WILLINGNESS TO PAY FOR IMPROVEMENTS IN WATER QUALITY AND SERVICES: A CASE STUDY OF MULTAN CITY

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Junaid Ishaq

Dedication

To my parents who prayed for me a lot and their prayers are always with me and may ALLAH bless them with good health and keep them live long.

Certificate

Abstract

This study analyzed the status of drinking water supply and quality and customers willingness to pay for improvement in drinking water supply and quality in Multan city. Required information was collected from through stratified sample of selected 210 households from Shah-Rukun-e-alam and Mumtazabad. The contextual information was analyzed through descriptive statistics and weighted average indexes whereas the demand function for hypothetical improvements was determined using multiple bound choice Contingent Valuation Method (CVM) and Logit regression. The findings revealed that respondent accorded high importance to safe drinking water compared with other household needs. This was because of their high level awareness about the link between health and safe drinking water. Respondents used multiple sources of drinking water. Tap water, water from public filtration plants and borehole were the primary, secondary and tertiary water sources, respectively, in the study area. Most of the households perceived the quality of their existing drinking water as good for drinking purposes. Such perception was not well grounded as most of them relied on their sensory appraisals of water quality and only a little more than one fourth of them had tested their water from laboratory. In such situation, despite awareness insignificant attention has been devoted to in-house water treatment. Situation of drinking water storage was relatively satisfactory as about half of the respondents were using insulated and simple plastic canes cleaned on weekly basis while most of the remaining households were storing it in rooftop tanks cleaned twice a year. Almost all of those bringing water from publically installed filter plants were storing it in cane. While half of those using tap water for drinking purposes were storing it directly from supply line before it is released into rooftop tank for washing purposes. The remaining half of the households using tap water were storing it in rooftop tanks and using it for all purposes including drinking. Despite high level of satisfaction with water quality and supply, people could come with the demand for some of the improvements. Seemingly, demand for improvement in supply parameters has exceeded that of the quality parameters. Even in service improvement, high demand was observed for improving reliability through installation of generators and establishment of customer care. Most of the respondent realized government budget constraints in providing demanded improvement. Within the bounds of certain degree of surety and confidence, it would be safe to expect that significant majority of the respondents would pay PKR 100 in addition to the amount they are paying at the moment. Most the WTP in this study is explained by level of people's awareness about the water and health consciousness. Among the most significant variable leading to major increase in peoples WTP included per head income, number of children under 14 years age, knowledge about health and water linkage, knowledge about the actual water quality tested through laboratory explained major proportion for their WTP for improved drinking water quality and supply. The study recommend different options as mobile water testing laboratory and health care complain through clinics, use electric and print media for raising awareness in order to raising people's WTP for safe drinking water.

Keywords: Willingness to pay; Drinking water supply; Drinking water quality; Waterborne diseases; Water and Sanitation; WASA; Multan city.

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List of abbreviations

CVM	Contingent Valuation Method
DDA	Demand Driven Approach
DMA	Demand-Side Management Approach
EPD	Environmental Protection Department
GDP	Gross Domestic Product
HH	Household
IDRC	International Development Research Centre
JSDF	Japan Social Development Fund
KAP	Knowledge, Attitudes and Practice
LPP	Lodhran Pilot Project
MBDC	Multiple Bound Discrete Choices
MDGs	Millennium Development Goals
MLD	Million Liter Per Day
MoE	Ministry of Environment
Mum	Mumtazabad Town
NGO	Non Governmental Organization
OI	Official Interview
OLS	Ordinary Least Squares
OPP	Orangi Pilot Project
PDHS	Pakistan Demographic Household Survey
PHED	Public Health Engineering Department
PKR	Pakistani Rupee
Ppb	Part per billion
Ppm	Part per million
PSDW-HPP	Pakistan Safe Drinking Water and Hygiene Promotion Project
PSLM	Pakistan Social and Living Standards Measurement
RCC	Rural Communal Committee
SD	Standard Deviation
SDA	Supply Driven Approach
SPSS	Statistical Package for the Social Sciences
SRA	Shah Rukun-e-Alam Town
TDS	Total Disolved Solids
TMA	Tehsil/ Town Municipal Administration
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
USD	United State Dollar
WAI	Weighted Average Index
WASA	Water And Sanitation Agency
WHO	World Health Organization
WTP	Willingness to Pay
WWF	World Wide Fund for Nature

