

# ASSESSING THE CHALLENGES OF WATER SUPPLY AND CONSUMPTION SYSTEMS OF TORA TOWN, SNNPR, ETHIOPIA

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**Abstract:** Urban water supply and consumption challenges are the widespread problems in most of the developing countries such as Ethiopia. The main focus of the present paper was to assess the challenges of water supply and consumption system in case of Tora town of South Nation Nationalities People Region, Ethiopia. Descriptive survey design was employed to identify the root of the challenges and find the scientific solutions or suggestion to tackle and overcome. Systematic random sampling was used to select household respondents, while purposive sampling was attended for interviewing the key personnel's. The survey work involved collection of feedback in the form of questionnaires from 157Nos town household respondents, interviewing of 6Nos of experts and 8Nos of employees in focus group discussions. The results of the study indicated that, insufficient water source and poor distribution of water infrastructure, lack of technological capacity, Weak sectorial coordination, insufficient financial resource, and shortage of efficient manpower are some of the main undermining root causes. Therefore, taking these challenges into consideration, it was suggested that providing alternative water sources, active involvement of the communities and participation of different actors and other sustainable approaches would prove to be an effective and efficient adaptive measures.

**Keywords:** Urban water supply, Consumption system, Challenges,

## 1.0. Introduction

Water is an essential life sustaining element on earth and is deeply embedded in our cultural backgrounds. Being an integral part of the environment, the range of services that are provided by water, dictate the economic growth and environmental sustainability. The achievement of the millennium development goals depend largely on improved water supply and sanitation in the developing countries (UN World Water Development Report 2006). Water supply is always a challenging task to be tackled with and there exists various factors which keep on posing challenges both in the rural and urban areas. Provision of urban water supply systems has been a major concern in many of the developed and the developing countries. In contrast to this, the aspect of providing water was downplayed by the focus on the access provision to water supply. Hence, the understanding of this integration and interrelation provides a better consideration of the importance on the universal provisions of providing water supply. The economic progress of towns and the health of people will be highly affected by the amounts of potable water supplied towards the basic urban service amenities.

Ethiopia is one of the member countries that have adopted the Millennium Development Goals (MDG) declarations with its main objective towards poverty reduction (UNDP, 2008). As a part of the Universal Access Program (UAP), the water supply and sanitation program was ratified by the Ethiopian Parliament in 2005. This initiatives laid the framework for planning the Water Sanitation and Hygiene measures (WASH). The MDG target was to attain 70% of National Potable Water Access in 2015 whereas, the UAP national targets was to attain 98% of Rural Potable Water Access within 1.5Kms (15Liters/Capita/Day) and 100% of Urban Potable Water Access within 0.5Km (20Liters/Capita/Day) by the end of 2012 (MoWR, 2006). Early research works concluded that access to water in terms of quality and quantity for domestic needs are the indicators for poverty alleviation.

Rapid urbanization in Ethiopia is leading to overcrowding, development of slums and informal settlements. They in turn inhibit the increase in the nature of challenges that hamper effective urban water supply and consumption systems. Growing population will further increase the demand for water. The limited cost-effective water supply augmentation options, lack of reliable estimates to forecast residential

water demands, water source choice decisions and several other factors; are becoming more important for policy making in the water supply sector. Policies aimed at reducing water consumption are debating about the effectiveness of using Price and Non-Price methods in water supply systems. Several years of planning and huge capital investments are essential for ensuring effective supply augmentation. In light of these ever increasing challenges, various governments are adopting different kinds of strategies, so as to promote water conservation, particularly with residential consumers. Challenges of urban water supply are increasingly becoming a big problem in many cities of Ethiopia and the situation of **Tora Town** of South Nation Nationalities people Region (**SNNPR**) is no exception.

Sound knowledge about the Availability of sources, Treatment facilities, Supply systems, Distribution mechanisms, Demands and Consumption systems is very much important in studies pertaining to water supply. This attempt identifies the root causes and the major challenges of water supply and consumption systems. The studies conducted at national level, indicated that the challenges of water supply varied from place to place based on residence and consumption. There were no previous studies done in Tora town in this regard. Therefore, the present study was intended to assess the magnitude of water supply and its consumption system. The challenges that are being faced by the community of the town and service providers will be addressed. The research would bridge the existing research gap and helps to plan or replicate the findings for sustainable development of urban water supply and consumption system in other parts of the country.

