ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

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Assessing Households Willingness to Pay For Improved Water Supply Services in Holeta Town Using Contingent Valuation Method

BY

FEKADU MEGERSA

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Water and Development

APPROVED BY THE BOARD OF EXAMINERS: SIGNATURE

Dr. Belay Simane _____
CENTER HEAD

Dr. Mebruk Mohammed _____
ADVISOR

Dr. Mulugeta Feseha _____
INTERNAL EXAMINER

Abstract

This paper tried to examine and analyze the households' willingness to pay for improved water supply services in urban areas of Ethiopia, Holeta town as a case study. Contingent valuation method was used to examine the determinants of willingness to pay. A total of 141 sample households were interviewed during the survey, together with focus group discussion and key informant interview. The survey result showed that, if the towns water supply office provide improved water supply, more than 80% of households' were willing and able to pay for the service at a price more than a cost recovery tariff rate. Correlation result showed that income of households' and household size were significantly affecting households' willingness to pay.

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Abbreviations

CSA	Central Statistics Authority
CVM	Contingent Valuation Method
CM	Choice Modelling
GDP	Gross Domestic Product
MDG	Millennium Development Goals
MoWR	Ministry of Water Resources
WHO	World Health Organisations
UNDP	United Nations Development Program
UNICEF	United Nations International Children Educational Fund
WTP	Willingness to Pay
WTA	Willingness to accept
TCM	Travel Cost method

Chapter One
Introduction

1.1 Back ground of the study

Millennium Development Goal (MDG) 7 addresses environmental sustainability, with a target 10 of "to halve by 2015 the proportion of people without sustainable access to safe drinking water" (WHO, 2003). This is because of the fact that domestic water supplies are one of the fundamental requirements for human life. Without water, life cannot be sustained beyond a few days and the lack of access to adequate water supplies leads to the spread of disease.

Children bear the greatest health burden associated with poor water supply and sanitation. Diarrhoeal diseases attributed to poor water supply, sanitation and hygiene account for 1.73 million deaths each year and contribute over 54 million disabilities worldwide (WHO, 2003).

Progress towards target 10 contributes significantly to the reduction of child mortality (target 5), major infectious diseases (target 8), maternal health (target 6) and quality of life of slum populations (target 11). It also contributes to gender equality and empowers women, and is linked to school enrolment and attendance, especially of girls (goal 3). Meeting the target would contribute to reducing poverty (target 1) and hunger (target 2) through use of water supply in industry and agriculture, saving productive time in accessing closer water sources and sanitation facilities, and contributing to workforce health.

But when we see the world's coverage as of 2000, it is estimated that one-sixth of humanity (1.1 billion people) lack access to any form of improved water supply within 1 kilometre of their home (WHO and UNICEF, 2000). Lack of access to safe and adequate water supplies contributes to ongoing poverty both through the economic costs of poor health and high proportion of household expenditure on water supplies in many poor communities. This is arising from the need to purchase water and/or time and energy expended in collection. Access to water services forms a key component in the UNDP Human Poverty Index for

developing countries (UNDP, 1999). The problem is more immense in developing countries than others.

When we see the case of Ethiopia, 86.2% of urban population and 53.9% of rural populations have access to clean potable water supply (MoWR, 2008). Relatively there is improvement in recent years, in rural areas of Ethiopia many people are travelling a long distance fetching water, resulting in wasting their productive time. In urban areas of Ethiopia, the service is better when compared with rural areas. But there is the problem with the quantity, quality, sustainability as well as coverage associated with rapid urbanisation in some cities like Holeta town.

The main reason for the urban water supply problem is absence of adequate finance. Most of water supply projects are by their nature requiring a huge capital. Additionally, most people's see water as a free good that is supplied freely. This has its own impact on the sustainability of the project. And in many areas, the revenues gained from charging consumer is unable to cover the cost incurred on it.

So, in order to maintain the sustainability of water projects as well as satisfying the required quantity and quality of water demand, at least there needs to be a cost recovery tariff rate. It is tariff rate at which the revenue gained from the service is fully covered all expenses incurred on water supply.

In order to implement cost recovery for improved water supply in urban areas researching whether the citizens are able and willing to pay for the service is very important. This helps to understand the fundamental value the consumer places on the improved water service, for identifying those groups who are not willing able pay, and to establish a cost recovery tariff rate.

1.2 Statement of the problem

The widespread failures of water supplies in urban areas of Ethiopia have been largely attributed by the cost incurred on water projects such as capital and/or a recurrent cost are too

high. In most urban areas the revenue gained from water supply is unable to cover the cost incurred on it.

Holeta town is one of urban towns in Ethiopia that the revenue gained from water sales is unable to cover the expense incurred on water activities. For example from the year 1999 to 2002 the revenue can cover only 80% of cost incurred. This has hindered the sector from operating in efficient and effective manner. This problem is further aggravated by a rapid population growth in recent years due to its strategic nearness to Addis Ababa.

The town's population was unable to get the required quantity of water in timely manner. In the town peoples are getting water through rationing. The quantity of water the population has consumed as compared with the national per capita water consumption, it is below half of the Ethiopian average. (I.e. Per capita-as per CSA/ m^3 is 32.65 but Holeta towns per capita /m^3 is only 17.8).

In order to satisfy the rapidly growing population of town's water need as well as the required quantity for the existing population, new water projects must be designed as well as the sustainability of existing water projects must be maintained. The capital needed to supply water to the town is too high. This can make the investment on water difficult. The finance required to fill this financial problem can be filled by donors, government, and community itself. But the most sustainable way is cost recovery by consumers/community itself. It is the system that all expenses on water supply can be covered by the revenue gained from sale of water. Water tariff should be at cost recovery rate.

In order to implement cost recovery tariff in urban areas, researching whether the citizens/households' are able and willing to pay is very important. This helps to understand the fundamental value the consumer places on the improved water service so that the price that reflects the ability and willingness to pay of the households for the improved water services, as strategy for cost recovery, can be established. What this paper was trying to answer.

1.3 Objectives of the study

Thus the main objective of the study was to assess the household's willingness and ability to pay for improved water supply services while examining the demand for improved water supply and determinants of willingness to pay. While specific objectives are:

- To examine the demand for improved water supply services
- To identify and estimate the willingness to pay for water supply
- To examine the determinants of Willingness to pay
- To find out the actual ability to pay

1.4 Hypothesis

The following hypothesis were tested during the study

- Income, education level, and age of households' are positively affecting their willingness to pay
- Level of satisfaction with the existing source is negatively affecting households' WTP
- Households' are willing to pay for improved water supply service.
- Households' are able to pay for improved water supply service.

1.5 Scope of the study

The scope of the study is limited to water use only for private connection. The study is also limited to demand side information to water supply problem and on supply side it was including the cost of providing improved water supply only.

1.6 Organization of the paper

This thesis is organised into five chapters. The first chapter deals with the introduction together with justification and objectives of the study. The second chapter discusses literatures on gaining insights about willingness to pay for improved water supply, including contingent valuation concepts, Experiences gained from different parts of the world in as a

basis for comparison. Chapter three deals with back ground of the study area together with the methodology used in research. Chapter four discusses the quantitative and qualitative results of the study. The last chapter, chapter five discusses the main findings which were explored during the study and the recommendation drawn from the study results.

Chapter Two

Literature Review

In this section review of literatures on households' willingness to pay for improved water supply services in urban areas will be presented. In this part concepts such as urban areas, willingness to pay and willingness to accept, contingent valuation method, and literatures or findings on WTP using CVM method will be discussed.

2.1 Urban areas

A definition of urban area differs between countries across the world. Such difference is reflected from their socio economic development. It is difficult to compare countries based on the percentage of urban population since many countries have different definitions of what size population is necessary. The way in which urban areas are defined often has an impact on the development of surveillance and improvement of water supply (Woldemeskel, March 2006). From different definitions of urban area the following are common.

> An urban area is characterized by higher population density and vast human features in comparison to areas surrounding it. Urban areas may be cities, towns or conurbations, but the term is not commonly extended to rural settlements such as villages and hamlets (en.wikipedia.org/wiki/Urban area).

Urban areas are often seen better served by basic services than rural areas. But it is a general truth that urban areas in developed regions and countries get better infrastructures and basic services such as water supply, sanitation, school and so on than in developing regions and countries. On the other hand there are also great differences between urban areas of developing regions and countries depending on the type of settlement, population size, and income and socio economic status of the different urban centres. (Woldemeskel, March 2006)

In Ethiopia, as elsewhere in the world, urban areas in the country differs by the level of urbanisation. The Central Statistical Agency defines urban areas as:

> "an area that can meet the following criteria of Localities greater than 2000 inhabitants, administrative capitals of regions, zones, and woredas, Localities with at least 1000 people doing non-agricultural activities, and / or areas where the administrative official declares the locality to be urban" ((CSA), 2007)

According to 2007 CSA census in Ethiopia, of the estimated 73 million people living in Ethiopia 16% lives in urban areas. Urban areas in Ethiopian differ in size as well as economic activities undertaken in them. There are large urban areas such as Addis Ababa, where a population of more than 3 million are found and more non agricultural activities can be carried out. Whereas there are small urban areas with a population of around 2000 with economic activities such as small trade can be carried out.

When we see the history of establishment of urban areas in Ethiopia, most of them are established through a process of urbanisation. Peoples are migrating from rural areas to urban areas daily in search of a better life. This population pressure puts a burden to services provided by the urban municipality such as water supply. This requires improving the services delivered usually impossible for the municipality because the cost of delivering the service is high. This needs assessing the households' WTP and WTA for improved water supply services, using non market valuation method as discussed in next section.

2.2 Concepts of Willingness and ability to pay

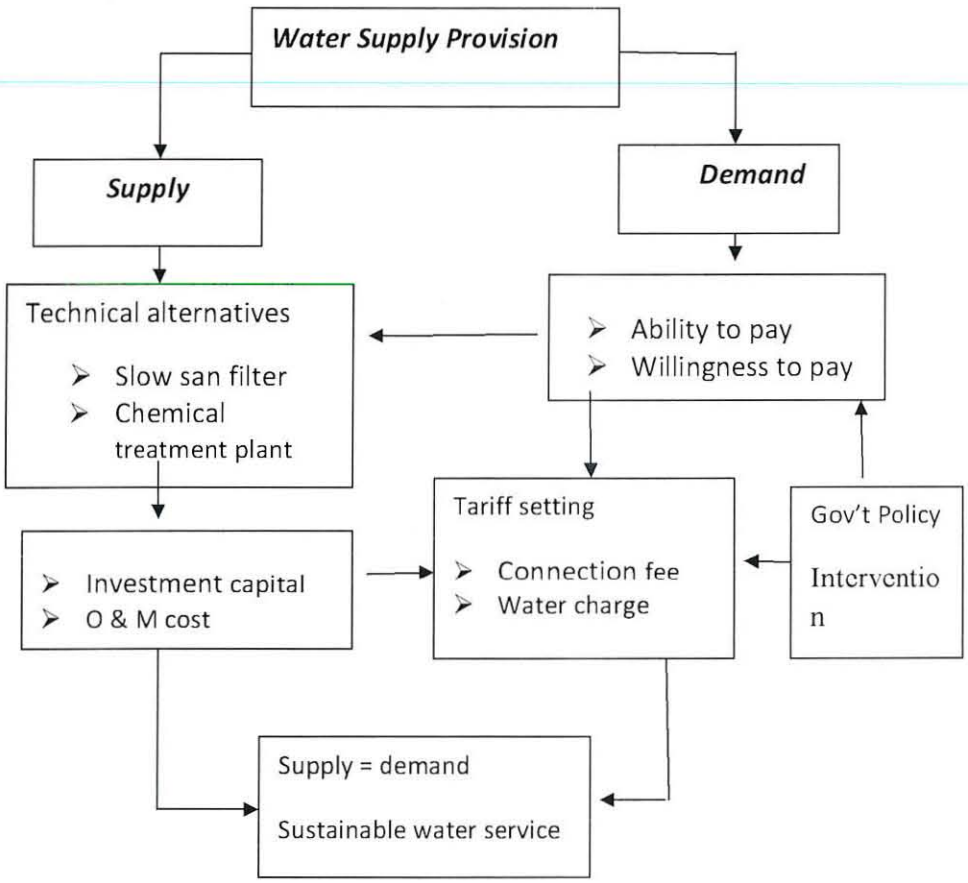
The issue that is most important for water project designers and planners is how to ensure the financial sustainability of a project. This can involve predicting and estimating what users will be willing and able to pay for proposed water schemes in the future. That is because most water projects in developing countries are financially unsustainable leading to water supply shortages in many places.