Chapter 1. Introduction

Safe drinking water is the basic need of human beings. Compared with the three-fold growth in the world population over the last 100 years, the water use for human purposes has grown six folds (Cosgrove & Rijsberman, 2000). Almost one billion people are without access to safe drinking water while about three million die every year due unhygienic practices and waterborne diseases (WHO, no date). The underlying cause of these trends have roots in the domestic environment and drinking water contaminated with viruses, bacterias and parasites (Hussainy, 2007). Developing nations are more affected compared with the developed nations because of improper sanitation, and inadequate and unsafe water supply (Demena et al., 2003). Like other developing nations, Pakistan also has threats of water safety and scarcity as it is not only a semi-arid to arid country (Majeed & Piracha, 2011) but also the sixth large population in world (Government of Pakistan, 2013). In such environment, water is increasingly scarce and per capita water availability is decreasing amid rapid population growth. The annual per capita water availability, that was 5,800 cubic meters in 1951, has decreased to 1,100 cubic meter in 2006 (Habib, 2008 cited in Tahir et al., 2011). According to World Health Organization (WHO), about 85 million Pakistanis lack access to safe drinking water (PCRWR, 2009) and even Government of Pakistan (2011) confirms these figures.

WWF Pakistan (2007) in their report titled “Pakistan’s Water at Risk” has revealed that the rapid population growth and unsustainable water consumption in industrial and agricultural sectors have created stress on the quantity and quality of water resources in Pakistan. The quality of ground and surface water is low and further deteriorating due to increase in anthropogenic activities such as disposal of untreated industrial and municipal wastewater and excessive use of fertilizers and insecticides (Khan & Javed, 2007). Changa Pani (2011) has reported over-exploitation of the groundwater resources by thousands of new tube-wells are installed in Pakistan every year. Yet there is no any stringent policies to regulate groundwater use and aquifer quality and property rights on groundwater in the most populated province of Pakistan (Government of Punjab, 2007). Water and sanitation are some of the important aspects to achieve the sustainable society. Research indicates that 80 percent of the diseases in children of developing countries are due to polluted water (Buchanan, M.K., 2006 cited in Changa Pani, 2011). It is concluded that 30 percent diseases and 40 percent deaths in Pakistan are caused by poor water system (Haydar et al., 2009). This results in various kind of waterborne diseases including Diarrhea which itself is the second leading cause of morbidity in Pakistan as about 22 percent of all deaths occur due to Diarrhea (PDHS, 2008). The main victims of Diarrhea are children as nearly 70,000 of the below 5 years of age child deaths are attributed to this silent killer (PDHS, 2008). Another disease that is also caused by contaminated water and sanitation is the Hepatitis. Reportedly, every 10^{th} Pakistani is infected of hepatitis (Changa Pani, 2011). This situation incurs heavy economic cost in shape of livelihood and productivity. Every year, an estimated amount of about PKR 112 billion has been lost on account of the inadequacy of water supply, hygiene and sanitation facilities (Ministry of Environment, no date). Improved water supply system can reduce this social and economic cost occurring due to this aspect of public lifestyles.

1.1 Problem statement

Access to clean and safe water is the fundamental human right for every individual in any society. A research conducted in 28 districts of Pakistan reported that about 70 percent of the respondent households considered that odorless and colorless water was drinkable despite that their water was contaminated and could cause various waterborne diseases (Ministry of Environment, no date). Governments in developing countries, such as in Pakistan, continuously invest in improving water and sanitation services but given the shortage of funds, the provision of these services is almost always insufficient. The demand of funds in provision of these services is so high that even foreign aid and national and international nongovernmental organizations initiatives shortfall. For example, water sector infrastructure improvement expenditure of Calcutta were round about $264 million at the 2001 prices (Majumdar & Gupta, 2009). In such situations, it is often very much difficult for government to bear such expenses that is why this sector is underdeveloped.