1.1. Objectives of the Study : The general objective of this study is intended to identify the underlying factors which are hindering the effectiveness of water supply and consumption system in the Tora town, so as to provide valuable information about the challenges that are existing in the reality scenario. This would be beneficial to have a better understanding of the severity of the situation and enable for a well-planned sustainable measures.

The specific objectives are listed below;

- To identify the challenges of water supply and consumption systems.
- To determine the average water consumption of the town households/ residents (Liters / Capital/Day)
- To assess the extent of accessibility, quality, adequacy and availability of water supply.
- To examine the feasibility of water tariff charge in relation to the living standard of the residents.

1.2. Description of the Study Area: The Tora town was established in 1957; situated at a distance of about 195Kms south of the Ethiopian capital, Addis Ababa, and located in the SNNPR(South Nation Nationalities People Region), at 7°51'42" Latitude North and Longitude 38°25'18" East. The altitude of the town is about 1990mts above mean sea level, with a total area of 5,520,000m<sup>2</sup>, and the average annual rainfall and mean temperature range between 450-800 mm and 20OC respectively. According to Central Statistics Agency (CSA 2007) census of the South Nation Nationalities Region finance and Economic Bureau, the total population of the town is about 13,794 out of which 7, 473Nos and 6,321Nos are males and females respectively. Among the total population, the town households are about 3,362Nos (Tora Municipal, 2016).

The only main source of water for domestic purposes is deep ground water, and the other sources of water are seasonal and include ponds, rivers that dry up in the dry season. The Tora town is divided into two urban kebeles and four rural kebeles, and further the urban kebeles are divided into 8 wide villages (ketans). Among the villages, only 4 villages at the center of the town have stretched water pipelines but the supply of water is frequently interrupted, and the supply is in shifts once in 3-4 days. The remaining villages have insufficient water pipelines and residents carry water from public taps for domestic use. There exists one pumping station that draws the deep ground water into two tankers of volume 98.13m<sup>3</sup> each (town water supply office report, 2016). The Map showing the study area is furnished in Fig 1 below;

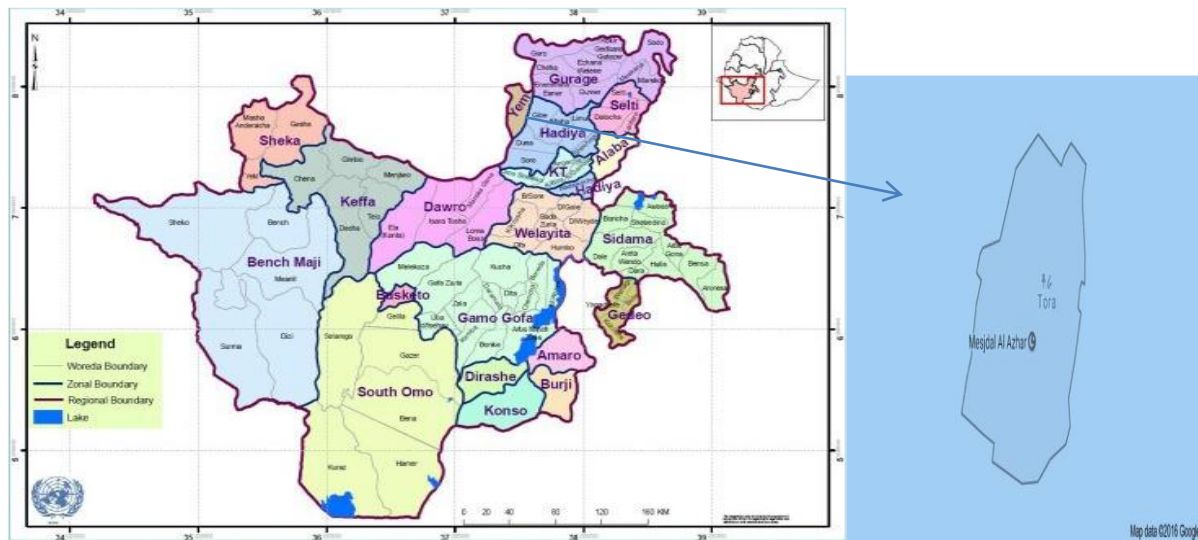


Fig 1: Figure showing the location of the Study area, Tora Town of SNNPR, Ethiopia

