



Full Length Research Paper

Problems and Challenges of Household Potable Water Supply: A Case Study of Durbete Town in Amhara National Regional State of Ethiopia

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Abstract

Durbete town has been experiencing potable water supply problems even if the modern water supply system was launched since 1973. Therefore, this study was focused on potable water supply problems and its challenges in the town. A total of 200 participants from two kebeles were used for questionnaire and interview. A survey questioner was conducted with 192 samples households (HHs). Complementary to this, unstructured interview were conducted with 8 participants. The respondents used for interview were Durebeta town water & sewage service experts, municipal experts, kebele leaders, school principals, Educational office & Health center directors. The finding of this study revealed that the town water supply and sewage service was not covered their demand. Currently, the coverage of potable water supply is 79%. From this, 92.4% HHs are used public stand water pipe and 7.8% of them have a private water pipe. In line with this, 90.5% of the respondents confirmed that the major factors affecting the supply of potable water are financial, technical, absence of water pipe master plan, time limitation and time spent due to keeping their order to fetch water, intermittent of electric power supply, size of water reservoir installed in the town and pipe leakage which results irregular flow of water. Moreover, the alternative water sources (wells, springs and streams) are minimized in dry season. Therefore, the water bureau collaborated with NGOs, zonal and woreda offices should installed additional reservoirs to enhance the number of private water pipe owners & allocate sufficient budget for maintenance.

Keyword: Potable Water supply, socio-economics of households

Introduction

Ethiopia is one of the member countries that adopted the millennium development declaration with its main objective of poverty reduction (UNDP, 2008). This resulted in prioritizing accessibility to improved water supply. Prior research has revealed that access to clean water, sanitation and hygiene are the significant elements for poverty alleviation (Water Aid (2009). Water is crucial for human survival and economic development. The provision of adequate potable water supply in urban areas is essential for life. In relation to this, Alebel (2004) and Churchill (1987) mentioned that in developing countries the provision of adequate potable water in addition to drinking and cleaning improves health by reducing incidence of water related illnesses such as diarrhea, cholera and the like. This also helps to reduce both the mortality and morbidity rates and the number of working days lost hence increases the growth of domestic production. Reducing the incidence of illness will help to slash demand for improved medicine and eases balance of payment problem facing least developing countries. Therefore, safe, adequate and accessible supplies of water together with proper sanitation are unquestionably basic needs and essential components of primary health care (Ministry of Water Resources, 2011). Sufficient potable water supply is one of the basic urban services that have positive impact in human health and their economic progress. However, many urban centers in Ethiopia is facing serious problem of water supply. This problem is worst and multidimensional in Amhara National Regional State (ANRS) of Ethiopia.

Durbete town is one of the towns in ANRS of Ethiopia that has been experiencing problem of adequate water supply for individual HHs. According to the data obtained from town water supply and sewage service office, 92.2% of HHs were obtained their water need from public stand pipes for drinking and fetch water from streams, springs and traditional wells for cooking, cleaning and washing purpose due to insufficient supply of potable water whereas the remaining 7.8% of the HHs have a private pipe water supply. From these sources, springs and streams were located an average distance of 1.5km from their residence for a single trip. However, the study area has potential sources of water supply from rain, river, springs and ground water to supply as drinkable water for the HHs.

Lack of access to safe and clean water is locked in the heart of the poverty. Even though the issue of water is observed as a general problem for both urban and rural population, women bear the greatest burden because of their social gender roles including collecting water for their households (Rose A.D, 2009). Because of their task of water provision at the households, women and children suffer from disease, have limited participation in education and both income generating activities and engagement in cultural and political issues are often compromised. Most of the urban community meets their water demand from stream, spring and traditional wells. This is because a rapid and steady growth of population in and around the town has aggravated the problems of accessing proper and timely water supply in the town. The look of various governmental, non-governmental and private institutions raising the demand of water services in the study area. The problem of using traditional well water is that they are often located close to toilet pits not more than 5 meters. Hence, the exposures of the water to be contaminated by toilet waste are very high. Moreover, the problem of water supply in

the town is not only the problem of adequacy and quality but also it has the problem of distribution and reliability. Water supply is intermittent; particularly during dry seasons and shortage of electric power supply. Moreover, the distribution of water is a time limited from morning 12 to 1 Ethiopian local time.