In order to address these problems, the Demand Driven Approach (DDA) has been widely used. Under this approach, those who demand for safe drinking water and sanitation are supposed to pay for it. This apparently straightforward solution is however difficult to implement due to various reasons. For example, studies such as Fissha (2006), Harapap and Hartono (2007) and Olajuyigbe and Fasakin (2010) have found that peoples' willingness to pay for safe drinking water depends on their ability to pay or income, education, family size. Beside these generally considered variables, Akram and Olmstead (2011), added water treatment Sattar et al. (2007) modeled awareness, and actual water quality and Zhang (2011) and Imandoust and Gadam (2007) incorporated general situation of infrastructure. While the above studies have provided us deep insights on our understanding of the determinants for willingness to pay (WTP) for improved drinking water, there are two fundamental problems limiting our understanding of the causality. Most of the models of WTP studies had been detached from the context and very rarely provide adequate description of the community views of their existing water supply both for its quality and quantity. For example above the referred study by USAID shows that people perceive the quality of their drinking water based on its physical appearance instead of its chemical composition. In such a case, despite being able to pay, people might not be willing to pay as they consider it as an unnecessary expenditure. Similarly, considering education as a determinant of WTP has a severe problem. Ultimately it is the awareness not only about the waterborne diseases but also the perception, no matter right or wrong, of the quality of existing water supply, that may motivate people to pay to for the improvements.

Another problem that has also been observed in most of the WTP studies on improved drinking water supply, is the fact that despite based on primary information, the questions asked from the respondents are designed in a way that best capture the opinion of respondents but not of household as a whole. It is then considered that opinions of respondent those of their households as a unil, which would certainly be a mistake. In line with these shortfalls, almost none of the research studies on the subject have ever attempted to answer that to which agencies the communities are willing to pay. In other words, do they trust government, private sector, NGO or themselves for the improvement in the public services? Given the significance of all this information before trusting any WTP studies, it is utmost important to design such studies in a way that not only gather a lot of contextual information but the information that best represents the opinion of household as a whole rather than the opinions of an individual member of the unit and their trust in institutions. This study applies the proposed conceptual modification by investigating the willingness to pay of urban customers in Multan City located in Punjab Province of Pakistan. The findings of the study will not only serve as useful guide for the improvement of drinking water supply in Multan City but will also serve as an important conceptual framework for similar studies in Pakistan and elsewhere.

1.2 Objectives

The broader objective of the study will be to analyze the drinking water market in Multan City of Punjab province in Pakistan. More specifically it will attempt to achieve following objectives:

1) To gather the customer view of the importance of safe drinking water quality, demand for improvement in the service delivery and their willingness to pay for it.
2) To determine the factors influencing people's willingness to pay for improved drinking water service delivery.
3) To recommend the improvements in the existing drinking water service supply to the city based on the local demand.

1.3 Conceptual framework

Willingness to pay is economic value that a person is ready to sacrifice for getting a good or service. Willingness to pay concept is related to Equivalent Variation[1] and Compensating Variation[2] (Harapap & Hartono, 2007). Finding willingness to pay for any good or service requires the analysis of household characteristics, level of awareness about the important of that service, quality of existing services delivery and other variables. The household characteristics taken in this research are family income, family size, age, education, number of children, daily requirement of services, access to services and expenditure on drinking water services. Family income is the main determinant of household's willingness to pay for safe and improved drinking water as the increase in income may increase the demand for quality of services (Arouna & Dabbert, 2012; Genius et al., 2008; Wang et al., 2008). The low income household may not be WTP for quality because of their strategic focus on the basic necessities of life rather instead of quality. However, as Wang et al. (2008) observed that high level of awareness for the importance of safe drinking water among even low income household may also make them WTP as an attempt to preempt the waterborne diseases and to reduce their expenditure on medical cure.