## 2.0 Literature Review

In Africa, about 85% of the water is used in agriculture, about 10% was utilized in households and only 5% is used for industrial purposes. For meeting the food demands of the growing population, more and more water is required for agriculture. The majority of the rural Africans on an average have only 30-40Liters of water per day for their domestic utilization. On the contrary, the average U.S. customer utilizes about 700Liters of water for each day. Scientists consider a country to be facing water shortages, when the quantum of water obtainable per person per year in Africa countries is less than 1,000 cubic meters. The water-related human morbidity and mortality, resulting from the broad divergent levels of both water quality and quantity, are widespread and almost 80% of the global population faces the danger levels of water insecurity.

As stated by WHO & UNICEF (2008) the world's population is projected to expand to nine billion people by 2050. It was approximated that 90% of the additional 3billion people will be living in various developing countries, which are already experiencing severe water scarcity. Approximations demonstrated that by 2030, 75 to 250million people in Africa only would be experiencing water shortage. Millennium Development Goal-VII aims to raise access to secure water, in order to achieve this, water supplies should reach an included 1.5billion people by 2015. Some notable achievement in the MDG were, the increase of population from 4.1billion in 1990 to 5.3billion in 2004 with access to water from improved sources.

Mushir (2012) carried out studies on water supply and consumption relating to home functions, in Nekemate Town, Ethiopia. In this investigation, it was found that the economic backwardness and topographical features of the land determined the supply of water for consumption in the study area. The study revealed that amount of income; working conditions and education were indicators and influenced the water consumption in the town. Mekonnen and R. Uttama (2014) studied on the assessment of potable water supply in Awaday town, Ethiopia. The study indicated that, inadequate water supply, poor standards and absence of correct allocation were caused due to high interruptions in electric power supply and administration problems. In this study, it was felt that, the causes and effects of water interruptions were necessary for a better understanding. Hence questions were posed to get the information about this issue.

Kebede (2015) studied on the urban water supply system in Hosanna town, Ethiopia. The objective of this study was to assess the household water supply problems by using descriptive survey research design. The results showed that the major factors attributed to lower supply of water were, shortage of water provision, high cost of piped water connection, rapid population growth, frequent interruption and lack of narrowing gap between communities. It was concluded that majority of the dwellers preferred to use alternative sources, which have seriously contributed to water supply problems. YehualaMinwuye (2015) conducted studies on assessing the potable water supply and distribution problems in Rebugebeya town, Ethiopia. In his study, he highlighted that the source of water supply was crucial in affecting the various

water requirement experiences of the respondents. The information regarding the various sources of water, availability of the sources within the residence compound of the respondents, alternate sources, distance of source and other important details were exclusively studied in this study.

### 3.0 Methodology and Data sources

Descriptive Survey Research Design was adopted to investigate challenges of urban water supply and consumption system in the study area. It was proved in earlier research studies that, this approach is economical in obtaining information from wider areas and large population, time efficient and inferences could be easily drawn. In the study data collection instruments like questionnaires, interviews, field observations and focus group discussions were adopted. The approach would be to collect, extract, and process and analyze the information obtained from the Town Residents, Water Supply Service Office Heads, Experts/Employees, Technician, Municipal Heads /Mayor, Employees and the two Kebeles Chairmen. Since the population size was less than 10000, Kothari formula was used to evaluate the sampling size, and it was calculated as 159Nos households from a total of 3362Nos households of the two Kebeles. The sample size of 159Nos households were selected by systematic random sampling from the two Kebeles and shared of households respondents based on proportionality of household size in each Kebele is determined by Bhan (1989) cited in Birhane (2010).