Policy makers most of the time sees water supply provision using both demand and supply side. As can be seen from the following chart supply side of water provision usually sees

technical alternatives used in water investment. While the demand side of water supply provision sees the households' WTP and ATP as a policy recommendation

Graph 1: the water provision aspect of demand and supply

Supply/Demand and ATP/WTP



Source: (Douangchanh lopaying, 2004)

WTP is the maximum amount individual states they are willing to pay for particular goods or services based its characteristics (e.g. water supply: the difficulty of obtaining it, available sources, water quality and service level) (Douangchanh lopaying, 2004)

It is the amount a person would be "willing to pay" to obtain a good or service. It is what the person is willing to sacrifice to get the good. It is the amount of money a person can give up, receive the good, and have their utility remain the same.

People are willing to pay very high prices for basic minimum water requirements to ensure the survival of household. Consumers are often willing to pay a higher price for water than the tariffs charged. How much higher depends on how much water is being used. WTP diminishes rapidly with non-essential levels of water use, therefore the relationship between WTP and water use can be shown by a downward sloping demand curve (sansoon, 2003)

Another definition is one by Cardone and fonseca states that "Willingness to pay (WTP) is an expression of the demand for a service, and it is strong prerequisite for sustainable cost recovery because it is the materialization of the users' satisfaction and of their desire to contribute its functioning" (Woldemeskel, March 2006). At this time most of water projects revenue is unable to cover the cost incurred on it. So this willingness to pay survey is an important tool wether to state consumers preference to pay at cost recover rate.

Governments in developing countries have often subsidized water supplies, typically in an attempt to achieve social and health benefits for the low-income household which form a large majority of the rural and urban population. The amount an individual is willing to pay to acquire some good or service depends on whether the good or service that is bought and sold (a market good), or it may be one that is not bought or sold (a non-market good) (aers.psu.edu/glossary.seach.cfm)

Generally, WTP refers to the value of a good people are willing to pay, sacrifice or exchange for it. Used in contingent valuation to estimate the value of a nonmarket good, WTP would generally be determined through questionnaires distributed to a representative population asking something like, 'How much would you be willing to pay for a certain improved water supply service'?

In economics, consumer's WTP means the maximum amount that a person would be willing to pay for a service rather than do without it (sansoon, 2003)

Method of determination of WTP

WTP can be estimated indirectly by observing the behavioural pattern of the people and their stated preferences. According to sansoon (2003), there are three ways to estimate WTP

1. Observe the prices that people pay for goods in various markets (i.e. water vending, buying from neighbours, paying local taxes).
2. Observe individual expenditures of money, time, labour, etc. to obtain goods or to avoid their loss. This method might involve an assessment of coping strategies and involves observations, focus group discussions and even a household survey.
3. Ask people directly what they are willing to pay for goods or services in the future.

The first two approaches are based on observations of behaviour and are called Revealed preference techniques. The third technique is based up on stated preferences and includes Contingent valuation methodology as we have discussed earlier.

The valuation of environmental services or policy outcomes can be based on WTP. It is one of the most widely used instruments for measuring environmental quality. CVM study, which has been used in many environmental studies such as water, air, land and the like that is designed to value the quality of this assets can be assesses by their WTP for this environmental services.

The method is usually performed by surveying or interviewing a sample of the concerned population. People are presented with hypothetical situations that ask how much they would be willing to pay for a specified environmental improvement, or how much environmental degradation they would be willing to accept.

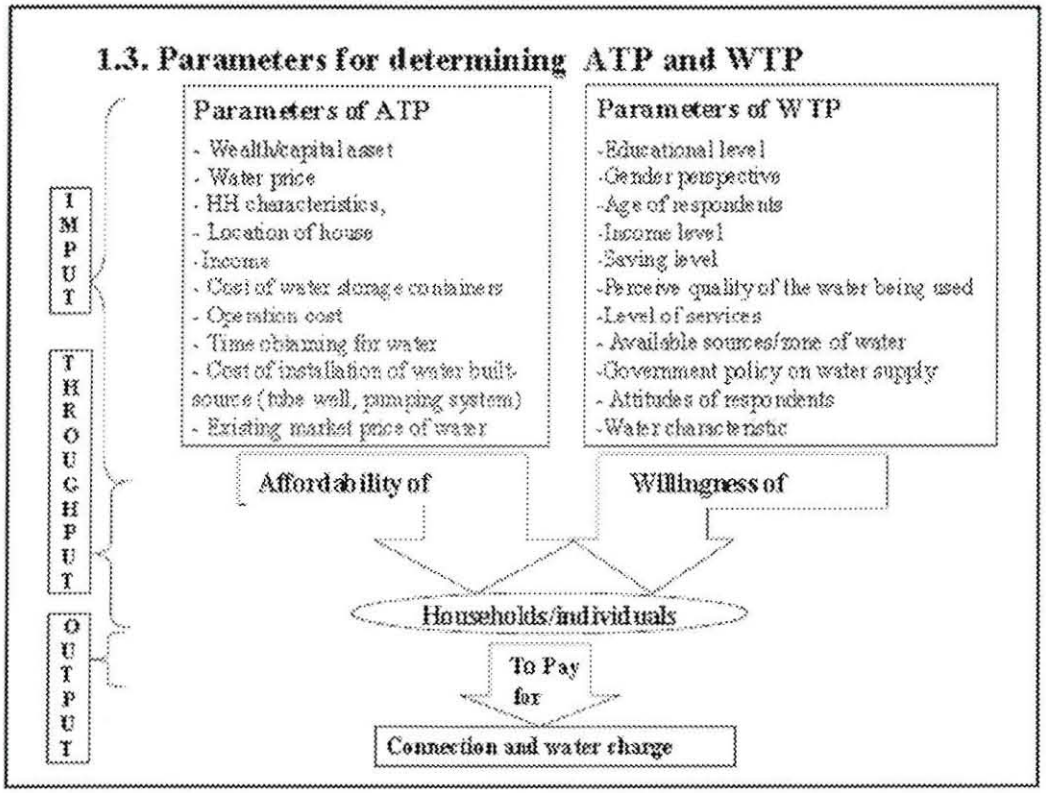
WTA also termed as affordability to pay is the extent to which prices are the financial means of users (Gunatilake.H (2007). It is the amount an individual can be compensated to ensure something bad and have his or her utility remain the same. ATP for water is expressed by the ratio of monthly HH water consumption expenditure, the monthly income and can be

estimated by the cost of existing equipment for water collection and storage, working time for obtaining water and price from existing built sources.

Affordability to pay is one and most important factor influencing households' willingness to pay for the service, other things remain constant. As affordability to pay for water services are high households are more willing to pay for service.

Parameters that are used to determine both Ability to pay and willingness to pay can be described in the following chart

Graph 2: Parameters of determining ATP and WTP



Source: (Douangchanh lopaying, 2004)

From the above chart, parameters used for determining Ability to pay are water price, HH characteristics, Location of the house, income, and the like determinants. While, parameters

such as educational level, gender, income level, level of services and other parameters can be used to determine WTP.

2.3 Economic Valuation

There are many definitions of the word value, but in this study the value of a good is defined as follows:

> "The word Value, it is to be observed, has two different meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys. The one may be called 'value in use'; the other, 'value in exchange'. The things which have the greatest value in use have frequently little or no value in exchange; and, on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it" (hanneman, 2005)

Adam smith, the famous economist, used the comparison between diamond and water to illustrate the difference between two the meaning of value.

Economic valuation deals with the valuation in monetary terms of items that people might care for. It is a method of valuing goods that are not normally traded in market places, such as water, air, recreational services, or preservation of unique places. Unlike ordinary market prices environmental assets have no market price. The history of non market valuation is partly closely related to water projects. Water projects were part of an important motivation for the development of cost benefit analysis in the 1960s in the U.S.

Economists have developed a number of valuation techniques to estimate the value consumer place on public goods. According to Fauzi (2004), there are two groups of economic

valuation techniques for non marketable resources. The first group is valuation technique which relies on implicit price that can reveal WTP through developed model, known as Revealed WTP techniques. Some techniques included in this group are travel cost method, hedonic pricing, the new technique random utility model. The latter is valuation technique based on surveys where WTP is obtained directly from respondent through written or oral interviews. Some popular techniques included in this group are Contingent Valuation Method (CVM) and Discrete Choice Model. Each valuation method has been discussed in the following sub section by introducing their importance and their limitations.

2.3.1 Indirect/Behavioural/ method

This is often referred to as revealed preference method. The most common methods of indirect methods used to value environmental resources are: Travel cost method, Hedonic pricing method, Production function method. These are usually used in a situation where markets for environmental goods or services are absent or not well developed, under which it is hardly possible to value the environmental impacts of a particular project by using the market. (Alebel, (2003)).

2.3.1.1 Travel cost method

TCM is the oldest of the non market valuation techniques. Travel Cost Method (TCM) is derived from a concept developed by Hotteling in 1931 which is formally introduced by Wood and Trice and Clawson and Knetsch (Hartono, 2007). TCM method is also known by the name TCM of recreational demand.

It is widely used to measure the value of water based recreational services such as national parks and fishing. It indirectly measures how people are willing to pay to travel to that site. It utilises the time and travel cost expenses that people are willing to incur to visit a site to hunt, swim, fish, bird watch and the like. For example, when someone wants to visit lake wonchi, there is time and transportation cost incurred when travelling from Addis Ababa to lake wonchi. The cost of travel by visitor is used as a proxy for the price of enjoying the water

service. This method relies on observations of people's behaviour, particularly expenditures for transportation and other trip related expenses incurred when travelling to and from the site of interest.

Basic assumption underlying the TCM approach is that each consumer's utility towards recreation activities is separable, so that the demand function of recreation activities is not affected by the demand of other activities such as watching movies, shopping, etc (Hartono, 2007)

This method of valuation has advantage and disadvantages. Advantages are, it uses real market data and has relatively inexpensive that makes for most of developing countries researchers make possible. This method has limitations and such as defining and measuring the opportunity cost is complex because there is no consensus on appropriate measure when substitute sites are taken into account, It can only estimate use values but not non use values, this method need substantial data requirements, requires estimates of value of travel/leisure time (Smith, 2009)

2.3.1.2 Hedonic pricing

This hedonic pricing method approach has been used extensively to estimate the value of property and housing prices. It assumes that a good (or service) can be fully characterized by its attributes, that consumers have very good information on the attributes of goods, and that price differentials reflect the values of different attributes of goods (World Bank, 2004).

It is based on the assumption that a good or service is fully characterised by it attributes, and consumers have very good information on the attributes of goods and diffrerential price in the market reflects values of different attributes of goods. For example, the price of a house can be divided and classified into Physical structure of the house, age of the house, accebility to the town,work place, water and electicity availability and the like.

The application of the hedonic pricing method to capture the effect on prices of improvements in environmental quality requires observations of sufficiently varying quality levels within the confines of a single housing market (Leggett and Bockstael 2000).