Awareness of water quality and its relation to diseases is an important factor to describe the satisfaction of the people with available water and affect the demand for improved water services. An study carried out in Hyderabad Pakistan by Sattar et al. (2007) found that awareness of safe drinking water was the most significant factor motivating people on adopting any particular method of water purification. Education of interviewee is taken. The more education expected more conscious to water quality and its impact on human. They would be more willing to pay to get the best services. Sattar et al. (2007) found that people are willingness to pay of higher educated persons is 784 percent higher than illiterate people. Most of the studies such as Haq et al. (2007), Wang et al. (2008), and Genius et al. (2008) have considered education as a proxy of awareness. While education may be one of the primary sources of awareness on the importance of safe drinking water, it may also come from various sources such as electronic media, print media, doctor, friends and self-observation.

Quality and quantity of available water plays an important role in determining the value

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[1] The amount taken from the individual to make him worse off / better off of price change at new utility level.
[2] The amount of income given to an individual to compensate him from price shock and keep him at same utility level.

which the people are willing to pay for improvement of water services. If the available water is considered already safe to drink, available in adequate quantity and people are satisfied from it then they may not demand any further improvements and thus there will be no any WTP for it. But if the people are not satisfied with both the quality and quantity of existing water services, their WTP would directly proportional to their perception on the importance of water quality and quantity. Um et al. (2002) analyzed that water quality of Pusan also known as Busan second largest metropolitan city of South Korea is good and direct drinkable from tab. The people of area perceived it not good, they are not satisfied from it and they use different way to purify it because they don't like to use it without further treatment, and they demand improved water services. Actual water quality consists on physical, chemical and biological parameters. Nevertheless, in most of the cases, people ignore chemical and biological parameters due to lack of their awareness and formal testing of water quality in the developing country in general and Pakistan in particular. Thus the actual quality of drinking water as may not affect the willingness to pay but the attributes which can easily be observed through people's own sensory analysis may better determine their willingness to pay. Often than not, people perceive the quality of drinking water by its physical attributes observable through their senses. The sensory analysis of color, odor, taste, contamination and hardness may enable them to determine the quality of the water available to them.