In the present study, the researcher used the two major sources of data, which include Primary and the Secondary data. The primary sources of data for this study were gathered from the resident, experts and key persons through questionnaire, interview and focus group discussion. The observations noted during the field investigation also contributed to the primary data, whereas information gathered from the study of documents, reports, periodicals, journals, etc., which were literature written by different knowledgeable scholars contributed the secondary sources.

### 4.0 Data Analysis:

To evaluate the correctness of the assessment, it is important to construct reliable and valid questionnaires. In the present study, prior to the actual starting of the data collection, a pilot study was conducted to assess the effectiveness, clarity of the questions and reliability of the questionnaire. The pilot test was made using seven individuals from the study area, the suggestions were incorporated, necessary modifications were incorporated in the questionnaire and contained both closed and open ended questions (38Nos). The final set of questions framed for the questionnaire was effective in addressing the research questions and objectives. Alternatively, the effectiveness was checked by using the Cronbach alpha for the questions relating to Water sources and its distribution, Water consumption, Accessibility (cost, distance, time), Availability and tariff, Water quality and Challenges. And the alpha value was found to be 0.729, 0.752, 0.750 and 0.736 respectively, which indicated a higher value thereby the reliability was significant.

Amharic is the working language of the study area, so the questionnaires, interview and focus group discussion guides were translated into the Amharic language. This helped the respondents for easy understanding of the questions and give reliable information in a proper manner. On the other hand, the views of an experienced professional in the field of water supply and consumption system, on the tools to be used in the study were taken so as to ensure their validity.

In the current study total 159Nos questionnaires were administered to the household respondents of the town. Out of the 159Nos questionnaires distributed, 157Nos were returned back from the respondents in a proper way; which contributed to 98.7% response rate. In the interview study, 6Nos respondents composing of officials from the Municipal and Water office, Water Technicians and Kebele Chairmen were interviewed and four types of questions were posed to them in the study. In the Focus Group Discussion study, from the Water Office and Municipal Experts 8Nos respondents were selected and valuable information was gathered from them

In the study, the researcher used quantitative and qualitative approaches of data analysis. The data were collected by survey, closed-ended and opened-ended questionnaire, semi- structured interview, focus group discussion and field observations. The analysis of the sample respondents of survey questionnaires and other quantitative data were analyzed by the Statistical Package for Social Studies (SPSS.20) and Microsoft Excels 2007. In the study the dependent variable and independent variables were water supply,

consumption system and challenges in Tora town respectively. The researcher analyzed the relationship between the variables by means, standard deviations and correlation coefficients.

### 5.0 Results and Discussions

**5.1 Demographic details of the respondents:** The study was conducted for 157Nos household respondents in two Kebeles (K1-88Nos and K2-69Nos);121Nos (77.1%) and 36Nos (22.9%) were the male and female respondents respectively. Understanding of various technical and social aspects of the present study, it is required that the respondents were aware and having sound knowledge of the present situations in the study area. Hence, the respondents with age of 18years and above were chosen and questions relating to their duration residence in the study area, occupation and family size were inquired. The age wise, duration of residence and occupation distribution were indicated below in respective figures. Since the majority of the participants were between 30-40years and most of them were residing for more than 10 years, the information obtained was highly informative.