The major limitations of this method are it can estimate use values only, requires extensive house market data, it is not suitable for for use in benefit transfer, difficulty in detecting small effects of environmental quality factors on property price, connection between implicit prices and value measures is technically complex ((Smith, 2009)

2.3.1.3 Production method

This valuation approach is based on econometric estimation of production function. It is used to situations where input demand for water is not directly observable. We use this method quantity of water used (W) and other inputs (X) used to realise outputs (Q) are available, but no information on sales price and quantity bought.

In this method, the marginal physical product of water is found and the price of water is estimated based on profit maximisation rule.

2.3.2 Direct (Stated Preference) Method

Indirect methods cannot be used to value non use values of environmental resources because of relying on data from situations where consumers make actual market prices. While direct approach based on the survey that asks people to state their preferences. The direct method draws conclusion from responses to hypothetical questions (Alebel, 2004). The most common methods of valuing the environmental resources using direct methods are Contingent Valuation method (CVM), discrete choice model, and Contingent choice methods are mentioned.

2.3.2.1 Contingent Valuation method

Contingent valuation method (CVM) is first suggested by Ciriacy-Wantrup in 1947, to interview people and elicit their monetary value. Ciriacy-Wantrup was discussing soil

conservation and he noted that several of the benefits were non-market goods, such as reduced siltation of rivers or reduced impairment of scenic resources. He characterized the problem as being how to obtain a demand curve for such goods, and suggested the following solution: "[Individuals] may be asked how much money they are willing to pay for successive additional quantities of a collective extra-market good. The choices offered relate to quantities consumed by all members of a social group... If every individual of the whole social group is interrogated, all individual values (not quantities) are aggregated. The results correspond to a market-demand schedule (hanneman, 2005)

Wantrup identified a solution conceptually. Since then it is applied by Davis, which deals with economic value of outdoor recreation in the Maine woods, Ridker to measure the damages from air pollution. In 1969, a steady stream of CV studies began to appear in the economics literature. Official recognition was given to CV in 1979, when the US Water Resources Council included it along with travel cost as recommended methods of non-market valuation. (hanneman, 2005)

Since then, contingent valuation method (CVM) has been applied as an effective valuation technique in many developing countries to address a wide variety of issues such as water quality improvements and sanitation. It is a direct means of estimating the economic benefits of an improved water supply. Using this method, one simply asks how much the consumer is willing to pay for a given level of service. It is a survey based method, where people are asked directly how much money they would be willing to pay or accept to maintain the existence of environmental resources such as water. CVM has been increasingly advocated by Economists and sector specialists as a useful tool for gathering reasonably accurate data about how much a household can afford and is willing to pay for particular water and sanitation options presented to them. In summary of statement of the small towns' water supply and sanitation conference held in Addis Ababa 0n 11-15 June 2002 CVM is stated as:

> "The contingent Valuation method allows planners to assess the people's willingness to pay for service options and provides the necessary basis for projecting sales and

revenues. This information is essential to support community participation and enable 'informed choice' at the household level as well as for the community as a whole. WTP surveys provide the parameters to underpin financial models needed to evaluate expansion plans and to set tariffs. The relative high cost of WTP tools is likely to come down as they are systematically applied and as the local consulting profession builds up its capacity". (kanson, 2003)

CVM method has advantages over other valuation methods, the most important advantages of this method is the one quoted by smith N. (2009) is as follows:

i) One can observe the current water situation of the households; inquire about the level of service people want and how much they are willing to pay for it.
ii) The consumer can value services for which indirect approaches would be imperfect (e.g., what are the benefits of increased reliability, higher water quality)
iii) The analyst can estimate the reactions of households to prices or technologies beyond the range of past experience.
iv) The answers of respondents to WTP questions are easily understood by non economists and decision makers.
v) CVM can be used to easily derive estimates of economic benefits without the use of econometric techniques
vi) The CVM could also be used to assess the benefits of improved water services to industries and commercial establishments.

There are various stages and steps involved in the estimation of WTP using CV method. Those steps that most researchers use has a little variation but the most common steps followed by most researchers are the following ((devi, 2009)

Preparation:

Step 1: Select interview technique,

Step 2: Develop a sampling strategy,

Step 3: Develop the CVM scenario,

Step 4: Decide which elicitation method to use,

Step 5: Cost the options

Step 6: Write household survey and CVM questionnaire.

Implementation:

Step 7: Enumerator training and pilot testing,

Step 8: Implement survey.

Data analysis and policy implications:

Step 9: Data entry and analysis,

Step 10: Using CVM results to develop tariffs,

Step 11: Ensuring that WTP studies inform policy

Despite its importance, CV has some disadvantages,

CVM method is a better way of valuing environmental resources using a direct method. It is the method that is suitable to be used in developing countries. Despite its importance still there is a lot of scepticism concerning the actual reliability of the method. According to Alebel (2004), the problem associated with CVM can be classified in to biased estimates of value and choice of welfare measures. Biases can be arising at any stage in survey design and implementation, construction of CV scenario, Sample selection, and in drawing inferences from results. At each stage, to make the result reliable those biases must be carefully assessed and minimised. With this regard, Alison Wedgewood (2003) noted that strategic bias, hypothetical bias, information bias, starting point bias, and other biases can influence CVM.

Strategic bias can arise when respondents intentionally understate and overstate the amount they are willing and could afford to pay for unproven idea of service improvement. It is due to respondents are not bothering to answer accurately.

As sited by Alebel, Whittington et al (1987) may point out the reason why people overstate his or her WTP. He reveals that by assuming the government will provide the service with

high subsidies in case he/she responds positively. On the other hand, the individual may under state his/her willingness by assuming that the investment has already been decided.

To minimise this type of bias, CVM questions should be designed in a way motivating mechanisms to minimize this type of action from happening.

Hypothetical bias may arise due to two main reasons. First, the respondent may not sympathize and understand the characteristics of the environmental good being described by the interviewer such as improvement of water supply that respondents may be willing to pay. Second, since respondents do not suffer any cost from inaccurate response he can respond, he is not giving attention to the CVM questions.

Information bias is very similar to hypothetical bias and is dependent on the amount and quality of information provided to the respondent. As delivered information increases, variation in final results decreases (Alison Wedgewood (2003). Providing information to respondents about a proper change can reduce the likelihood of unlikely answers. It is important to give some time to respondent to answer the question accurately. Unless and otherwise bias can't be minimised.

Starting point bias According to (Rodriguez, 2003), starting bias arises when the interviewer starts the questioning at an initial bid. A respondent who is unsure of an appropriate answer and wants to please the interviewer may interpret this initial process as a clue to the "correct" bid affecting his or her willingness to pay. Several studies have shown that this bias exists and that it can be important interms of outcome of the study. The solution to this type of bias is using randomly choosing starting point, and using payment cards.

To conclude this part, despite its limitations CVM is more advantageous method of valuing environmental resources such as improvement of water supply services, air quality and the like. It captures both use and non values of resources. So, if it is well managed and coordinated and bias associated with method can be reduced it can yield appropriate result.

2.3.2.2. Choice Modelling

CM is one of a stated preference technique offering hypothetical changes to respondents and using indirect choice behaviour to estimate the WTP and welfare of policy changes. As indicated by (virgee, 2007) this method has developed out of conjoint analysis indicated by Louviere(1988) and has been applied in environmental valuation exercises Blamey et al. (1999) and, in one case, water supply valuation Anand, (2001).

A set of choices are presented to the respondent, which contains a set of alternatives and the respondent chooses one which suits him/her. In CM a set of available alternatives and available substitutes must be presented.

2.4 Water Related CVM studies in Ethiopia and other contries

A few studies have been conducting in Ethiopia using CVM methods in order to elicit willingness to pay for water services. From studies under taken the following are pointed out.

Gossaye Fanta (2007) conducting Master thesis entitled Estimating Willingness to pay for improved water supply services using CVM method, in Debre zeit town, 41 km west of Addis Ababa. In his study randomly selecting 234 households were selected from 15 kebeles of the town. Households asked open ended and closed ended questions to elicit households' willingness to pay. His study revealed that piped water is the main source of water for the town. On the level of satisfaction with the existing level, only 10.26% of households are satisfied with current level. results of probit model of Gossaye fanta also indicated that age, household size, water volume, reliability, income of households are significantly determines willingness to pay. Households were willing to pay more than the existing tariff level.

Medhin Fisseha (2006) did a study on Households demand for improved water supply services **Addis Ababa** town using contingent valuation method. The study uses both primary and secondary data by sampling 250 households. The result indicates that households are

willing to pay more than the existing tariff rate. There is also a positive relationship between educational status and willingness to connect for improved water supply.

Alebel Bayrou (2004) also made a study on analysis and affordability of willingness to pay for improved water supply services in Nazret town using Contingent valuation method. Wealth of respondent, source of water the household is being used, quality of water, time taken to fetch water from the existing source and educational level of the respondents has positive effects on the respondents' choice for improved water services. The result also reveals that peoples are willing to pay at the price at which the revenue covers the cost: at cost recovery rate.

Genenew Bekele (1999) also conducted a study in Harar town to analyze the determinants of households' willingness to pay and demand for improved water supply services. He used ordered probit model and OLS estimation to elicit households WTP. In his study it is found that education level and sex of family head significantly affects the WTP of households. In the town, high water problem is conceived in that 97.8 percent of households who can access to direct piped water get water once in 4 days.

Assefa Chaka (1998) using CVM and indirect approach, his did a study entitled Households Willingness to pay for improved water services and factors determining willingness to pay In selected areas of Addis Ababa City. His result like other studies reveals that households are more willing to pay than existing tariff rate.

Fisseha (1996) take a sample of 266 respondents in Meki town of Oromia regional state to point out determinants of willingness to pay for improved water services using contingent valuation method. His study reveals that income and time taken to fetch water are significantly determines WTP for improved water in the town. Socio demographic characteristics such as education and occupation also show significant relationship with WTP.

Gloria Soto Montes de Oca, Ian J. Bateman, Robert Tinch and Peter G. Moffatt (2008), together had done a study on assessing the willingness to for maintained and improved water supply services in Mexico City. CVM is used to investigate households' willingness and ability to pay. From the respondents it is revealed that there is a problem of water shortage in the area. The study reveals two tariff rate should designed for the poor as well as the rich, since the poor households sees their unwillingness to pay for the improved water service level. (Glorio Sotode oca, 2008)

To conclude this part, from researches done in different urban areas of Ethiopia it is possible to conclude that households were willing and able to pay for improved water supply services. If the town where they live provide them with the improved water, they show their willingness to pay at a cost recovery tariff level. Most of the respondents were not satisfied with the current source of water. Socio economic characteristic of the respondents were affecting their willingness to pay. So when the tariff rate is designed it should have to take into account the socio economic characteristics.

2.5 Stata

Stata is a complete, integrated statistical package that provides everything you need for data analysis, data management, and graphics. It makes easy to generate publication-quality, distinctly styled graphs, including regression fit graphs, distributional plots, time-series graphs, and survival plots. It is distributed in more than 150 countries and is used by professionals in many (www.stata.com)

Chapter Three: Back Ground of the study area

3.1 Description of the study Area

Holeta town is found about 30 km west of Addis Ababa, along the main road from Addis Ababa to Nekemte. The total surface area of the town is 5,550 hectare. The town has found at an altitude of 9^0 30' N and longitude of 38^0 30' E. The average elevation of the town is 2,450 metre above sea level. The mean annual precipitation of the town is about 1060 mm. Its mean annual temperature is between 5^Oc to 12^Oc. The vegetation around the town is characterised by bush lands, numerous herbaceous flora, scattered trees, cultivated eucalyptus, oil crops, and horticultural crops.