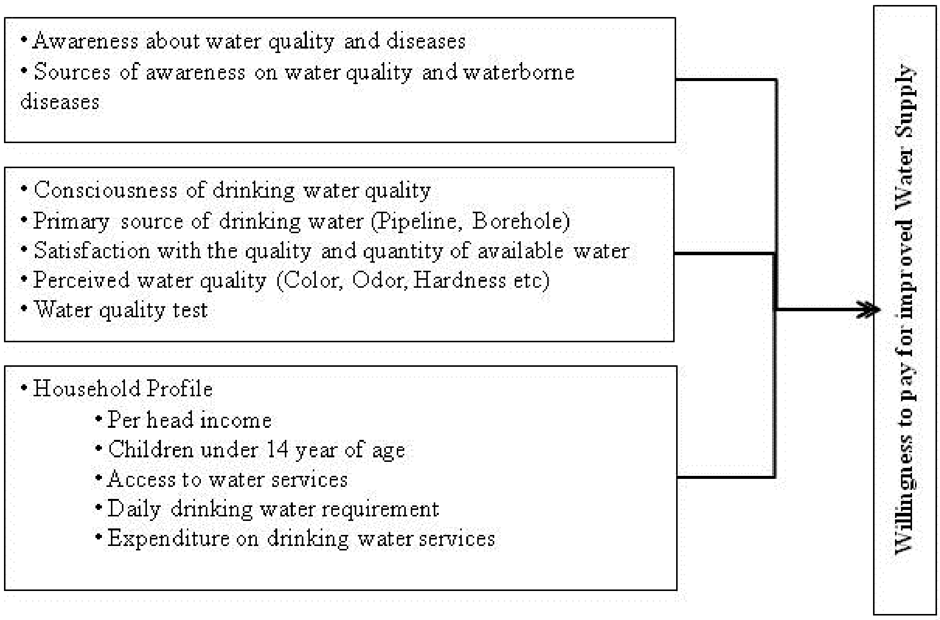

Figure 1.1: Conceptual framework

Children in a household play an important role in their decision making for water services improvements. Normally the household are more careful for their children. The household having children at home are more willing to pay for improved water services or they prefer water treatments (Genius et al., 2008; Lee & Kwak, 2007). Expenditure on drinking water services also affect the willingness to pay for water quality and services improvements. The households already give treatment to drinking water are more willing to pay for water quality improvements. As some studies like Lee and Kwak (2007) and Rosado (1998) analyzed that the spend money for water treatment and they prefer to pay if they get some improved drinking water. Even water service parameters such as timing and duration, interruption in service, quantity supplied, and distance from availability of tap may affect people's WTP.

1.4 Rationale

In water, hygiene and sanitation sector the last knowledge, attitudes and practice (KAP) research was implemented by UNICEF and Ministry of Environment Pakistan in the year 2001. Since that time there is very improvement occurred in education and social sector. This study is an attempt in this direction to check behavior change, people's preferences and government activities in this sector. Water And Sanitation Agency (WASA) and Tehsil Municipal Administration (TMA) are the responsible for water and sanitation services in Pakistan. The tariff they received from household are not sufficient even for operating cost (Government of Punjab, 2007). The reasons are low rates and poor collection of tariff. This leads to poor service, maintenance and distribution. This leads to a burden on government. The Economist believes that environmental issues arise due to failure in giving appropriate prices in relation to resource (Tanrıvermiş, 1998). A sample survey of India indicates that about 95 million liter per day (MLD) of water flows through stand posts in Calcutta of which just 50 MLD is used by consumers (World Bank, 2001 cited in Majumdar & Gupta, 2009). Wastewater generation is calculated at a minimum of 80 per cent of water supplied (National Institute of Urban Affairs, 2005). The access to groundwater is reported as 79 percent of population of Punjab province (Tahir et al., 2011). The household access to water supply services is accounted as 55 percent of population. However the household has access to water supply system is more than 75 percent in Rawalpindi, Sialkot and Lahore, and less than 30 percent in Bahawalpur, DG Khan and Gujranwala, and near about 20 percent in Multan (Government of Punjab, 2007). But this is not considered the water supply quality, quantity and duration.

This research is based on ground realities, that can't be neglected. This study tries to find out the demand of drinking water improvement that is demand driven approach (DDA), the government is not in situation to face such type of expenses. If this type of research is not conducted then it would be hard to maintain quality water supply to public. Awareness to water and health linkage is very much necessary to safe waterborne diseases, that leads to better health and economy. This research tried to find out the most effected sources of awareness that leads to increase public awareness regarding safe drinking water and health linkages. This research would highlight the water related issues of public, that cannot be undermine for better services.

1.5 Scope and limitation

This study is an initiative in water and hygiene sector to check the gap in services provided to people by the government. This study analyzes the people's expectations and the actions and measures the government took to meet the challenging issues arise with polluted water. People are asked their preferences and the action they are ready to take in this sector to assist the government. The government cannot handle this sector alone due to lack of finance. In today's world people's participation in this sector is arise and they handle it themselves. This research is a try to ask people knowledge for their water conditions and the expected solution of this, and ask them their willingness to pay to improve the water conditions. This study based on DDA and find people's demand for improved water services. In this way a good market price can be assigned to water, acceptable by people, and very much important to stable market and resource. This study can perform functions of a bridge between government and the public. This research is trying to analyze the demand side function that can be used to set the new price. These types of studies can be done in various cities to find the attitude of people of different places. This can help to make policies to improve the safe drinking water availability in Pakistan. As it is our objective to find determents of WTP. There are various cities like Multan, the findings of this study can be implement there also.