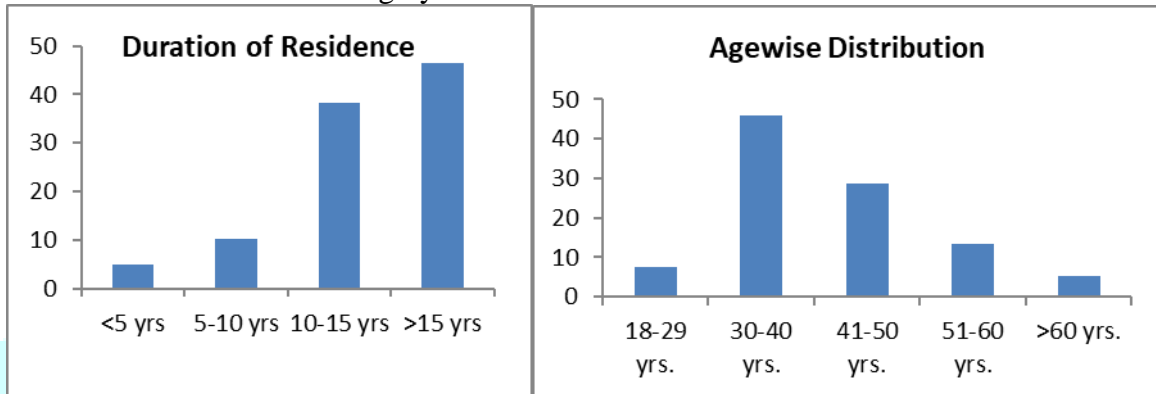


Fig 2 : Figure showing the demographic details of respondents

**5.2 Water Sources and Distribution System in the Town:** The information regarding the various sources of water, availability of the sources within the residence compound of the respondents, alternate sources, distance of source and other important details were exclusively studied in this study. It was felt that, the causes and effects of water interruptions and their frequencies were also necessary for a better understanding, hence questions were posed to get the information about this issue. The survey result showed that from the total sampled respondents, 30Nos (19.1%) were having their sources of water within their compound and the rest 127Nos (80.9%) do not have water source in their compound. This signifies that, the majority of them do not have their water source in their compound and largely depend the public taps and shared sources for their survival. It is also to be noted that the households which were unable to get private meter connection or private tap, were forced to depend and use the alternative water supply sources.

With regards to the frequencies in interruptions, it was reported that out of the total respondents, about 3Nos (1.9%) were getting water tap water regularly on a daily basis, about 47Nos (29.9%) and 76Nos (48.4%) of the sampled respondents were getting tap water once in 2 to 3days and 4 to 5days in a week respectively. Among the remaining about 18Nos (11.5%) of them were accessing tap water only once in 6 to 7days per week and 13Nos (8.3%) of respondents have reported that they hardly would have chance for tap water may be only once in more than a week duration. These problems were more severe in the summer seasons, mostly girls and women spend more time standing in long queues and at times fetching water from long distances. Due to this, the school absenteeism of female child is severe and health related problem due to water scarcity are high.

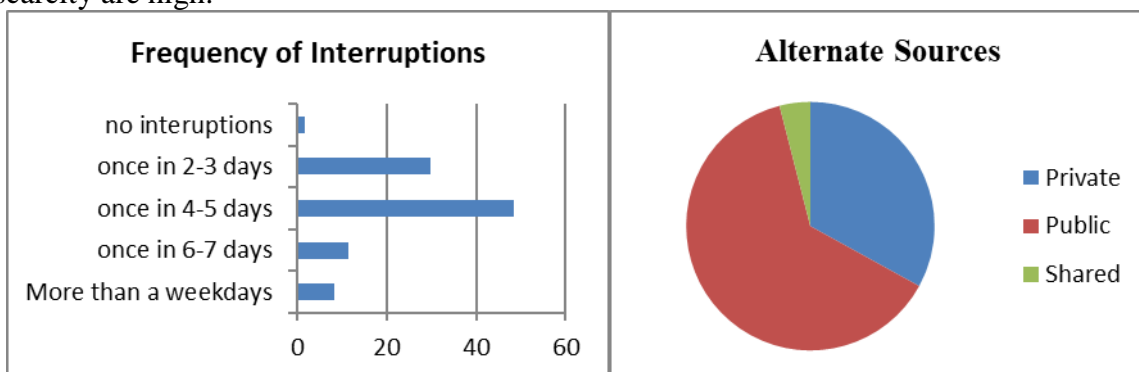


Fig 3 : Figure showing the frequencies of interruptions and alternate sources

When inquired about the interruptions and related problems, among the respondents about 6Nos (3.8%) of the survey respondents said that they were getting taped water regularly from water sources; whereas the remaining 151Nos (96.2%) of them identified the interruptions of water supply in the town. During the interruptions, the respondents faced problems due to water shortage and scarcity, and were forced to buy water from commercial sources. The percentage-wise breakup of various commercial sources is, 54Nos (34.4%) from other Private pipe, 83Nos (52.9%) from Public Bonos and 20Nos (12.7%) of respondents were buying water from other areas of the neighbor town for their domestic requirements respectively. It is noteworthy, to state that, the quantity of water that is being supplied to the town, did not match the demands of the residents, and serious water scarcity is prevailing whereby the residents are forced to buy from other sources.