The population of the town is 36,325, of which 18017 (49.8%) are males while the remaining 18,308 (50.4%) are females (Towns Administration, 2010). Average number of persons per household is 4.6, and the total number of households living in the city is estimated to be 7896. Growth rate of the population is estimated to be 7.24% per annum. This is the highest when compared with other urban areas of Ethiopia. This growth rate can be largely attributed to its close distance to the main town, Addis Ababa and large inflow of daily labourers as a result of rapid industrialisation in the area. The total kebeles of the town is 8, of which five of them are included to the city by 1997 due to rapid urbanisation of the city from neighbouring wolmera district.

The dominant activities in the town are industrial activities such as horticulture, agro industry followed by commercial and government work respectively. Because of the strategic place the town has to the capital Addis Ababa, industrial Sector can create a lot of employment opportunity for the town's inhabitants. Most of inhabitants are followers of Orthodox Church followed by Protestant and Muslims.

In the town there are 3 colleges, 1 federal research institute, 1 military academy 1 regional bee research institute, 1 health centre, 1 high school, 5 primary schools, and 2 local government administration autonomies.

The town has digital telephone service and has full network coverage for cell phone service. It has one regular post office, which gives services with its different postal codes. The town has also benefited from 24 hours of electricity power service.

3.2 Water Supply Situation of the Town

The water supply system of the town was constructed in 1965 from 2 bore holes located at Arada Kebelle to serve the then population of 3000 – 4000. Presently, there are 6 boreholes, 26 water points, two reservoirs with capacity of 300 and 500 m^3, with 47 km pipeline.

Water produced in the year 1998, 1999 and 2000 is 193,871, 144.730, and 181,031 m^3 respectively. While water consumed in the above years are 186,467, 138,320 and 159,774 m^3 respectively. From this figure it is clear that, the leakage rate is on average 6.46% of water produced per year. Factors for this leakage is pipelines were old in age and many of them are not replaced.

According to the towns' water supply and sewerage authority, annual per capita water consumption of the town is low as compared with that of the national. In 2008, annual per capita water consumption of the town population is 13.78 m^3 of water. The national annual per capita water consumption is 32.65 m^3 of water. This clearly indicates that the amount of water supplied to the town is low even as compared with the national average.

The water tariff now in use by the town's water supply and sewerage authority is given below. Accordingly, for public fountains 1 m^3 of water is supplied at a cost of 2 birr irrespective of the amount of water supplied. With regard to house connection, those who are using 0 – 2m^3 of water monthly can pay 2.55 birr per m^3 of water. While those who are using greater than 10 m^3 of water monthly can pay a monthly bill of 4 birr per m^3. From table 2, it is clear to see that the towns' water supply authority uses progressive tariff structure. I.e. the tariff rate that can increase as the water consumed increases.

Table 1: Tariff rate of Holeta town water supply

Mode of service	Public Fountain	House Connection			
		0-2m3	3-5m3	6-10m3	>10m3
	2.00	2.55	2.85	3.30	4.00

Source: Holeta water supply authority

The numbers of connections that are found in the town are totally 2526. From this, there are 26 public fountains, 2,210 private connection, 220 commercial, 65 government and 5 industrial connections.

When we see the revenue and expenditures of the town's water supply, table 2 provides the necessary data. From Table 2, until 2005/06 the financial performance of the town's water supply and sewerage authority is good. But starting from 2006/07, the financial performance is not good. The revenue gained from the water is less than cost. The possible reasons for this can be the recent inflationary rate as well as foreign exchange rate devaluation in our country makes the materials expensive. Besides this, there is high cost of fuel and power supply cost. Till now the financial gap has been covered from town's Municipality.

Table 2: Revenue and expenditure of Holeta Town Water Supply Office

Year	**Revenue /in Birr/**	**Cost /In bIrr/**
2001/02	320950	270,607
2002/03	257123	269,393
2003/04	489027	362,162
2004/05	528,547	461,435
2005/06	699,354	679,000
2006/07	590,821	909,403
2007/08	602,951	682,061
2008/09	1,481,075	1,479,986
2009/10	1,128,069	1,633,760
Total	**6,097,017**	**6,747,867**

Source: Towns water supply and sewerage authority

3.3 Methodology

3.3.1 Determination of Sample size

In planning a survey, one must decide how many people need to be studied in order to answer the study objectives. If the study is too small, the researcher may fail to detect important effects. If the study is too large then it wastes resources. The sample size of the research is 237 households as can be calculated using the following criteria.

The minimum Sample size required for a population is $N \geq 10,000$

Is $n=Z^2 p (1-p) /W^2$

Where n= Sample size

Z=Confidence interval (usually set at 95% confidence level)

P = population proportion

W= margin of error

Accordingly, the total household of the town is N=7896

Confidence interval of 95% (z) = 1.96

Population proportion (p) = 0.8

Margin of error (W) = 0.05 therefore the sample size is calculated as

$n= (1.96)^2 0.8(0.2)/0.05^2$

$= 3.8416 \times 0.16/0.0025$

$= 245$

The above sample size is taken, if household number is greater than 10,000. But if it is relatively smaller population, the required sample size can obtained from the above estimate by making some adjustment.

$245/ (1+245/7896)) = 237$

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-

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$145 (1+145/7896) = 141$

Therefore the study takes a sample of ***141*** households

Sample households can be selected randomly from each kebelle by their population size. Goro kerensa kebele with the highest number of population have also higher sample size.

3.3.2 Description of sampling Strategy

Simple random sampling was used to elicit households' willingness to pay for improved water supply services in the town. Each household have equal chance to be selected. Using simple random sampling, each household were interviewed personally by trained enumerators. In using random sampling, since there is no accurate census information in the town, it has done by constructing sampling frame by using simple mapping techniques.

3.3.3 Methods of data collection

The information collected for the study has been primary and secondary data. The primary data was collected mainly from interviewing the respondents, focus group discussions and key informant interview. The questionnaires that are used to elicit households' willingness to pay for improved water supply services can be divided to three basic parts namely:-

1. Households socio economic characteristics
2. Existing water supply situations of the town
3. Households willingness to pay for improved water supply questions

Secondary data was collected from Ministry of water resources, town's water supply and sewerage authority, town's administration. Moreover, books, journals, papers, thesis and internet were used.

3.3.4 Description of the expected outcome and explanatory variables

Variables that are used to elicit household's willingness to pay for improved water supply in this study are: Gender, Age, educational status, household size, income of households',

housing condition, quality of water, quantity of water, time to fetch water. The description of expected outcomes of this variable is:-

- **GNDR:** it is sex of respondents'. In most literatures, it is assumed that women would express more WTP for improved water supply services than men. This is because of the fact that they face many burdens of fetching water. In this paper the dummy variable for male is 0 and female 1.
- **EDCN**: Education level of respondents. As the level of education increases, people become more aware of the benefits of improved water. So educated people are expected to pay willingly higher cost as compared with that of uneducated.
- **AGE**: Age of respondents. It is believed that, older people are less willing to pay for water services because of the fact that they were living with more free water and fewer prices previously. So there is an expected negative relationship between age and willingness to pay.
- **INC**: Income of households'. There is an expected positive relationship between income households willingness to pay for improved water supply. As income of households' the need for improved water supply increases together with their affordability to pay.
- **HHSZ**: Households size of the respondents. As household size increases the ability to pay will expected to decreases, so their willingness to pay decreases. They have a negative relationship.
- **STSFN:** satisfaction with existing source: if the level of satisfaction with existing water supply is high, households are less willing to pay for improved water supply. But, if they are not satisfied with the current source, they are more willing to pay.

3.3.5 Data Analysis

Respondents were asked Willingness to pay questions that was used to elicit their willingness to pay for improved water supply. Quantitative and qualitative data analysis was used to show their willingness to pay for the improved water supply service. Correlation coefficient result using STATA version 11.0 has been used in order to measure the strength of relationship between dependent variable (WTP) and independent variables of socio economic characteristics. It is calculated using

$$\frac{n\sum XY-(\sum X)(\sum Y)}{\sqrt{n\sum X^2-(\sum X)^2}\,n\sum Y2-(\sum Y)^2}$$

Where X is dependent variable and Y independent variables

The primary and secondary data gathered is carefully analysed using STATA version 11.

Moreover, data can also be analysed using:

- ✓ Tables and simple frequency graphs that indicates existing water supply situation of town and to compare different data results.
- ✓ Mean willingness to pay was calculated from the data collected.

Chapter Four

Discussion and Data Analysis

4.1 Socio Economic Characteristics of Respondents

Using a contingent valuation survey, a total of 141 sample households were interviewed during the survey. From the total sample households, 63(44.68%) are male households, while the remaining 78(55.32%) are female households. From total male respondents, 58 (92%) were head of households, while the remaining 5 (8%) were not head of the households. The same with, from total female respondents 63 (80%) were head of households, while the remaining 12 (20%) were not head of households. The result also showed that 38.89 year is the average age, with the minimum of 20 years and maximum of 85 years.

The education level of the respondents showed that, majority of the respondents were within primary education level. The minimum education level achieved by the respondents was not able to read and write (illiterate), while the maximum level is Masters Degree. From total respondents who gave answer to this question,17(14.4%) can neither read nor write (illiterate), 43 (36%) have within primary education (1-8 grades), 31 (26.1%) have within Secondary Education (9-12), and the remaining 28(23.5%) were achieved tertiary level of education ranging from 12+1 to masters degree.

The average family size of the total sample households were 5.1. The maximum family size of the sampled household is 13, while the minimum of 1. The data about the occupation of the respondents shows that 66 (49.3%) of them were self employed. They are running their life by working in different self income generating activities such as trade and farming. 36 (26.9%) of sampled households were hired and working in private and NGO such as Investment companies (Horticulture) and other privately owned enterprises. 20 (14.9%) were working in Government organisations, while the remaining 12 (8.9%) were unemployed.

From the contingent valuation survey, it is clearly seen that employment patterns mirror the geographical spreads of the households. There is a division between fringe and core areas with regard to employment pattern. The households' living in core areas was relying mostly on small businesses such as shops, government and private works. While most of households' who were found in fringe areas are relying predominantly on agricultural activities.

The average monthly income of the sample households was Birr 1008.76, which is ranging from the maximum of Birr 4800 to the minimum of Birr 150. Data about the income of households reveals that, there is income disparity between core and fringe areas of the town. In core areas of the town, 1176.11 birr is average monthly income per household, while in the fringe areas; 692.29 birr is average monthly income per household.

Attempts were also made to know the wealth status of the sampled households. Based on this, house and television ownership could be taken as a proxy. From total sample households' 102 (72.3%) of them reveals that they live in their own house, 33 (23.4%) lives in privately rented house, while the remaining 6 (4.3%) lives in houses of their relatives. Television ownership of the sample households also shows that 74 (52.5%) have television, while the remaining 67 (47.5%) do not have Television.

Data about the ownership of basic infrastructure service shows that about 119 (84.4%) have Electricity power, while the remaining 22 (15.6%) do not have formal electricity source and they are getting electricity from traditional sources.

Households were given different social services to rank them in accordance with their priority of need. Survey results showed that 84 (59.6%) rank health service as their first need, 49 (34.8%) rank water supply as their first need, 6 (4.3%) rank education service as their first need, 1.4% rank sanitation as their first need. With regard to their second and third choice, 80 (56.7%) of respondents rank water supply as their second need, and the remaining 12 (8.5%) of sample respondents rank water supply as their third need. From this we are clearly

understood next to health water supply is the priority need of sample households', and the most important thing for them.

With regard to expenditure on selected basic items, 118 (83.7%) of respondents rank expenditure on food as their highest expenditure, 8 (5.7%) rank expenditure on clothes as their highest expenditure, and 7 (5%) rank expenditure on water supply as their highest expenditure.