This study contains some limitations also. When area for research is selected it was a thought to take similar towns to get data and compare the results, but when data collected and make analyses on data then found that the results are homogeneous, and not comparable. It would be better to take two different types of areas for this study that can compare and do some analyses on that characteristic base, and find the appropriate reasons on that analysis. In questionnaire construction while asking about the household preference for different services it missed to ask them about the schools as a service. While data collection schools, colleges, hospitals and offices are not included in our data sample. While asking about the willingness to pay, this study neglect to ask about the different aspect of improvements as quality improvement, services improvement, and both or any other category as improvements in different aspects in services and quality. The reason behind this was that this research would unable to offer people different aspects of improvements without knowing of their demands. If directly ask them about that, in that case the questionnaire would be expected to be more complicated. That is why while asking them about their willingness to pay for improvements, in fulfilling the case whatever they demanded.

1.6 Organization

After this first introductory chapter, Chapter 2 analyzed the literature related to water pricing in different time periods and at different places, their awareness about water and health, financial affordability and attitude to make the services and quality better. Chapter 3 presents the way that used to collect data and methodology that is used to analyze the data. Later Chapter 4 consists of community view about existing drinking water situation, awareness about the water to health linkages, satisfaction from water services and demand for improved drinking water services, quality and trusted institution. Later on in Chapter 5 elaborate relations between different variables, determinants of willingness to pay are discussed and fitness of the model is discussed. Later in last Chapter 6 consist on summary, conclusion and recommendation for policy and for further research.

Chapter 2. Literature review

The chapter presents the state of the art literature review on the importance of safe drinking water, its demand and supply and methods used for the measurement of demand. The chapter has been divided into four sections. Section 2.1 provides global state of access to safe drinking water and is followed by Section 2.2, problems with delivery of safe drinking water has been analyzed and elaborated. In section 2.3 different models for provision of access to safe drinking water are discussed while in the Section 2.4 discusses different variables affecting customer's willingness to pay and issues in its measurement. In Section 2.5 different methodologies for estimating safe drinking water is discussed and in the end of the chapter in Section 2.6 the hypothetical markets are discussed. In nutshell this chapter provides background information for the statement of research problem narrated in Section 1.1 of Chapter 1.

2.1 Global state of access to safe drinking water

Water supply in Ethiopia starts almost with beginning of twentieth century. Basically it was provided free of cost. But later on the price for drinking water was assigned. Even this Ethiopia faces lowest water supply services in Africa and drinking water availability is not up to World Health Organization (WHO) standards (Tarfasa & Brouwer, 2011). Addis Ababa is capital city of Ethiopia. Here pipe water is available since 1901. Later in 1927-28 a flat rate was being introduced for supplied water. In 1945 meters installed and a flat rate of birr 0.50/m^3 was fixed. It remains unchanged for next fifty years. In 1995 a rate is introduced having a partial cost recovery but not even to bear operating and management cost. Now the policy indicates to recover full cost. The average per capita water consumption is 18.97 liter. And the price of water is fifty cents by private vendors and three cent by government per bucket of twenty liter (Fissha, 2006). In Shebedino District, Ethiopia respondents used protected, unprotected water sources and both of these sources. The water services were charged however 27 percent respondents choose the water source free of cost, 34.9 percent reported to pay 5 cents or less per 25L water and 28.1 percent were paying 20 cents or more for same size of water bucket. The average payment was 8.05 cents for 25L water bucket (Behailu et al., 2012).