Even if the coverage of potable water in the town is 79% in 2013/2014, only 1520(7.8%) of the households in the town had access to individual piped water supply and the majority about 18480(92.2%) HHs used common public stand piped water supply for drinking and unprotected hand dung wells, springs, and streams for cooking, cleaning and washing purpose (Durbete town water supply and sewage service report, 2014). However, there is no any work which has been conducted by different organizations and individual researchers before to fill these gaps in terms of population and quality of water supply in Durbete town. Therefore, the main objective of this study is to examine the problem of potable water supply for households, way of distribution, quality and challenges that hamper the provision of adequate water supplies in the town. In order to address the main objective of the study, the researcher was guided by the following research questions.

- a. What are the major constraints & challenges of Durbete town potable water supplies?
- b. How much is the extent of water demand and supply in the town in connection with adequacy, quality and sustainability?
- c. What are the sources and coverage of potable water supply in the town?
- d. Do technical, financial and organizational capacities affect the water supply service delivery in the study area?

Materials and Methods

Data Source and Gathering Techniques

The data source used in this study includes both primary and secondary. Primary data sources are selected sample households, key informants (Durebeta town water & sewage service experts, municipal experts & kebele leaders) and governmental institution leaders such as school(primary, secondary, preparatory), educational office & health center/station directors. While secondary data sources include books, annual reports, journals, periodicals and other official documents of relevant quality. In addition to these, personal observation by the researcher was used in enriching the data used in the study.

Different data gathering instruments were employed in order to collect necessary data for this study. Structured questionnaire, unstructured interview, personal observation and document analysis were the principal means of gathering data used for this study. The base for the preparation of final questionnaire was the pilot survey undertaken including 4 HHs from the two kebeles by taking 2 HHs from each kebele. The pre-testing of the questionnaire helped in the administration and implementation of the actual survey and in restructuring the questionnaire format and content. The questionnaire included both open-ended and closed-ended questions were administered by sample HHs. Complementary to the sample HHs, unstructured interview was conducted with key informants (Durebeta administrative town water & sewerage service professional experts, town municipal experts & kebele leaders) and governmental institution leaders such as school(primary, secondary, preparatory) & health center/station directors.

Sampling techniques

In Durbete town, there are two kebeles which are named as kebele 01 and 02. The numbers of total HH heads and HH members in the kebeles are about 20000 & 39875 respectively (Durbete town municipal office report, 2014). As a result, sampling technique was introduced to select the target sample population to examine the problem of potable water supply for households and factors that hamper the provision of adequate water supplies at Durbete town in ANRS of Ethiopia to achieve the objective of this research. However, to conduct this research, Primary data was not collected from each and every customer of the service. This is due to finance and time constraints. As a result, the researcher was made to focus on selected households, key informants (Durbete town water & sewerage service professional experts, municipal experts & kebele leaders) and governmental institution leaders such as school(primary, secondary, preparatory), educational office and health center/station directors. Therefore, it is desirable to have a sample to represent the total households of the town hence 192 household heads was used in this study. Simple random sampling technique was used to draw samples from the entire households to provide equal opportunity.

Method of data analysis

To analyze the data which is collected from different sources, both qualitative and quantitative methods was used. From the quantitative methods, the descriptive statistical methods like frequency, percentage and cross tabulation was used in order to come up with the appropriate result. In addition to this, qualitative methods like narration were employed in the study.

Results and Discussion

Demographic Characteristics of Sample Households

From 20,000 HH heads living in Durbete town, 192 respondents have been used in this survey, 142(70%) were females since water problem is foreseeable in female than males and the remaining 50(30 %) were males. The average household size of the sample is nearly 2 and their average age is 35 years. And also education and economy is one of the determinant factors in consumption, management and demand of water (Yekoye, 2010). This is because the consumption of water is directly related to their education level comparing to non educated respondents due to their awareness difference in health and self hygiene.