When we compare the households' first need and expenditure on basic items, 49 (34.8%) of the respondent said that water supply as their first need, but only 7 (5%) of respondents said water supply as their most expenditure. From this it is possible to conclude that households' sees water as a free resource they were not paying for the service according to the satisfaction they can get from it. The point we will discuss in the next topic.

4.2 Existing Water Supply Situation

Households' attitude towards current water supply situation of the town is presented in the following section by discussing main source of water, existing price of water, quantity, quality and reliability of current water supply source.

4.2.1 Current Source of Water Supply

With respect to the sources of water supply households were using, most of sampled households were using piped water from the main source supplied to the town, followed by public hand pump, water vendors, protected spring or well, river, and ground water respectively as can be seen in the following table.

Table 3: Current Sources of water supply for the town by area

S. N	Sources of water supply	Sources of water supply by area					
		Core areas		Fringe areas		Average	
		Frequency	%	Frequency	%	Frequency	%
1	Protected spring or well	1	0.71%	9	6.4	10	7.11
2	River	0	0%	8	5.7	8	5.7
3	Public Hand Pump	5	3.5%	29	20.6	34	24
4	Water Vendors	8	5.7%	2	1.4	10	7.1
4	Piped water	72	51.1%	3	2.1	75	53.2
5	Ground water	1	0.71%	3	2.1	4	2.81
	Total	87	61.7%	54	38.3	141	100

Source: Household survey

With regard to sources of water supply households were using, there is a difference between core and fringe areas. Thus, 97% of households who are using piped water from the main source supplied to the town were found in core areas, while the remaining 3% of households' who were using piped water supply is found in fringe areas.

From this figure, it is clear to observe that most of households' who are found in fringe areas do not have piped water supply, while those households' who are found in core areas have their own piped water supply. From key informant interview with city's water supply office head, he has said that this problem arises due to the fact that kebeles that are found in fringe areas were included in 1997 as one part of the town from neighbouring wolmera district. But most of water supply sources were building before 1997. That is why they are not getting the piped water supply. But in the future there is a plan to connect those kebeles with a piped water supply.

Households' who were not using private piped water supply were asked why there are not using the source. Based on this, 23 (35.4%) told there is high connection cost, 40 (61.5%)

said that water supply office is unable to deliver the service, 2 (3.1%) said that the house has not their own and they do not need piped water source. They are also asked why they have not preferring piped water supply source. Based on this 45 (69.2%) of respondents said that access to piped water is difficult, 19 (29.3%) said the pipe water is too costly and not affordable and the remaining 2 (3.1%) said because of the other reason.

4.2.2 Price of water

Survey about the current Government water tariff of the towns' water supply indicated that, monthly average tariff households' were paying is 25.08 birr. The maximum tariff is 60 birr while the minimum is 5 birr per month. From this figure, it is easy to estimate that those households' who have piped water supply source can consume on average 5.3m^3 of water per month. This figure, when we compare with the national CSA standard, it is too low. Households' are not using the required quantity of water.

Respondents who are found in the core area, and have not their own piped water connection can get their water mainly from water vendors. These households can bought on average 3.13 bucket (62.6 litres) of water per day. For one bucket of water they are paying on average 15 cents. On average, they are paying 14.08 birr of monthly price for water vendors.

The other measures of cost incurred by households can be calculated by the time they take to walk to water point and back again as well as waiting time at water point. Based on this, from households who do not have piped water supply, 66 (46.8%) were said the distance of water source from their home is less than 10 meter, 19 (28.8%) said water source is less than 20 meter, 10 (15.2%) said the water source is between 21 to 50 meter, 31 (47%) said it is between 51 and 100 meters of distance, while the remaining 5 (7.6%) said it is greater than 100 meter.

Survey about the time taken to walk to water point and back again indicates that, 17 (25.8%) were taken up to 5 minutes to walk to water point and back again, 18 (27.3%) six to 10 minutes and 10 (15.1%) takes 11 to 20 minutes, while the remaining 20 (30.3%) takes greater

than 20 minutes. Waiting time of at water source also indicated that 20 (30.3%) were responded no queue at source, 13 (19.7%) queue for maximum of 5 minutes, 8 (12.1%) queue for 6 to 10 minutes, 24 (36.4%) responded there is queue at the source for greater than 10 minutes at the source.

4.2.3 Quantity, Quality and reliability of current water supply source

Contingent valuation survey about quantity, quality and reliability of current piped water supply source indicated that, most of respondents said the amount of water delivered and the quality of water is good but there is a problem in all time availability of water as indicated in the following table.

Table 4: Households' attitude towards current water supply

	Quantity		**Availability**	
Performance	***No of response***	*%*	***No of response***	*%*
Good	47	62.7%	6	8%
Average	27	36%	57	76%
Poor	1	1.3%	12	16%
Total	**75**	**100**	**75**	**100**

Source: Household Survey

With regard to the quantity of water supplied to town's population, a small percentage of population said that quantity of water delivered at a time is poor. While the majority of respondents were said the water quantity delivered at a time is good.

A question related to the quality of water was, whether the households uses any purification method before they drink or not. 79.1% of households' who were responded for this question was not using any purification method before drinking and using for domestic use. 20.9% of respondents were using cleaning materials such as boiling, and wuha Agar before using the water. Those who were not using any purification method were asked why they are not, based on this, 64.7% of households' said water is clean for drinking and domestic use, 12.1% said

purification is costly and time consuming, and the rest 23.3% responded water is not clean but no side effect on health.

With Regard to all time availability of water, only a small proportion of respondents were said the water availability at all time is good. While most of the respondents' responded availability of water at all time is average. On average water is available only for 15 hours per day. For the question during at what time do you face water shortage, 31.9% of respondents were said during the day time, 35.7% during the morning time, 15.7% at noon, 15.7%, it is not possible to tell the exact time.

4.2.4 Level of satisfaction with the existing source

Data about the level of satisfaction with the existing source of piped water supply indicate that, 9 (12%) of the respondents are fully satisfied with the existing water supply provision. While the remaining 55 (73.3%) are partially satisfied, 11 (14.7%) are not satisfied with the existing source of piped water supply. From this figure, it is clearly seen that most of sample households are not satisfied with the existing source.

There are some reasons for their dissatisfaction with the existing source. From the total respondents giving answer to this question, 34 (54%) were said current water supply source is un reliable, 11 (17.5%) were said water has not good quality and it is unreliable, 12 (19%) responded water is unreliable, it is difficult to get the required water at a desired time. 6 (9.5%) were responded three problems with their dissatisfaction. They responded there is problem in water quality, water is unreliable, and quantity of water supplied has also a problem. Respondents reveal that, if the above problem is solved, they are fully satisfied with the towns' water supply.

Focus group discussion with selected fringe areas population indicates that, they are not fully satisfied with the current water supply situation. The reason they are putting for their dissatisfaction is, first they are not getting the quality water because they pick up water from

hand pump that cannot be handled properly. Second, the water source is far from their home which is created a time and cost problem.

All of focus group discussion participants need the improved piped water supply provision to solve their water supply shortage, quality problem, and time and force incurred in water fetching.

4.2.5 Persons Responsible for fetching water from source

Data about those persons who are responsible for fetching water from non piped water supply source indicate that 7 (10.6%) said boys are responsible to fetch water from source, 39 (59.1%) said girls are responsible for fetching water from the source, 3 (4.5%) are said women's are responsible for fetching water from the source, 14 (21.2%) said all persons' are responsible for fetching water from source and it is impossible to tell the person who is responsible.

4.2.6 Disease Episodes

Water quality and disease episodes are directly related. As the water quality becomes good, the chance of getting water borne diseases such as typhoid, Diarrhea and Vomiting is getting lower. This question was forwarded to those households' who have not piped water supply source. From sample households' who were responded to this question, 52.94% were said that one member of their family over 12 years in the last one year were affected with one the above disease. The remaining 3.9% responded that one member of their family were affected by at least two diseases in the last one year.

4.3 Demand and Willingness to Pay for improved water supply

In the previous two parts, data about households' attitude towards current water supply situation is presented together with their socio economic and demographic characteristics. In this section, households' willingness to pay for the improved water supply service is

presented. Before doing that, it is important to see the question presented to the sample households.

The provision of improved water service among other things means, good quality of water which is safe for health and an increased amount of water available for use .It also means a highly reliable source at any time (7 days a week, 24 hours a day) moreover; the family need not have to spend its time and effort in fetching water from distant sources.

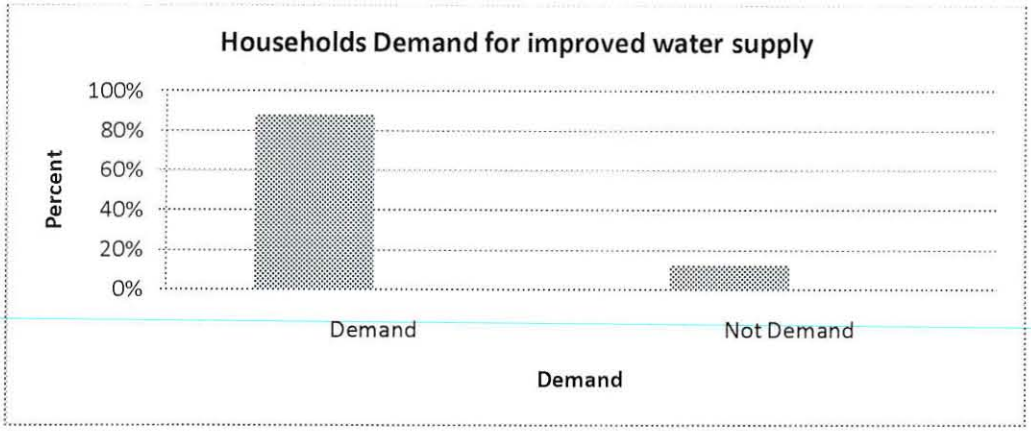
Now, let us assume that you have an option for a private connection to such an improved piped water supply scheme. The improved system will provide you with as much water as you wish at any time of the day, throughout the year.

Let us also assume that you will be charged a monthly water fee based on the volume of water your household consume in a month (the tariff is Progressive), the more you consume the higher will be your monthly bill. The tariff per volume will be the same for all consumers. You may not be required to pay initially the costs of connection to the new scheme. Instead, it will be distributed over several years in your monthly bill (The payment will be built-in the monthly water bill). You are required to pay a minimum of at cost recovery after the improved water supply has been come into effect.

4.3.1 Demand for improved water supply

Provision of Improved water supply has much importance. Among them it is reducing the incidence of water borne diseases such as diarrhoea; it also improves sanitation activities, and generally contributes to the economic growth of every nation. With regard to the choice for the above improved water supply, since most of households' are not satisfied with the existing source, they told they need improved water supply.

Graph 3: Demand for improved water supply in the core areas'



Source: Household survey

From the above figure, it is clearly indicated that from the total sample households' in the core areas', only 12% were saying that, they don't need any improved water supply. The reason they are putting is, they are fully satisfied with the existing source of water supply. The remaining 88% of sample households responded that they need improved water supply. Their main reason for demanding improved water supply is, there is no sufficient amount of water at the required quantity and quality in the desired time.

Data regarding the demand for improved water supply of the fringe areas indicated that, all sample households' will need improved water supply at their home. There are many reasons why they are demanding the improved water service. First, since their current water source is river, public hand pump, ground water and protected spring, it has created its own impact on wasting the time in collecting water from the source. Second, opportunity cost of fetching water is high. Third, the water quality is not good which has created another cost of purifying water. Because of those reasons they replied that, they were demanding improved water supply.