**5.3 Consumption related issues:** According to available reports of SNNPR, the family size of urban households is 3.9Nos but in this research study, the average family size of the households was found to be 4.4Nos and the evaluated average daily consumption of water per household per day is 53.8Liters and per person per day was 12.24Liters. The average water consumption of the respondents per day in liters was investigated, and it was found that about 42Nos (26.8%) consumed less than 30Liters, 75Nos (47.8%) between 30-70Liters, 22Nos (14.0%) and 12Nos (7.6%) of households were between 71 to100Liters and 101 to 130Liters respectively. The remaining 6Nos (3.8%) of them on an average were consumed more than 130Liters every day. The data indicated that majority of respondents used water between 30 to 70Liters per day on average. This was compared with the National Minimum Daily water requirements of 20Liters/Person/day, and it indicated that the water consumption level was very low relative to the amount of water required per each individual for home consumption per day.

**5.4 Travel distances and Time durations:** The World Health Organization (2004) indicated that basic indicators for water accessibility include; Optimal access (water supply through taps continuously), Intermediate access (water supplied through multiple taps continuously within less than 100m distance travel and within 5 minutes), Basic access (between 100m and 1000m distance and 5-30 minutes time) and No access (more than 1000m distance travel and more than 30 minutes time). They reflect the extent to which the accessibility challenges time, distance and affordability. In this study, the respondents were asked about the distances and time taken for fetching water to for household consumption of the family. The investigation facts explained by the respondent indicated that the travel distance required for fetching water for 19Nos (12.1%) and 17Nos (10.8%) was less than 4mts and within 100mts respectively. For the remaining 39Nos (24.8%) and 82Nos (52.2%), it was found to be between 100to1000mts and above 1000mts respectively.

**5.5 Monthly income and expenditure scenario:** The monthly income and the expenditure towards water, education and health were studied to investigate the financial strength and the living conditions of the respondents. The ranges of monthly income of the respondents were studied under five classes ranging from below 1000 Birr to above 4000 Birr. From the data, it was observed that 47Nos (29.9%) of them were having their average monthly income below 1000 Birr. The monthly incomes of 61Nos (38.9%) was between 1000 and 2000 Birr, 23Nos (14.6%) was between 2001 and 3000 Birr, 15Nos (9.6%) was between 3001 and 4000 birr and 11Nos (7%) was getting monthly earnings of more than 4000 Birr respectively. The monthly expenditures are shown in the figure below; which shows that, majority of the respondents are earning meager incomes and are spending considerable amounts towards water. Due to the constraints on water consumptions, they are in turn paying huge loss to cope up with the health related issues such as, kidney problems, poor hygiene and others. It is very important to note that in spite of higher usage, the respondents with higher income are spending fewer amounts towards water, due to nonexistence of slabs in the tariff charges. This indicated an inequality in terms of economy and signified the key area with a need to levy charges based on usage.