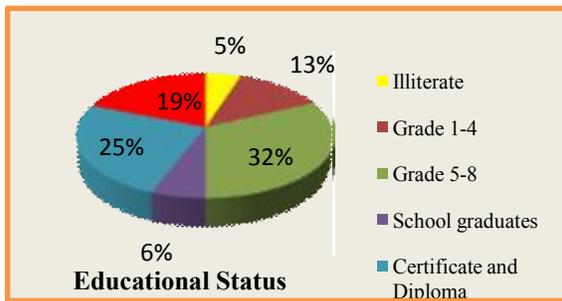


Fig 1: Educational status of the respondents

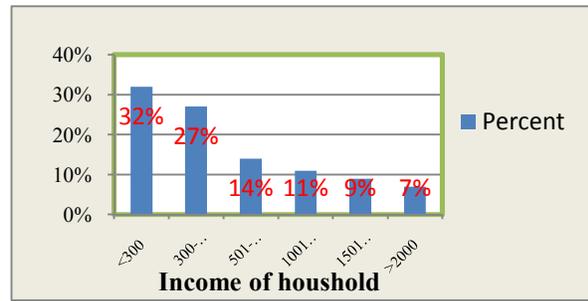


Fig 2: Income of households used in this study

With reference to their educational level 5% are illiterate, 13% are completed from grade 1-4, and 32% are completed from grade 5-8 and 6% are high school graduates. Those who have certificate and diploma constitute 25% and the remaining 19% have first degrees and above. As stated in Figure 2, 32% of the household income was less than 300 Ethiopian birr (ETB), 27% were between 300 and 500 ETB, 14% have 501-1000, 11% have 1001-1500, and 9% have 1501-2000 whereas 7% of them have income greater than 2000ETB. From this data, 75% of the sample households have income below the average while 25% have above the average. As a result, most of the respondents were suffer with potable water sources. Therefore, income source has direct impact on drinkable water access and human health whereas the high level of average income is providing an opportunity for access of potable water better than low income respondents. Because of this, the majority of the households are forced to search another alternative source of water like traditional well, springs and streams that are not certified to use as drinkable water by town water supply and sewage service. Moreover, as the data obtained from different participants shows that the sample households have different occupations such as governmental employees, trader, informal business activities (selling of tela, injera and local arki), daily laborers and farmers. From 192 sample households, 37% are governmental employees, 13% are engaged in different business activities (selling of tela, injera and local arki), and 15% of them are daily laborers whereas the remaining 10% and 25% are farmers and traders respectively.

Sources and Consumption of Water

The average per capita consumption of water in the field surveys was 9.1 liter per day per person. This is below the standard which is from 30to 50 liters per day per person. Therefore, alternative sources of water primarily traditional well, streams and springs are used to satisfy their water demand for washing and cleaning purpose (Table 1). A combination of water sources were used at household level for different purposes. This is because the supply of potable water was not continuous and reliable. Hence, due to shortage of water supply, alternative sources were used to meet their needs. In the town, public stand pipe taps were the major sources for domestic activities followed by traditional well, springs and streams. All sample households used tap water for drinking which account 92.2% from public stand piped and the remaining 7.8% of HHs have private piped water owners. This shows that the time of getting water, the time wastage to keep their order and the distance of public stand water are influence their economic and living system. As a result, most of the household are searching alternative source of water with low cost for cooking, utensil cleaning, bathing, clothe washing, house cleaning, toilet and other purposes.

Table 1: Sources of water and its purpose of the households

Sources of water	For Drinking		For Cooking		For Washing and Cleaning	
	No.	Percent	No.	Percent	No.	Percent
Private tap	15	7.8%	15	7.8%	8	4.2%
Public stand pipe	177	92.2%	50	26%	-	-
Traditional wells	-	-	59	31%	119	62%
Springs and streams	-	-	68	35%	65	33.9%

Source: Survey data, 2014

According to the households response their water sources are different. The water sources for 7.8 % are private taps for drinking and cooking. Among them, 4.2% are also used for washing and cleaning purpose. While 92.2% of the households used public stand pipe water for drinking only whereas their water demand for washing and cleaning satisfied with traditional well which accounts 62% and 31% for cooking purpose. While the remaining 35% of the household for cooking and 33.9% of them for washing and cleaning are used springs and streams. Therefore, the above data indicates that the chronic problems of potable water supply in the town. As the result, the households have faced healthy problems (Basania, M., Ishamb, J. and Reilly, B., 2008).

Potable water sources and means of distribution of Durbete town

Currently, there are two water reservoirs, one of them is 30m depth with pumping rate of 5litter/seconds and the other one is 90m depth with pumping rate of 23litter/second. The existing source of potable water supply for the town is ground water. At this time, both of them are functional, however, the pumping rate of the first pump is decrease from 13litter/second during installation to 5litter/second due to its age since it was constructed in 1973 and the second one is pumped 23litter/second since it is a new pump