4.3.2. Willingness to Pay (WTP) for Improved Water Service

The first question related to willingness to pay for improved water supply is, whether they are willing to pay or not for the improved water supply option. The answer from respondents' reveal that, if the towns' water supply office provides them the above improved water supply option, most of the sample households' (80.1%) responded they are willing to pay at a cost recovery tariff rate. While the remaining 19.9% is not willing to pay for the improved water supply option provided to them at a cost recovery tariff rate.

Table 5: Households' response of WTP for improved water supply

Willingness to pay for improved water supply	*Holeta town*		*Fringe areas*		*Core areas*	
	Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*
No	28	19.9	3	5.6	25	28.7
Yes	113	80.1	51	94.4	62	71.3
Total	***141***	***100***	***54***	***100***	***87***	***100***

Source: Household survey

As we can see from the table, willingness to pay varies geographically. Compared with core areas, those sample households who are living in fringe areas' are more willing to pay for the improved water supply option. This is mainly due to the fact that there is more water supply problem in fringe areas than core areas.

Responses from the Economic valuation question of Mean WTP reveals that, the mean willingness to pay for the improved water supply services of the sample households' were 10.47 cents per bucket of water. This implies that the residents of the town are willing to pay more than the existing tariff rate, which is 5.1 cents for the lowest consumption bundle and 8.00 cents per bucket for the highest consumption bundle. This can be derived using the following formula

$$MWTP = \sum WTP / n$$

Where $\sum$WTP = Summation of sample households Willingness to pay

n = Total sample households' interviewed

The households' Willingness to pay in the town differs geographically. Based on this, the mean WTP for 20 litres of water is 12.37 cents in the fringe areas, where 38.3% of the population lives. While in core areas, where 61.7% of sample households were living, households' are willing to pay 9.08 cents per 20 litres of improved water supply. This result goes in line with the theory that, in areas where there is water supply problem, households are more willing to pay than that of less water problem.

The total number of population of the town is estimated to be 36,323. From this 14,034 population lives in fringe areas, while 22289 lives in core areas. Households' who are found in core areas are willing to pay 9.08 cents per bucket of water, while those households' who are living in fringe areas' are willing to pay 12.47 cents per bucket of water. Thus, the total mean willingness to pay of the town is 10.46 cents per bucket of water. From this households' are willing to pay 5.23 birr per m3 of improved water provision.

The frequency distribution for Willingness to pay responses indicated in the following table reveals that from the total of 141 sample households, 20.6% are willing to pay between 0.00-5.00 cents per bucket of improved water. More than half percent of sample households' are willing to pay between 5.01 - 10.00 cents, 17% of them are willing to pay between 10.01-15.00 cents, and 11.30% are willing to pay greater than 15 cents per bucket of water. From the table it is also clearly indicated that more than 70% percent of sample households' will be willing to pay between 0 -10 cents.

Table 6: frequency of WTP ranges

WTP/Bucket of water	*Frequency*	*Relative frequency %*	*Cumulative frequency %*
0-5 cents	29	20.6	20.6
5.01-10 cents	72	51.1	71.7
10.01-15 cents	24	17	88.7
>15 cents	26	11.3	100

Source: Household survey

Data about willingness to pay and some economic variables reveals that, those sample households' who were WTP in the range between 0 to 5 cents per bucket of improved water were their Mean WTP of near 5 cents. Numbers of respondent in this group were 29 households' of which 62% were women, while the remaining 38% were men'. Mean income of households' who were WTP in this tariff range was 682.8 birr per month. The average age figure for this group indicates that 49 is their mean age. The average family size of sampled household was 6.9, which is greater than that of the total mean family size of the sampled households.

The majority of sample households were WTP the tariff between 5.01 to 10 cents/per bucket of water. Of the total sample households, 51% of them were WTP in this range. Their Mean WTP is 9.29 cents/bucket of water. Majority of respondents (56%) in this group were women. Mean income of households in this group were 784.30 birr per month. With regard to age of respondents, 36.6 is the average age size. The average family size also indicates that it less than the average family size of sampled respondents, which is 5 persons' per household.

The total 24 respondents' were found WTP the tariff rate in the range of 10.01 to 15 cent/per bucket of water. This figure is 17% percent of the total sampled households. The average maximum WTP for improved water supply option is 13.9 cents per bucket of water, which is 25% greater than the AWTP of sampled households'. The mean income of households' in this range of tariff is 1,883.40 birr, which is 85% greater than the mean income of sampled households. 54% of respondents' in this age category were women, while the remaining 46% were men'. The average age category of the respondents' in this category also reveals that,

35.9 is the average age size of the respondents, while 4.25 of average household size in the range.

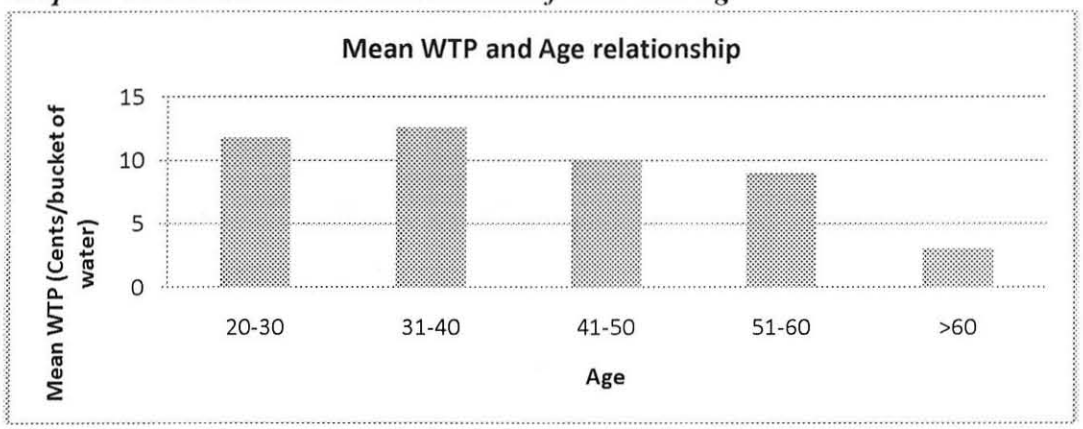
4.4. Determinants of Willingness to Pay

Willingness to pay for improved water supply services can be determined by many factors. Socio economic and demographic factors such as age, gender, income, household size, housing condition, educational level and level of satisfaction with the existing source were affecting households' willingness to pay as discussed in the following section.

4.4.1 Age and willingness to pay

The relationship between Age and Willingness to pay (WTP) reveals that, those households' who are willing to pay in range of 0 to 5 cents per bucket of improved water have a mean age of 49 years. While those households' who are willing to pay greater than 15 cents per bucket of water for improved water service was an average age of 35.2. From this result, age of the respondents and Willingness to pay have a positive relationship. So, it is possible to conclude that as the age of respondents' increases, his/her willingness to pay for the improved water service becomes smaller.

Graph 4: Households' Mean WTP/Bucket of water and Age



Source: Household Survey

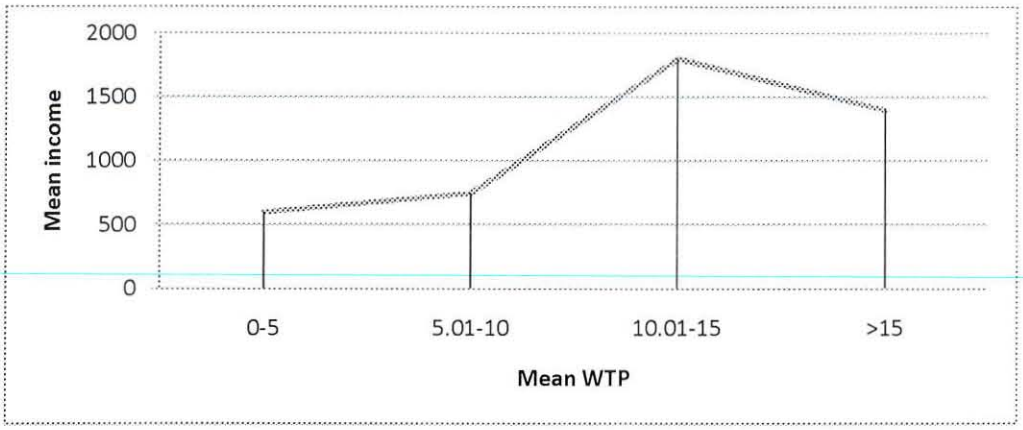
4.4.2 Households Income and willingness to pay

Literatures reveal that households who have more income are more willing to pay for improvements in quality and quantity of water than lower income households'. This is mainly because of the fact that these households were able to pay for improvements in water services than the poorer households.

Based on this, income and willingness to pay relationship of sample households' reveals that, those households' who are willing to pay from 0 to 5 cents per bucket of water has a mean income of 682.80. While those households' who are willing to pay from 5.01 to 10, from 10.01 to 15 and greater than 15 cents per bucket of improved water were a mean income of 784.3, 1,883.4 and 1,324.67 respectively. From this figure it is clear as expected that, as income of households' increases, their willingness to pay for the service improvements also increases.

But there were exceptional cases in the result found. From figure below, the mean income of those sample households' who are willing to pay greater than 15 cents per bucket of improved water have mean income of less than those who are willing to pay in the range of 10.01 to 15 cents per bucket of improved water. This is due to the fact that, respondents' who are willing to pay between 10.01 and 15 cents per bucket of improved water have replied they are satisfied with the current source and the government should be responsible for providing the service freely. This is the reason why they are willing to pay less.

Graph 5: Households' Mean WTP/Bucket of water and mean income

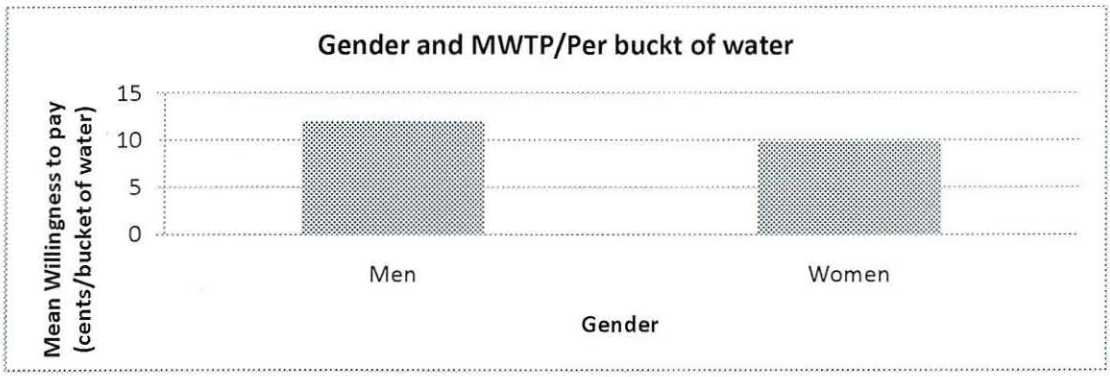


Source: household survey

4.4.3 Gender and willingness to pay

Data gathered from respondents' reveals that, male respondents are more willing to pay than women for improved water supply services. In literatures, it is hypothesised that women's are more willing to pay for improved water services than men, because of the fact that they are facing more problem in collecting and fetching water from the source. But in survey, they are willing to pay than men's' for the improved service. This is because of the fact that they do not have equal control over or access to the household's cash resources. Therefore when they have asked how much they are willing to pay for improved water services, they may be reluctant to give a response though they may give more worth to the improved water service.