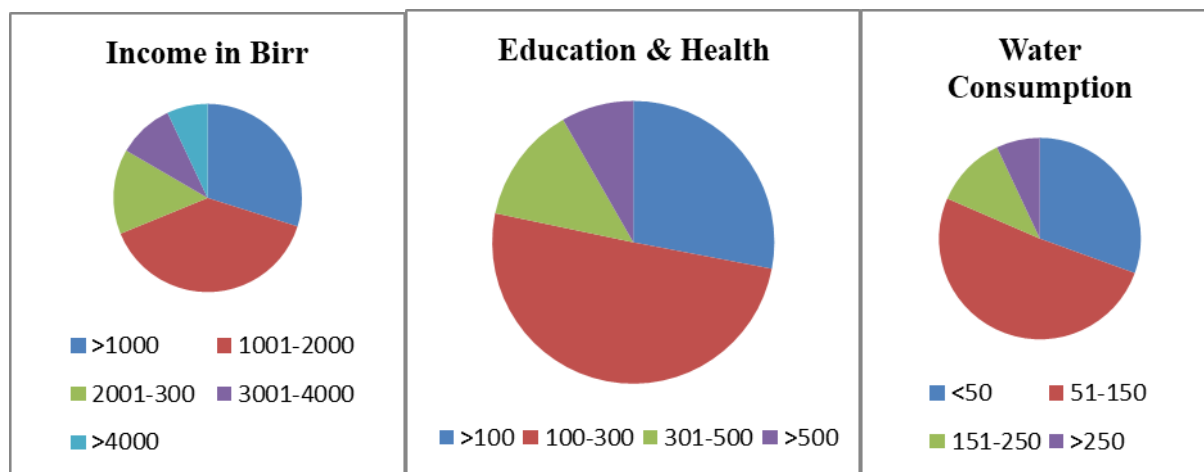


Fig 4 : Figure showing the Income and expenditure details of respondents

**5.6 Rating of the satisfaction levels:** The respondents were asked to rate the levels of their satisfaction with regards to the reasons contributing to the existence of the challenges within the system and the details are furnished below;

Tab 1 : Table showing the Rating levels of respondents

Variable	Items(cases)	Percentage				
		5 =strongly agree	4= Agree	3= Uncertain	2= Disagree	1= strongly disagree
Concerning the challenges that are being faced relating to the water supply and consumption system of the town	1.Increase in the number of dwellers	81.5%	12.7%	1.9%	2.5%	1.3%
	2.Insufficient water source and poor distribution of water infrastructure	77.7%	16.6%	1.9%	1.3%	2.5%
	3.Lack of community participation	54.8%	35.7%	4.5%	3.2%	1.9%
	4.Lack of technological capacity	48.4%	46.5%	1.9%	1.9%	1.3%
	5.Weak sector coordination	63.1%	28.0%	3.8%	2.5%	2.5%
	6.Insufficient financial resource	45.9%	42.7%	5.1%	3.2%	3.2%
	7.Shortage of pipe lines and maintenance problems	74.5%	17.8%	3.2%	2.5%	1.9%
	8.Lack of technical skills to handle equipment's such as pumps, pipes on the operators part	49.7%	41.4%	3.2%	1.9%	3.8%
	9.Electric power cut	82.2%	10.8%	4.5%	1.9%	1.3%
	10.Lack of enough pressure in the system	66.2%	26.8%	1.3%	2.5%	3.2%
	11.Landscape /topography	66.9%	24.2%	3.8%	3.2%	1.9%

**5.3. Recommendations:** Based on the present study survey findings certain noteworthy suggestions were made, they include;

- The average daily consumptions were very less, when compared with the international or national standard benchmark for water utilization different domestic purposes. There is a massive gap between demand and supply with regard to water consumption of the dwellers.
- These challenges identified are affecting the economic and social development of the residents.
- Continuous water interruptions, low pressure and insufficiencies are present in the town water supply system. The water supply system of the town is rendering unequal distributions among the residents of the town, which was a common cause for complaints from the community.

- Since most of the residents are low income people, and are spending major portion of their income towards water and health related issues. A feasible slab system must be encouraged, so that the user will have to pay based on the water consumption and income levels.
- The town has very low availability and accessibility of water provision which is not enough to cater the needs. The town water supply service office should find other potential alternative water sources which are supported by planned project to improve the water demand of the society.
- The efforts made by the local government of Tora town could not turn to reality due to the lack of active participation of the people at various levels. The water supply service office should actively involve and collaborate with the people, private sectors, and NGOs to improve the current water demand of the dwellers of the town is very much essential.
- Integration with different sectors helps in sharing ideas and experiences to solve the problems of water supply system that are being faced on the dwellers in the town.

According to Water Sanitation and Hygiene program, (WaSH) of the Unicef, access to safe drinking water and sanitation is the basic right of any individual. Hence necessary measures must be ensured by the governments to provide access to drinking water. There is a huge need to conduct similar studies to investigate the challenges that are being faced in developing countries and sustainable approaches are to be taken to supply adequate water for all.

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