water supply and good for distribution system of pipelines due to this reason the available of water supply access and safeties of water is good in some places of town (I: W (1))”.

Regard Table 5.3, access of safe drinking water supply in town is not safe and access easily because 85.8% of interview explained as unsafe domestic water supply in study area, therefore great parts of the community use unsafe domestic water from unprotected sources because the improved water supply is not always available and good quality for all community and also there is not all parts of town installation of distribution systems because the existing distribution system is old but the town master planned increasing time to time due to numbers of town households are increasing rapidly every time without any redesign of water supply components starting from sources up to distribution of consumers depends on numbers of present and future forecast population of studying town. Therefore, the water supply and sewerage offices must be redesigning all components of water supply starting from population forecasting up to distribution system of water supply depends on current numbers of population and by calculating maximum daily demand and peak hourly demand to calculate all components.

**DIMENSION 4:** What factors facilitate more the problem of water supply in the town?

Answers of this question are show below Table 4, which is answered by sampled offices.

**Table 4:** The challenges of water supply in study town

Themes	participants status			Number of Participants Who Answer	%
	Total number of participants	Number of Questions			
Rapid growth of population	7	3			42.86
Lack of budget	7	2			28.57
Interruption of water	7	2			28.57
<b>Total</b>	<b>7</b>	<b>7</b>			<b>100</b>

First person answers the fourth question, “there are numbers of factor in Injibara town water supply systems, such as rapid growth rate of population, financial, technician, water production and electric power to pump water from water sources. The major factor is rapid growth rate of town population time to time without any gap every time because the water demand of the town is forecasting depending on before 20 years numbers of population but now a day the numbers of population more than double (I: T ((3)))”.

Second person answer the same question, “the problems of domestic water supply in study area is lack of adequate budget to improve the better water supply than existing system and for operation and maintenances of existing and new installation of distribution system (I: F ((2)))”.

Third person answer the same question, “the major factors of domestic water supply in town is interruption of water day to day because most of time there is not daily water consumption through the whole parts the town (I: L ((2)))”.

According to Table 4, more than half of interviews explained the challenges of existing water supply as rapid growth rate of town population without any water redesign and addition of water sources which is matched with

numbers of population in town. But there is a number of problems in the town addition to numbers of population such as lack of adequate budget for improve better water rather than existing one and interruption of water day to day due to electric power and technician problems. General the water supply and sewerage offices and municipal offices must be finding the better water sources than existing one and to solve the major problems starting from existing water sources up to distribution system of consumer and also to communicate with community at least six month or twice a year.

**DIMENSION 5:** How many percentages of households have access to sanitation?

This question is answered show below Table 5 by sampled interviewees of offices.

**Table 5:** Access of sanitation in study area

<b>participants status</b>			
<b>Ethiopia (Injibara Health office)</b>			
<b>Themes</b>	<b>Total number of participants</b>	<b>Number of Participants Who Answer Questions</b>	<b>%</b>
20%	5	1	20
10%	5	1	20
15%	5	3	60
<b>Total</b>	<b>5</b>	<b>5</b>	<b>100</b>

First person answers the first question, “in study town generally there is no proper sanitation system as total because most community is disposal solid and liquid waste from open ditch, road and any open area without any treatment before or after disposal but in some area especially governments and private institution have sanitation, which is 20% (I: B (1))”.

Second person answer the same question, “generally there is no sanitation system from study area not only this as whole country because there is no planned budget for sanitation in town for long time still now a day but there is some offices and hotels at least 10% of total population of the town (I: Y ((1))”.

Third person answer the same question, “most of Ethiopia towns have not sanitation system because there is no fixed budget for sanitation and domestic water supply from governments and community continuously therefore total community of the town disposal the solid and liquid waste from any open surfaces and from their private pin latrine toilets but some rich persons and privet and also some government offices have separate sanitation system which are 15% of total town community but not functions always because there are a numbers of problems such as budget, daily workers and etc (I: G ((3))”.