Ministry of Mineral, Energy and Water Affairs make responsible Department of Water Affairs for water supply in peri-urban area and villages of Botswana while for urban areas it was provided by Water Utilities Corporation. Mostly ground water used for drinking purpose, borehole ranging from 20 to 60 meters was used. In Maun the department charged water according to its usages, as water usage increase the per unit bill increased. The average 0-5 m^3 users were charged P0.9/ m^3 , 6-20 m^3 users charged P2.3/ m^3, 21-40 m^3 user charged P4.75/ m^3 and more than 40 m^3 charged P5.5/ m^3 (Mmopelwa et al., 2005). In Kampala majority of peri-urban area get water by public stand posts. A large portion of population gets water from protected springs free of cost. They can carry water from there easily and they consider it safe to health. They often used it for daily use as well as for drinking. On average stand posts charge Ushs 50 per 20L bucket and cost of it was Ushs 15.68 for public stand posts and Ushs 24.26 for residential connection (Kulabako et al., 2010). In La Argentina steps taken by Rural Communal Committee (RCC) for independently and self-financed drinking water system. In Heredia monthly water bill fixed ¢6,000 for 23 cubic meter. And they charged ¢300 for every additional cubic meter. In this way their average monthly bill is near about ¢10,000 (Kaplowitz et al., 2012).

Lahore is second largest city in Pakistan; it relies on three main water supply modes. Those are water and sanitation agency, cantonment authorities and household water pumps. Water quality is not so much good and safe to health, monthly fixed water bill was charged, varies on based on number of taps and fixture in household (Akram & Olmstead, 2011). In 5 major urban areas of Punjab (Lahore, Faisalabad, Multan, Bahawalpur and Rawalpindi) 55 percent peoples have access to tap water and on average they were being charged PKR 135 per month for water supply services. People were highly demand quality water supply services as 98 percent households express interested to this kind of services but in relation to improved quality and nonstop water service (World Bank, 2007). In some area of Pakistan community managed services are started, where the local community take responsibility of these services (Ali, 2002; Robinson, 2005).

Harapap and Hartono (2007) found that drinking water quality of Indonesia was not up to mark. Near about 22.31 percent of population had no access to safe drinking water and 72 percent of them lives in less developed area. In urban area availability of pipe water increased the rent of house. A large proportion as 88 percent urban population of state of Espirito Santo, Southeast of Brazil had access to water supply services in 1991 (Rosado, 1998). In Bangladesh almost 93 percent people of sample area get drinking water from tubewells. Mostly the water was arsenic contaminated. People used different ways to purify water and they spend a lot of money on it. The methods used for mitigation of arsenic were not permanent and secure (Ahmad et al., 2003). In Kolkata existing water supply services were not sufficient as for quality and quantity. Near about 75 percent spending on these services were being financed by subsidy. It was analyzed that in residential area 77 percent households are currently using some techniques to purify water but in slum area no any such practice is seen. The estimated average household expenditure was Rs. 168.72 per month. But there was a wide variation as from minimum Rs 1.97 to maximum Rs. 887.5 per household per month (Roy et al., 2004). In Kanye a town of Botswana the water supply services was started in 1972 under the Village Water Supply Program. Mostly that time used standpipe now they demanded the private water connection to save their time (Mbata, 2006).

Um et al. (2002) reported that the water quality of Korea was not bad to drink but people here not preferred to drink untreated water. According to Pusan Waterworks survey 1995 only 1.4 percent population of Pusan used to drink untreated water. They were paying $13 monthly as water bill. That was very much low portion of their average monthly income as just 0.54 percent of that. A large portion of respondents as more than 78 percent reported to unpleasant with this water situation. And no one of the respondents use to drinking untreated water. In China water quality was determined in shape of grades as and after grade 3 the water situation is not considered to be drinkable. And the water of the lake was considered of the grade 3. This lake served 33 million people including users for drinking purposes. According to our survey 58 percent of respondents were not satisfied with the quality of the lake water (Zhang, 2011). Lee and Kwak (2007) took survey in Seoul Metropolitan, Korea of 810 respondents and counted that they were used four types of practices for water purification as 49 percent of them used boiled water, 37 percent used filtered water, 10 percent used bolted water and 4 percent used to bring water from springs.