Graph 6: Mean Willingness to pay and Gender



Source: Household survey

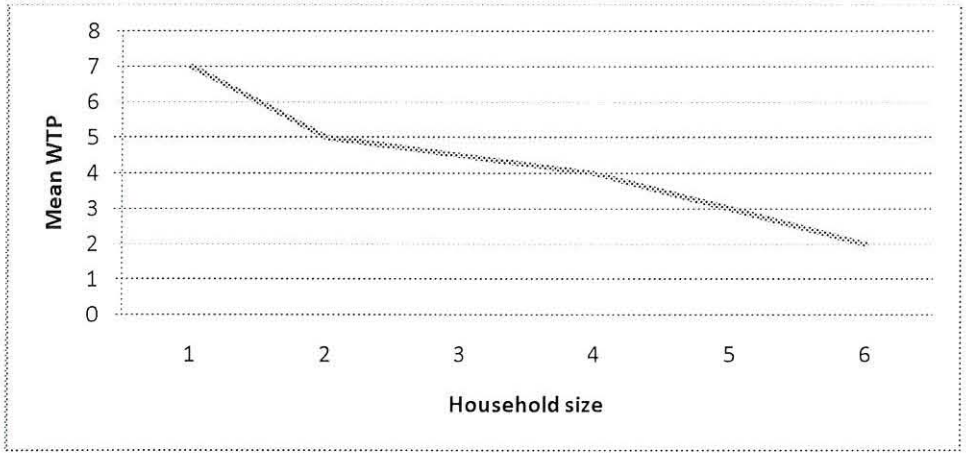
The above result clearly indicated that, men's are more willing to pay for the improved water supply service by 18.6% than women's in the area where the survey was conducted.

4.4.4 Household size and Willingness to pay

The above socio economic characteristics of surveyed households' clearly indicate that socio economic factors are clearly affecting their WTP for improved water supply service. Willingness to pay is positively affected by the level of income. But age and WTP is negatively related, as age of households' increases, their WTP for the service decreases. While in the survey, it is found that men's are more willing to pay for the service than women's.

In the following table, the relationship between Household size and WTP for improved water supply service is clearly described. As starting from those households' who are less family size, they are more willing to pay than those who have large no of households'. As the number of family size increases, households' willingness to pay for the service decreases. From this we can clearly understood that family size and Willingness to pay is negatively related.

Graph 7: Households' Mean WTP/Bucket and Mean Household size



Source: Household Survey

Data with regard to willingness to pay and education level of households' reveals that those households' who are more educated will be willing to pay more for the improved water

supply services. The level of satisfaction with the existing source has negatively affecting households' willingness to pay. Households' who are satisfied with the existing source was less willing to pay for the service.

To conclude this part, socio economic and demographic factors such as income, house ownership and education level were directly proportional with the households' willingness to pay for the improved service as observed from the survey. As these factors increased, households' WTP for the service also increased. Women's are less willing to pay for improved service than men. Age, household size, satisfaction with the existing source has negatively affecting households' WTP.

In order to the measure the strength of relationship between two or more variables coefficient of correlation were used. It is the statistical method employed to measure the strength of the linear relationship between two or more variables. In this paper, the dependent variable is willingness to pay and independent variables are income, age, gender, household size, home status, educational status, and level of satisfaction with the existing source. The coefficient of correlation assumes any value between -1.00 and +1.00. A positive correlation (between +1.000 and >0) indicates a positive or direct relationship which is linear. A negative correlation (between -1.000 and <0) indicates a negative or inverse relationship. Conventionally, correlation coefficient >+0.5 or <-0.5 indicate a strong relationship.

Table 7: Correlation coefficient between WTP and socio economic variables

	WTP	*INC*	*GNDR*	*AGE*	*HHSZ*	*WLT*	*EDCN*
WTP	1.0000						
INC	0.3517	1.0000					
GNDR	-0.1657	-0.1601	1.0000				
AGE	-0.2110	-0.0618	-0.1875	1.0000			
HHSZ	-0.2932	-0.0861	-0.1215	0.6116	1.0000		
HSEC	0.0517	0.0998	0.0332	0.2494	0.3174	1.0000	
EDCN	0.0257	0.4940	-0.0021	-0.5237	-0.4524	0.1887	1.0000
STSFN	-0.0726	0.1467	-0.0425	-0.1839	-0.0300	0.0447	0.0873

Source: Survey result (Using STATA version 11)

Whereas WTP = Willingness to pay

INC = Income of the household

GNDR = Gender of the respondent

AGE = Age of the respondent

HHSZ = Household size

HSEC = House ownership

EDCN = Educational level of the respondent

STSFN = Level of satisfaction with the existing source

As seen from the table above, variables such as income, wealth, and educational level of the respondents have a positive relationship with the level of willingness to pay. Gender, age and household size shows a negative relationship with the level of WTP.

From the correlation result table, it is also possible to identify which variable is strongly affecting the level of WTP. From those variables that have a positive relationship income, wealth and education level is strongly affecting the households' willingness to pay respectively. Level of satisfaction with the existing source, age and household size were more affecting households' willingness to pay for improved water supply services negatively respectively.

4.5 Non willingness to pay

As can be seen from the table, 32.2% of core areas sample households' were not willing to pay for any improvement of existing water supply, whilst only 5.6% of fringe areas' population refused to pay for improved private piped water supply. In the fringe areas, sample households' who were not willing to pay were satisfied by the status of the current water supply. In most cases, a respondent's refusal in fringe area is usually associated with not having enough money to pay for the new system. In this area, since they are not piped water supply to deliver the required quantity and quality of water, no one answers they are

satisfied with the current source. In this area, no one believes that water should be provided free.

In the core areas' of the town, respondents refusal is usually associated with not having enough money to pay for the new system, while a significant number of sample households' were responded water should have to provided freely, because it is a basic need to human beings. The remaining households' believe that they were satisfied with the current source, and they are not worrying about improved water supply.

Table 8: Households' reasons for Their Unwillingness to pay

Reason for Un willingness	*Holeta town*		*Fringe areas*		*Core areas*	
	Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*
Water should be provided free	8	28.58	0	0	8	32
Satisfied with the current source	4	14.29	0	0	4	15
Not have enough money to pay for the new system	16	57.13	3	100	13	52
Total	28	100	3	100	25	100

Source: Household survey

4.6 Ability to pay

For any water supply projects, financial adequacy is needed to ensure its sustainability. In order to bring financial adequacy, the first and important thing is to recover the money incurred on the service from users by charging through monthly bill. The costs used in water projects are mainly divided into investment, maintenance and administrative cost. So to make the project sustainable and make it to deliver the required service efficiently and effectively, costs should be recovered and set at cost recovery level. This involves assessing the willingness to pay for the service as discussed in the previous section.

But, only assessing households' willingness to pay is not useful to consumers to charge the tariff rate at cost recovery rate. Rather it is important to see that whether they can afford to pay or not. This involves assessing households' ability to pay for the service improvements.

In the 4.3 sub section, the mean willingness to pay of households' for improved water supply services is 5.23 birr per m^3 of improved water. But before setting the tariff rate at cost recovery level, it is important to know the cost, of improved water supply option which is calculated using Average Incremental cost /AIC/. It is defined as the present value of incremental investment and operation and maintenance cost of the project divided by the present value of incremental water production of project. Or in other words:

$$\mathbf{AIC} = \frac{\textbf{Present Value of Cost}}{\textbf{Present Value of Production}}$$

The data for cost and water production is obtained from town's water supply office estimation. While discount factor is a national parameter set by MoFED for environmental goods such as water projects set at 10.5% annually.

Where present value of costs, represent the cost difference between the project with and without the project, whereas, present value of production represent the different in water production with and without project.

Based on the above formula the AIC calculated is Birr 4.1 per m3 of water produced. Thus the affordability analyses for the three sub groups and the town is done as follow.

a. *Fringe Areas*

From the discussion part, it is assumed that the average water consumption of the households' in fringe areas per month is 5m3, (it is assumed that when improved water supply will be delivered, there is increment in water demand). While the average monthly incomes of those households' were 756 birr. From this the average monthly expenditure for water is 2.7% of their total monthly income. From this, the average monthly expenditure is

20.5 birr/month. This percent is less than the 5% of the average monthly income of the household, implying that if an average household in this sub group consumes the proposed per capita amount of water and buy $1m^3$ of water at a price equal to AIC, it can afford the price based on the 5% rule of thumb of the World Bank.

b. Core Areas

From the discussion part, it is assumed that the average water consumption of the households' in core areas per month is 12 m^3 of water. (it is assumed that when improved water supply will be delivered, there is increment in water demand). While the average monthly incomes of those households' were 1161.59 birr. From this, the average monthly expenditure for water is 4.2% of their total monthly income of those households'. The average monthly expenditure is 49.2 birr/month. This percent is less than the 5% of the average monthly income of the household, implying that if an average household in this sub group consumes the proposed per capita amount of water and buy $1m^3$ of water at a price equal to AIC, it can afford the price based on the 5% rule of thumb of the World Bank.

CHAPTER FIVE
CONCLUSION AND RECOMENDATION

5.1. Conclusion

This paper tried to estimate the households' willingness to pay for improved water supply services in Holeta town of Oromia regional state. It is one of urban areas in Ethiopia, which shows rapid urbanisation due to its strategic nearness to Addis Ababa. A total of 141 households' were interviewed during the survey together with focus group discussion and key informant interview.

In the study a descriptive analysis using tables and graphs were used to indicate the existing water supply situation of the households, their willingness to pay and to indicate their socio economic characteristics.

The results of this study showed that from sampled 141 households', 44.68% were males, while the remaining 55.32 men's. The education level of the respondents shows that, majority of the respondents were categorized under primary education level, of maximum of master's degree and minimum of illiterate. The average family size is 5.1 persons per household. Data about the occupational status of households' reveal that majority of respondents were self employed. With regard to monthly income 1008.76 is the average monthly income.

Responses about the existing water supply situation reveals that, from total respondents 51.1% own piped water supply, while the remaining are using protected spring or well, public hand pump, river and other sources. With regard to sources of water supply disparity can be seen between core and fringe areas. Majority of Respondents' who were not own piped water supply can reveal because of the towns' water supply inability to supply water, they are not own piped water supply. With regard to the current tariff rate of towns' water supply, 25.08 birr is average expenditure for water in core areas, while, 14.08 for fringe areas.

With regard to the current water quality, quantity and reliability, majority of respondents reveals that the current water supply quantity and quality is good but there is a problem with the reliability of water. By level of satisfaction with the existing source only 9% of respondents' are fully satisfied with the existing water supply situation. Responsible persons for fetching water reveal that majorities are women.

Responses from demand for improved water services show that more than 80% of respondents' are demanding improved water service, and the remaining 12% were not demanding the improved water supply because of different reasons they described.

Responses about the improved water supply option provided to households' shows that, if the towns' water supply office will provide them with the improved private water supply solution, 80% of respondents' sees WTP for the service at cost recovery rate. This WTP varies between areas in the town. Towns' with high water problem are more WTP. The mean Maximum Willingness to pay for this improved water supply service is **10.47** per 20 litres/bucket of water, or **5.32** birr per one m^3 of water. This figure is much higher than the existing tariff rate of the town.

Determinants of WTP shows that age, income, Household size, gender are affecting households' WTP for the improved service. WTP is positively affected by household income, implying that higher income households are willing to pay more than lower income households. Sex of the respondent is found to have a negative influence on the respondent's willingness to pay, implying that males are willing to pay more than females. Household size is found negatively related with WTP. Households' who were large number of family size have willing to pay less for the improved water service.

Non willingness to pay for the improved water supply shows that of the total households who were not WTP for the service, they responded that majority have not enough to pay for the improved water service, while the remaining have replied water should be provided free, and totally satisfied with the current source.

The costs incurred on improved water supply were calculated using Average Incremental cost /AIC/. It is defined as the present value of incremental investment and operation and maintenance cost of the project divided by the present value of incremental water production of project. Based on this 4.1 birr/M^3 of water is incurred on improved water supply. The affordability analyses showed that households of Holeta town are able to pay for the new improved water service, if they are provided with the improved service at a price equal to the average incremental cost of supplying the new improved water service. Furthermore, if they are provided with the price of AIC, there is also a possibility of sustaining the improved service.