Regard to Table 5, there is no sanitation system in study area because there is no budget for town sanitation and adequate domestic water supply of the town due to this reason most of households’ dispose the solid and liquid waste on open surfaces such as road, ditch and anywhere without treatment before or after disposal, but 60% of interviews explain as there is 15% from some areas. These areas are some hotels and governmental offices but there are not households of community used this system, the one problem is there is no adequate amounts of daily domestic water supply in studying town.

**DIMENSION 6:** Is there integration between water supply and sanitation services with your office and home?

The question is answered by sampled offices show below Table 6.

**Table 6:** Interaction between water supply and sanitation service

<b>participants status</b>			
<b>Ethiopia (Injibara Health office)</b>			
<b>Themes</b>	<b>Total number of participants</b>	<b>Number of Participants Who Answer Questions</b>	<b>%</b>
Yes, some times	5	1	20
No, b/c no water supply	5	4	80
<b>Total</b>	<b>5</b>	<b>5</b>	<b>100</b>

First person answers the second question, “in some area there is integration between water supply and sanitation services but there is no function because there is no water supply day to day, this is difficult for offices because during absences of water to create odor (I: B ((1))”.

Second person answer the same question, “there is no integration between water supply and sanitation system because there is not adequate water not only sanitation purpose there is not totally for domestic purposes in study area due to this reason more peoples using water from alternative sources therefore, there is no interaction of water and sanitation in offices and households of town as total may be there is system but not functioned (I:Y ((4))”.

According to table 6, there is not the interaction between water supply and sanitation services because 80% of sampled interviews explained as there is not interaction between water supply and sanitation services because there is not adequate water supply in study area not only sanitation purpose for all domestic purposes for all town communities. Lack of sanitation system in town causes a number of diseases on community and quality of town through the year.

**DIMENSION 7:** Are there water borne diseases, what are the common types of water related diseases in 2018?

This question is answered by sampled offices under below Table 7.

**Table 7:** Types of water borne diseases in study town

<b>participants status</b>			
<b>Ethiopia (Injibara Health office)</b>			
<b>Themes</b>	<b>Total number of participants</b>	<b>Number of Participants Who Answer Questions</b>	<b>%</b>
Amoeba	5	2	40
Giardia	5	2	40
Typhoid	5	1	20
<b>Total</b>	<b>5</b>	<b>5</b>	<b>100</b>

First person answers the third question, “there are numbers of water related and water borne diseases in study area but the major one is Amoeba, because the quality of water is very poor and it is not improved sources, some people is used from unprotected alternative sources from far distance travel every day (I: B (2))”.

Second person answer the same question, “there are three common water borne disease from theses, Giardia is the most one in study town for long time up to now (I: Y (2))”.

Third person answer the same question, “the most common diseases of water borne in town is Typhoid because this disease happened after all types of water borne diseases (I: G (1))”.

According to Table 7, there are numbers of water borne diseases in study town such as amoeba, Giardia and typhoid, but the amoeba and Giardia are most common diseases which are caused by unclean domestic water supply in town, because 40% of sampled interviews are explains clearly. Therefore, the town water supply and sewerage offices could be treating and prevent the domestic water starting from sources up to users properly to reduces the water borne diseases and to create awareness from all community of town about domestic water quality and how to treat and use before and after treatments especially drinking purposes.

Generally, in study area there is not adequate and safe domestic water supply at existing conditions because most sampled household during questionnaires and interviews are explained the same causes and challenges of insufficient domestic water supply in the town. Therefore, more people are affected by different problems especially women and children to fetch water or collect water from far distances to their houses but the water is unsafe for drinking and also affect their health by different means through the year.

### 3.1. Challenges and Root Causes of Water Supply in Town

There are many problems and root causes of water supply shortage from studying town at past and present condition and may be encourage for future time, because there are no immediate improvements of this causes and challenges of domestic water supply in study area.