constructed since 2011. As it can be understood from the preceding discussion, the production and distribution systems of the town's water supply are generally inefficient and tied up with serious problems. In line with this, information obtained through questionnaire revealed that 92.2% of the respondents are not satisfied by the existing water supply. This implies the demand of the society is not met by the existing supply of water. This is because the first submersible pump installed were decreased the pumping rate capacity due to its oldness. As a result, the amount of water that reaches the inhabitants is not adequate and the existing water supply is characterized by inequitable and inefficient distribution system with time limited. In order to confirm the information obtained from questioner, interviewees were conducted. The result of interview also shows insufficient potable water supply due to population growth, expansion of the town and the limited capacity of the office in terms of technical, financial, materials such as machines, equipments, spare parts and fittings etc. So, most of the inhabitants are using water from nearby springs, streams and traditional hand dug wells. Furthermore, the system of distribution is the most important aspect of water supply in any community. The type and efficiency of water supply system greatly affects the rate of household consumption. However, the respondents were pointed out that the present reservoirs, the rate of meter connection and the spatial distribution of public stand pipes or water points cannot meet the demand of the community. Frequent interruptions in production coupled with limited capacity of reservoirs and unfair distribution of water points on one hand and the growing need on the other hand are ever widening the already existing unbridgeable gap between the demand and supply of water. This unbridgeable gap between demand and supply of water caused different challenges to the community. The first challenge is that shortage of water supply led to poor personal hygiene and environmental sanitation. The second challenge that was encountered by the community is exposure to unprotected water sources that caused water borne and related diseases which in turn penalize the poor for medical costs. The third challenge is this unprotected alternative water sources like a streams and springs except traditional hand-dug wells are found at long distance averagely 2 km for single trip from their home and imposed opportunity costs of time, energy and labor during water collection. The fourth challenge is that intermittent and shortage of water forced the community to buy water from sellers at high costs.

Distribution of Public Tabs

According to the result obtained in this study, more than 65% of the households were unable to get adequate potable water supply due to having low income and limited access of water. This is because the public stand water pipe is functional from Monday to Friday at the morning@12 to 1 local time only and for Saturday and Sunday morning from 2:30 up to 5:30 and afternoon from 8:00 to 10:00. As a result, it is impossible to get drinkable water at any time the household want. During this time the households search alternative water supply sources from traditional hand dug well, springs, and streams with low or free charge. There are a total of 13(7 in 01 and 6 in 02 kebeles) public stand water pipe available for 92.2%(18480) of households. This shows that over 36,900 populations were used 13 public stand (common) water point. From these population, 1422 HHs (2844 people) were used one public stand water points. This shows that how much the challenges are faced the households in the study area.

Cost of accessing potable water supply

In this paper, the cost of clean water supply can be categorized in terms of the amount of money spent, time consumed and distance covered.

Amount of money spent in accessing potable water

Income is a major and prominent influencing factor, which determines household water consumption level and has a direct relationship with water use (Schwartz, J.B. and Johnson, R.W (1992), African Development Fund (2005)). Table 2, indicates the sources of water supplied to households and the amount of money spent as outlined by the respondents. As illustrated in the table, averagely the households spend 60ETB of their income per month in private water pipes, 45ETB of income per month for water from public stand pipes and 6ETB on water from traditional dung well. In the case of springs and streams, it is usually free of charge except the energy and time lost to fetch it. This data shows that the costs of potable water from public stand pipes are less than private water vendors. This may be due to the fact that government stand pipes are subsidized. The private ones are relatively high because the private water vendor might be more profit oriented than for social reasons. It can also be stated that the unit cost of water partly depends on its source.

Time spent in accessing potable water

Table 2 shows the sources of water for households and time spent in accessing water from the various sources. As we can see from this table, households spent less than 10 minutes of their time daily on obtaining water from private pipes and averagely an hour is spent in accessing water from public stand pipes while 0.5 to 1 hour is spent in accessing water from wells and springs respectively because of the advantage of nearness. The finding of this study realized that the time spent by households in accessing water largely depends on the season. For instance, more time is spent in searching for water in the dry season whereas less time is spent in the raining season because rain water serves as a complementary. However, the amount of time spent in accessing water depends on the location of the source of the water. Hence, households that are closely located to water sources spend lesser time in obtaining water as compared to those far away from water sources.

Distance covered in accessing potable water

Table 2 also illustrates the various sources of water as explained by the respondents and the average distance covered in accessing water from these sources. The average distance covered to get water for individual water pipe owners are less than 4 meters whereas

the public stand water pipes are located an average distance of 0.5km since they are often located at free places. From this, one can understand that the households that depend on public stand pipes cover greater distances in order to obtain drinkable water which has a bigger challenge in performing their domestic household tasks. More distance covered means more time consumed in accessing water.