The respondents' willingness to pay is higher than the AIC of supplying the improved water service, implying that the town's water supply office can earn more revenue, if it sets the price of improved water equal to the willingness to pay amount.

5.2 Recommendation

From the survey done to assess their WTP for improvement in the existing water supply, the following policy recommendations will be forwarded.

- The result showed that Households' are more willing and able to pay for an improved water service at a price equal to the AIC of supplying the improved service. This implies that even if the towns' water supply office provides the improved water service by designing new projects at cost recovery rate, peoples are able and willing to pay for the service. So the water supply office has to design new projects.

- In this study Education of respondents' and Willingness to pay are positively related. From this educating peoples about the benefits of improved water supply can change the people's attitude towards value of improved water.

- When we see WTP frequency range, some lower income households' were not able to afford the price at a cost recovery rate. So, when it was designed a new improved water supply system, cross subsidization from the rich to poor must be done. Because as we all know water is a basic need of human life, if they cannot afford to pay, we are not prohibiting them from using it.

- In this study only the demand side of water supply were assessed. But proper utilisation of the revenue must be done. The revenue gathered from the sale of water should be expended in efficient and effective manner. Because if the resources will not be used in such a manner the towns' water supply office in unable to go in line with cost recovery manner.

- Since some respondents' responded they are unable to cover the connection fee, the towns' water supply office should have to cover the connection fees, by dividing and aggregating into monthly tariff bill.

- The WTP results provide an early indication of the need for enhanced future management arrangements that are necessary to provide adequate, reliable, and sustainable water services. Developing capacities to achieve these changes needs to be incorporated in new project plans.

- Since the existing water supply system cannot satisfy the existing demand, which lead to the availability of water only for some hours per day or makes the availability unpredictable, people of the town are forced to buy water from vendors, or using unreliable sources and waste time in fetching water. However, if improved water services are supplied to the households, it can increase its revenue by increasing the water tariff, since households are willing to pay more than the existing tariff rate.

- The tariff rate households' were willing to pay is higher than the cost of providing the service. From this point, first since the cost of providing the service is less than the

households WTP and ATP, if private companies will be involved in this service delivery program, they will be benefited and benefit the community. Second, the town water supply office will have to provide the service in the near future, since households' were and able to pay for the improved water supply service. The cost of providing the service will be covered by monthly tariff.

- To conclude the recommendation, existing past researches done on affordability and willingness to pay for the improved water supply services in different urban areas of the country such as Debrezeit, Meki, Nazret, and Mekelle reveals that households who were found in urban areas of the country were willing and able to pay full cost for the improved water supply services. This helps to maintain the sustainability of the service and helps the national and local governments to reach their service level to the maximum level.

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Annex 2: Questionnaire

Hello my name is Fekadu Megersa, I am conducting the research for a partial fulfilment of MA in water resources planning and management at college of development study, Addis Ababa University. I have been granted permission from the towns' water supply authority to undertake the research o n households' willingness to pay if the current status of water supply services of your town is improved. The correct answer you have to provide is the most important factor influencing the town water supply. Your answer is kept confidential. During the interview if there are any questions that you would like to ask please feel free. Thank you for your cooperation.

Part I: Socio Economic Characteristics of Respondents

1. Interview Code: _____
2. Sex: 0=male, 1=female
3. Age of respondents _____ Years
4. Position in household

   1= male, head of household

   2=female, head of household

   3=female of household who is not head

   4=brother or sister of head of household
5. Educational level: _____ grade
6. Total income of household/month _____ birr
7. Occupational status

   1=self employed

   2=employed in private and NGO

   3=government worker

   4=unemployed
8. Total number of people living in the house? _____people
9. Rank the following items interms of you incurred on them monthly

1=house 2=food 3=consumption 4=transportation

5=Education 6=Telephone 7=Water 8=clothing 9health

10. List the following services in order of importance(Rank them)

1=school 2=Health 3=Water

4=Sanitation 5=Road 6=Electricity

7=Telephone

11. How long have you been living in this town? _____ years

12. Do you rent or own house?

1=own 2=rented 3=other

13. Number of rooms by household unit excluding bathroom _____ rooms

14. Do you have electricity? 1=yes 2=no

15. Do you own television? 1=yes 2=no

Part II: Existing Water Supply Situations

1. What is your households' main source of water

1=protected spring or well

2=river or stream

3=public hand pump

4=water vendor

5=own private well

6=shared connection

- If the answer for Question number 1 is e and f go to Q 2 to 19 and 31 to 32
- If the answer for Question number 1 is a, b, c, and d go to Q 20 to 30 and 31 to 32
- If other, decide which section is most suited (does water supply involve buying water or free supplies)

2. Is the connection shared with other households'

1=yes 2=no

3. If yes, how many households' shared the connection _____ Households'

4. Do you sell water to neighbours, or other organisations or groups?

   1=yes 2=no

5. In question 4, if the answer is yes, how much do you sell water per 20 liter jerrycan?

   1=up to 10 cents

   2=11-20 cents

   3=21-30 cents

   4=31-50 cents

   5=>50 cents

6. How much on average do you pay for you water consumption per month from source? _____ birr per month

7. How do you judge the existing tariff of towns' water supply office?

   1=too expensive 2=too cheap 3=fair 4=it is difficult to judge

8. Do you get tape water at a desired time and quantity?

   1=yes 2=no

9. If the answer for question 8 is no, from where do you get additional water?

   1=from vendors 2=from rivers 3=from springs 4=from well 5=if other specify

10. If the answer for question 9 is from vendors, how do you judge the price compared with the town water supply tariff

    1=it is less 2=it is the same 3=it is more 4=it is so more

11. During at what time do you face shortage of water?

1=Night 2=Day 3=Morning 3=noon 4=it is not possible to tell the exact time

12. From your experience, how often you get piped water within 24 hours?

_____ hours

13. Is there any time where piped water is completely absent?

1=yes 2=no

14. If your response to above question is yes how many days when water is absent?

_____ days

15. How do you rate the state of the service of piped water your house hold use?

i. Quantity

1. Good ii) average iii) not good

ii. Quality

1. Good ii) average iii) not good

iii. Reliability

1. Good ii) average iii) not good

16. Does your household use any purification method to clean piped water before drinking?

1=yes 2=no

17. If your answer for question 16 is not what are your main reason

1=Water is clean for drinking

2=Purification is time consuming and costly

3=Is not clean but no side effect on health

18. Generally are you satisfied with existing piped water service?

1=Yes 2=Averagely 3= No

19. If not what are the main causes of your dissatisfaction?

1=Poor quality

2=Unreliability

3=If other _____

20. How far is the water source from your home?

1= <20m 2= 21-50 m 3= 51-100 m 4= >100 m

21. How long does it take to walk to water point and back again?

1=Up to 5 minutes 2= 11 – 20 minutes

3= 6 – 10 minutes d.4= >20 minutes

22. How long on average at peak time do you have to queue at water point?

1=No queue at all

2=Queue for 5 minutes

3=Queue for 10 minutes

4=Queue for > 10 minutes

23. If public tap and water vendor how much time on average do you go per day for fetching of water?

_____times

24. If public tap and water vendor how many persons from the household go at a time to fetch water from this source? _____ persons

25. If public tap and water vendor who often go to the public tap to fetch water?

1=Girls' 2=boys 3= mens 4=women

5= it is impossible to tell

26. How much water is on average do you use daily _____ bucket (20 litres of jerry can)

27. If public tap and water vendor, how much do you pay per bucket? (20 litres of jerry can)

1=Up to 10 cents

2=11-20 cents

3=21-30 cents

4=31-50 cents

5=> 50 cents

28. If your current source of water is public tap and water vendor why you don't have your own connection or yard connection?

1=High connection cost 2=Water office is unable to deliver the service

3=the house is not mine, rented 4=Scarcity of water

5=I don't want to have yard connection 6= If other _____

29. Why do you prefer those sources?

1=Access to piped water is difficult

2=the pipe water is too costly and not affordable

3=Source is more reliable

4=this source has better quality

30. Does your household use any purification method?

1=Yes 2=No

31. If no what is your reason?

1=Water is clean for drinking

2=Purification is time consuming and costly

3=is not clean but no side effect on health

32. What type of disease affected has affected any members of your family of over 12 years in the last one year. (if there insert the number of patients)

1=Diarrhoea 2=Malaria

3=Vomiting____ 4=Typhoid _____ 5= If other _____

PART III: Willingness to pay Questions

The following questions are based on a split bidding game. Enumerators were asked to start at one of three prices, either at highest, middle or lowest price. The respondent was then given the opportunity to raise or lower their bid in the increments offered.

The provision of improved **water** service among other things means, good quality of **water** which is safe for health and an increased amount of **water** available for use .It also means a highly reliable source at any time (7 days a week, 24 hours a day) moreover; the family need not have to spend its time and effort in fetching **water** from distant sources.

Now, let us assume that you have an option for a private connection to such an improved piped **water** supply scheme. The improved system will provide you with as much **water** as you wish at any time of the day, throughout the year.

Let us also assume that you will be charged a monthly **water** fee based on the volume of **water** your household consume in a month (the tariff is Progressive), the more you consume the higher will be your monthly bill. The tariff per volume will be the same for all consumers. You may not be required to pay initially the costs of connection to the new scheme. In stead, it will be distributed over several years in your monthly bill (The payment will be built-in the monthly **water** bill). You are required to pay a minimum of at cost recovery after the improved water supply has been came into effect

33. Are you willing to pay any amount to the proposed scheme?

1=Yes 2= No

34. If the price (tariff) your household pays for obtaining **water** from this system is ***7*** cents per baldi/insira (20 liters), would your household choose to connect or prefer using other sources of water. (20 cent as a highest starting bid price, the enumerator has to make less and less and asks respondents)

1=Yes 2= No

35. What is the maximum price you are willing to pay for 1 bucket of water?

_____ Cents

36. If no price is recorded in Q.3 the reason is

1=Water should be provided free of charge ___

2=You are satisfied with existing source(s) ___

3=I would not have enough money to pay for the new system ___

4=Others (specify)_____

Annex 3: Summary (Descriptive Analysis)

Variables	*Observation*	*Mean*	*Std. Dev.*	*Min*	*Max*
WTP	141	10.4681	5.023592	2	30
INCM	129	1016.58	850.1843	100	4800
GNDR	141	0.5461	0.499645	0	1
AGE	141	38.8794	11.94659	20	85
HHSZ	141	5.0922	2.518221	1	13
HOUSE	141	1.31915	0.551869	1	3
EDCN	139	2.59712	0.953403	1	4
STSFN	141	2.31206	0.611027	1	3
OCCPN	134	1.85075	1.007546	1	4

WTP	*Freq*	*Percent*	*Cumulative*
2-5	6	20.57	20.57
6-10	72	51.06	71.63
11-15	24	17.02	88.65
16-20	13	9.22	97.87
21-30	3	2.13	1009
Total	***141***	***100***	

HHSZ	*Freq*	*Percent*	*Cum*
1-3	41	29.09	29.09
4-6	64	45.39	74.47
7-10	32	22.69	97.16
11-13	4	2.84	100
Total	***141***	***100***	

EDCN	*Freq*	*Percent*	*Cum.*
1	17	12.23	12.23
2	51	36.69	48.92
3	42	30.22	79.14
4	29	20.86	100
Total	***139***	***100***	

House	*Freq.*	*Percent*	*Cum.*
1	102	72.34	72.34
2	33	23.4	95.74
3	6	4.26	100
Total	***141***	***100***	

Gender	*Freq*	*Percent*	*Cumulative*
Male	64	45.39	45.39
Female	77	54.61	100
Total	***141***	***100***	