#### 3.1.1. Challenges of water supply in town

There are numbers of major challenges in town water supply system. These are as follow: -

**Fast growth rate of population:** the numbers of population is increasing rapidly by both natural and migration from per-urban to urban and rural to urban area without any gap in study town every year, because the study town is better for finding different job, better for education and health facilities, better for transportation and good air condition to live the people rather than around rural and per-urban areas. This influence on domestic water supply of the town and other infrastructures of the town like housing land for residential purposes and also create unbalance water supply and demand every day on community of town. These cause many problems on town domestic water supply consumptions time to time through a year. Such as:

- Do not balance demand and supply of town water supply system with numbers of population increasing rapidly
- To breakdown/ bursting of water supply components such as distribution network because to increasing the peak hourly demand of the town at the same time
- To create disagreements between community of the town and WSS offices due to inadequate water consumption or demands
- There are not enough amounts of water supply quantity for community of town, therefore the system of water supply is intermittent system

Generally, the numbers of population in town is the relevant to design any infrastructures of the town. Especially the water supply components starting from sources up to consumer services (such as yields of sources, capacity of main pipe, collection chamber, booster station, treatment plant, pump capacity, demands of water, capacity of reservoir and all size of distribution pipelines) are design depends on numbers of population present in studying town.

#### To solve these challenges or problems in studying town

1. Redesign or forecasting population numbers of town depends on numbers of present population in town
2. To find additional water sources to meet water demands of town water supply and it must be free from any kinds of disturbances
3. To construct additional services reservoir around north-west parts of town to balance demand and supply of water in town, because more population are expanding around this area time to time every year

4. Installation of additional distribution pipeline system especially new expanded population areas around town  
**Insufficient water supply:** insufficient water supply is limitation of water production from water sources of a spring and two boreholes, which means the actual production of water from sources is not equal to the estimated quantity of water during design period of the town water supply. This causes water shortages or scarcity in both seasons of summer and winter through the year every day and interruption of water frequently every day, especially in the dry season. Because during this season all water bodies reduce their quantity like alternative water sources due to lack of rainfall. In addition to this, there is regular breakdown of the water supply distribution networks and decreases production of water at sources; this leads scarcity of water in study town every day. Therefore, the current sources of water are not corresponding to present domestic water consumption of the town population because ground aquifer is decreased every time by different mechanisms.

**Unequal distribution of Water:** It is also the other major challenges in the town WSS office. The rate of distribution system and pipeline connection in the town is not meeting the consumption of the communities every day required for their domestic activities in study town, the distribution system is not installing at all parts of the town, which is install only at central parts of the town and some governmental residential areas, governmental institution, private institution and NGO but not all parts of residential areas of the town, especially new expanded area. Most parts of the border areas of the town are currently cannot reach the pipelines. This show the distribution system of the study town is unequal or unfair. Addition to these the distribution system of town has the many challenges on town water supply system at past and current situation. Because the distribution pipeline is not laying properly with topography of town landscape, due to these reasons the water pressure breakdown the distribution pipelines always through the year. This causes:

- Interruption of water supply system day to day
- Loss high amounts of water quantity
- Reduce the water quality due to different particles or wastewater enter into pipeline during before and after maintenance of pipelines
- Causes water borne and water related diseases on communities of town
- To create unplanned work for WSS offices employers and population to fetch water from alternative sources during this time from far distances
- To increase the work steers on women and children of community because they are care water collection burdens rather than men

In other ways there is not the good quality of distribution pipelines. Due to this reason the existing distribution pipelines cannot use properly through their life span periods, because

- It cannot resist water pressure during peak hourly flow of water demand
- They do not have durability
- It cannot transmit good quantity and quality of water supply
- It causes extra cost time to time for operation and maintenance and to change pipes, valves, elbows and different water supply materials.

#### **To solve these problems or challenges**

1. The main pipe of distribution system must be changing the direction by some degree to balance the water pressure from each distribution pipeline of the town and protects their duration or life span of working.
2. To change good quality of pipelines with fixed diameter for old kebeles and balanced diameter for new expanded kebeles match with their daily water consumption depends on their numbers of population and considering next increasing population of the town for determine capacity of main pipe to sub-main pipe, sub-main to branched pipelines and branched pipeline to customer user pipelines.