The data obtained from secondary source revealed that the urban water supply and sewage service of Durbete administrative town is the responsible governmental organ for the delivery of water supply service. Moreover, the town water service office is responsible for operation, maintenance and management of the already constructed water supply structures. As described by the office, the major challenges to deliver effective service for the town is shortage of revenue and finance which is indispensable for public services and facilities. Therefore, to resolve this problem the municipality of the town has the duty to budget adequate income and finance for maintenance and expanding the service of potable water supply for the households depending on population growth rate.

Table 2: Cost of clean water supply in terms of money spent, time consumed and distance covered per day

Sources of Water	Average amount of money spent in ETB	Average time spent	Average distance Covered	Nature of Interruption
Private pipe	2.00	< 10 minutes	<4 meter	undetermined interval
Public stand pipe	1.50	1 hour	0.5kms	Daily undetermined interval
Traditional Well	Nearly free	35 minutes	< 200 meters	Seasonal
Springs/streams	Free	1hour	2km	Seasonal

Source: Field Survey, 2014

Parallel to this, 95.8% of the interviewee respondents use potable water from private pipe and public stand pipe for drinking purpose only. However, only 4.2% of the interviewees use tap water for any purpose since they have private pipe water. The reason for this is that the capacity of the reservoir and the submersible water pump rate is not sufficient for the current population. The implication of the above scenario is that since majority of the interviewees depend on pipes, in cases of interruptions such as lights out and pipe leakages on daily, weekly and seasonal bases, supply of water is truncated forcing the people to walk long distances to fetch water from other sources which are mostly not potable. In this case more hours which would have been used in other productive endeavors are used in searching for water hence productivity is reduced. It may also be said that those who get infected as a result of drinking contaminated water do not go to work early and sometimes not at all. Other people who should have gone to work also spend enough of their working hours in catering for the infected persons. Table2 illustrates the various sources of water for the study area and the nature of interruptions that are experienced by households. The study revealed that households that depend on pipes in houses, public stand pipes and pipes in neighbor's house experience undetermined day interval interruptions as a result of electric power supply shortage and pipe leakages while those that depend on wells and springs experience seasonal interruptions. These interruptions are due to rationing as well as power failure and drying up of aquifers respectively.

Water balance in terms of demand and supply

The rapid growth of population makes water demand varies from kebele to kebele. In line with this, the population of the town was 22355 in 2007 and currently 39,875 which shows 78% increment with seven years (Durbete town municipal office, 2014). From this only 1520 households have a private piped potable water access whereas the majority of the households were used public stand pipe water service. Moreover, it works only from Morning 12 to 1 local time from Monday to Friday which makes the problem worse to get water as they need. The data obtained from water supply and sewage service shows that the demand of the population increases from time to time due to the above reasons (Table 3)

Table 3: Potable water supply and demand balance of Durbete town

Years	Demand in metric cub(m ³)	Supply in metric cub(m ³)
2009	51,000	48,007.92
2010	45,557	42,477
2011	80,318.20	64,558
2012	96,331	78,677.6
2013	156441.8	123,589

Source: Durbete water supply and sewage service, 2014

Conclusion

The major sources of water for the households in the study area are individual pipe, public stand pipe, springs, and traditional hand dug well and streams. The finding of this study shows that access to potable water supply is far below than the demand of households due to increasing population, commercial activities and its cost in terms of money and time spent, which significantly hinders the socio-economic development of households. The amount of spent time and distance covered in search of water are the main challenges to use the hours for productive work. Furthermore, the system of distribution is the most important aspect of water supply in any community. The type and efficiency of water supply system greatly affects the rate of household consumption. However, the respondents were pointed out that the present reservoirs, the rate of meter connection and the spatial distribution of public stand pipes or water points cannot meet the demand of the community. Frequent interruptions in production coupled with limited capacity of reservoirs and unfair distribution of water points on one hand and the growing need on the other hand are ever widening the already existing unbridgeable gap between the demand and supply of water. This unbridgeable gap between demand and supply of water caused different challenges to the community. The first challenge is that shortage of water supply led to poor personal hygiene and environmental sanitation. The second challenge that was encountered by the community is exposure to unprotected water sources that caused water borne and related diseases which in turn penalize the poor for medical costs. The third challenge is unprotected alternative water sources like streams and springs except traditional wells are found at long distance averagely 2 km for single trip from their home and imposed opportunity costs of time, energy and labor during water collection. The fourth challenge is that intermittent and shortage of water forced the community to buy water from sellers at high costs.

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