Changing pipeline are reduces interruption of water supply day to day, increasing water quantity and quality, reduce extra cost for operation and maintenance and to buy new pipes, valves and elbow and also reduce work steers from WSS office employers and community especially from women and children, reduce conflict between community and WSS office. Totally, it is good for developments of community economy, town level and prevents water borne, water related and water washing diseases from communities.

**Lack of enough numbers of gate valves:** there is not enough number of gate valves in distribution networks of town water supply system. Due to this reason causes a number of problems on town water supply system such as: to loss high amounts of water during burst or breakdown of distribution networks and cause water interruption during connect one pipe with other pipelines and control high water power.

To solve this problems or challenges: to fix a number of valves starting from sources to main pipe, main pipe to sub-main pipe, sub-main pipe to branched pipe and branched pipe to consumer user pipes and also at middle depending on their lengths of pipelines. This can be reduced water loss during burst or breakdown of pipeline of distribution network.

**Lack of power to pump:** in town there are not enough amounts of power to pump water from spring and boreholes to services reservoir. This is one major challenge to causes water interruption in town.

To solve this problem to set generator at each borehole and spring or from collection chamber to pump water



during absents of electric power. Other better solution is using solar energy instead of generator because the solar energy is reducing the cost of electric power and buying generators and generator oil every day, then the solar energy is the best pumping power for study town water supply because it is developing town with low income.

**Loss of water by leakage:** The issue of water Loss is consequence of leakage of water supply in town, this cause expansion gap between water consumption and water supply in the study town. Furthermore, under limit rate of production which a drop down the real manufacture of water supply, water failure has additional decrease the quantity of water supply that achieve the consumers of the town. From field study, in town water supply framework still there are old pipelines working to distributing water that lay during the presentation of piped water supply in the town for the first time, during 1985. Even if the majority of the older pipelines are removed at various times however still there are a lot of pipes that causes challenges on distribution system of water supply. This loss of water by leakage is not only distribution but from more public water points and some public institution there are many losses of water consumption due to without closings of gate valves after they use water.

**Limits to water demands:** there are different physical and financial variables restricts water demands by population in study town. These factors are: size of town, climate condition, insufficient demand and less quality of water, distance of water sources from home, unequal distribution, economic status of customers, numbers of commercial and institutional areas, types of water supply system, cost of water taxes and interruption of water are major challenges in town past and current situations to limits water demand. Among these elements the water interruption is more significant issue or challenges. Water supply interruption causes multidimensional issues on town households. Generally, the limit of water demand is the major challenges on community by different means, these challenges on their economy level and productivities. Because this affects their time and energy due to collect water from alternative sources walking far distances every day and their developments.

**Unreasonable tax and connection charges for the poor community:** The water tax set by the Injibara WSS office and the Board of town water supply for personal pipeline connection and its connection cost is unreasonable to the poor sections of the community. This is a direct result of the way that the individuals who used more volume of water pay small cost due to the value set in this way addition to high connection prices. The cost for the establishment of new pipeline connection and water uses is not reasonable for poor family units in study town. The minimum cost of the new pipeline connection is 2000 Ethiopian Birr which is extremely costly for poor community. Due to this reason more population have not private pipeline connection system inside the town because their economy status is not much with fixed tariff.

**Absences of sewerage system:** in study town there is not sewerage system, therefore the wastewater is following on surfaces cross on above the water supply pipeline of town distribution network without any types of treatment. Due to these reasons the sewages of town cause main challenges on water supply of town, when the pipelines of distribution network are burst or breakdown, which means wastewater enter into water supply pipeline by different mechanisms. This causes water borne diseases on community of town and reduces their life.

To solve these problems: to design and install the sewerage system of the town, to collect and treat wastewater and municipal solid waste which generates from town community, to reuse and disposal at planned areas. To create awareness from town community due to harmful of the sewage disposal at everywhere and to protect all communities of the town liquid and solid waste generation from sources before and after disposal.

### 3.1.2. Root causes of water supply in town

The domestic water supply services must be adequate in quantity and quality and also safe due to efficient, reasonable and available in terms of distance, time and price for all population of town before and after connect private pipelines, this required good quantity and quality of water sources, adequate materials before and after construct of water supply, funds and skilled manpower resources, progressed and state art innovation and institutional limits. As a result of the deficiency of these elements, the water supply management of town is not sustainable mean it is ineffective, unfair and unreachable important quantity of the public water supply consumption. Therefore, there are a number of factors in town which affects water supply consumption are:

**Administration issues:** administration issues caused by ineffective association structure, less numbers of workers in offices, low income for worker regard to their professional and absence of workers encouragement and failure of water supply and sewerage office to keep skilled and experience workers is the major requirement to services the community of town properly.

**Absence of institutional coordination:** Major associates in Injibara town water supply exercises have no planned linkages among the Regional water resources, mine and energy development office, town water board members, CBO, community, governmental and non-governmental office for specialized help and implementing developments of water works and also various experts are not joined in Board but individuals misuse their specialized learning.

**Inadequate financial plan and funds:** Delivery of urban water supply requires a huge range of investments. Absence of adequate funding has constrained the amount of water supply systems of WSS office. Even though, the present price of study town WSS office is not cover the costs of instruments and recovery costs to supplied good quantity and quality of water consumption satisfies the current required demands of the town community,

because there are no any funds to support this office to solve the challenges from different parts of water supply components of town water supply systems.

**Absence of capability:** deficiency of skillful labor is the basic issue looked by the WSS office. This limitation the good managements of different workers and materials of water supply and also to distribute water properly and planned for all community of town.

## CONCLUSION

Domestic water supply is the most important for individual and total town communities to develop by using water direct or indirect by different means, therefore water is the most significant for all living things to live on land, next to air.

In Injibara town the access of improved domestic water supply is not adequate in both quantity and quality for all town communities through the year.

Majority of the town communities use daily domestic water supply from unsafe and unprotected alternatives water sources to fulfill their daily need water demand from far distance almost 85.8% of total town communities.

The current demand and supply of domestic water supply is not balancing with numbers of town population, which is only 28.6%, because the numbers of population are increasing rapidly time to time without any types of gap (i.e there is not controls or reduction of numbers of population) by both natural and migration in studying town. Due to this reason most community cannot use the piped water supply, from 13601 total households only 5223 using the piped water supply in town but these households cannot get every day the piped water, which is 38.4% only.

The water tariff setting is unfair for all communities of town before and after connect pipelines. It is high prices, especially for low income levels communities. This is one major factor to limit the daily water consumption of community in past and present time, because the majority of community cannot cover this high cost.

In studying area there is not interaction of water supply and sanitation services, which is 20% only because there are not adequate quantities of water supply in town. This causes a number of waters borne and water related diseases, which are Amoeba, Giardia, Typhoid and Malaria through the year and indirect affects their time, energy, money and their productivities due to collecting daily water supply from alternative sources. Especially affect the women and children because 95% of daily water consumption is looking and collecting by them.

The coordination and participation of the town community, community-based organization, government organization, NGO and private institution with town WSS office is very low to identify the problem of existing water supply and solve easily and to improve the better adequate and safe water supply for future time for all communities of town.

Therefore, the existing water supply has multidimensional challenges and root causes of inadequate or insufficient quantity and quality water every day at past and present time through the year. These problems are lack of adequate sources, demand or consumption, unfair distribution system of network, lack of capacity of money and fund, unfair taxes, rapid growth rate of population, loss of water by leakage, lack of power to pump, lack of coordination and participation and lack of awareness of population about the aim of water supply for their life and developments of each community and the town by different means using water by direct or indirect and also developments of as whole country. This affects the total communities of the town and town by direct or indirect as well as country. Totally this study concludes as the existing domestic water supply is inadequate for all town communities at current time.

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