2.2 Problems with service delivery

World Health Organization (WHO) set a standard for daily water requirement and many studies shows that the people are getting less water, as WHO fix standard 45L per capita per day and in Ethiopia their average consumption is only 15L per capita per day. Currently the household receive 4 days water supply and consume 100L per day (Tarfasa & Brouwer, 2011). Fujita et al. (2005) considered that minimum water requirement of per person per day was 30 liter in Peru and found that 70.7 percent household had water supply. Quality of water service is also very much important as In Kanye a town of Botswana the water supply service was started in 1972 under the Village Water Supply Program. Mostly that time used standpipe and now the problem is low pressure and long queue to wait for water. They survived 135 households and 99 percent of them were willing to pay for private connection (Mbata, 2006). In Peru the water supply was not satisfactory due to time restriction or low pressure and they are not satisfied with these problem and they demanded solution for these issues (Fujita et al., 2005).

Safe drinking water is very much important to economic growth thus every 0.3 percent investment increase in access to safe drinking water of household brings 1 percent increment in gross domestic product (GDP). Peoples may get water free of cost but it is charged to make services better as supply, reliability, quality and for sustainable use (Behailu et al., 2012). Main issue of safe drinking water is raises due to financing issues, as concern about the water supply services in Ethiopia, it is observed that consumers are paid only 15 percent of that and the local government is also contribution near to 15 percent and rest of it (70 percent) is paid by international aid agencies (Tarfasa & Brouwer, 2011). Calcutta Municipal Corporation was responsible to water services in Calcutta. A limited numbers of households were provided by connections but mostly of them were not paid for it. However Calcutta Municipal Corporation had taken steps to include consumers in tariff net (Majumdar & Gupta, 2009).

Mostly water meters are not installed that leads to wastage of resource, and the consumer not paid as they use water as in case of Lahore, Pakistan analyzed households were paying fixed monthly water bills because generally there no water meters installed. Bills were varies based on number of taps and fixture in household (Akram & Olmstead, 2011). In Peru it is found that 70.7 percent household had water supply and only 22.7 percent of them installed water meter(Fujita et al., 2005). In Calcutta Water stand posts installed here and near about 45 million liter out of 90 million liter wasted daily (Majumdar & Gupta, 2009).

The chemical and bacteriological condition of water very much important and in Lahore, Pakistan sixteen water sources of Lahore, Pakistan analyzed and all of them are found arsenic contaminated and half of them are bacteriological contaminated (Akram & Olmstead, 2011). Bangladesh mostly the water was arsenic contaminated. People used different ways to purify water and they spend a lot of money on it. The methods used for mitigation of arsenic were not permanent and secure (Ahmad et al., 2003). Um et al. (2002) reported that the water quality of Korea was not bad to drink but people here not preferred to drink untreated water. According to Pusan Waterworks survey 1995 only 1.4 percent population of Pusan used to drink untreated water. In Shebedino District, Ethiopia near about 45 percent respondents using protected water sources, 32.8 percent using unprotected water sources and remaining 22.2 percent using both of these sources. The water services were charged however 27 percent respondents choose the water source free of cost (Behailu et al., 2012). In China water quality was determined in shape of grades as and after grade 3 the water situation is not considered to be drinkable. And the water of the lake was considered of the grade 3. This lake served 33 million people. According to our survey 58 percent of respondents were not satisfied with the quality of the lake water. The females were more willing to pay for the improvement of water quality of the lake. The average willingness to pay is 141CNY or USD 21.83 (Zhang, 2011). Imandoust and Gadam (2007) analyzed that pollution caused by population growth and it decreases consumer’s utility. In case of Pune River Water was reported dirty by 76 percent respondents.

2.3 Different models for provision of access to safe drinking water

During International Drinking Water Supply and Sanitation Decade (1980s) supply driven approach (SDA) was the first type of participation in water and sanitation projects. It was implemented by national government, donor agencies and international organizations as WHO, IDRC, UNICEF for the provision of basic facilities to the peoples of developing countries. They set a flat rate of tariff that not covers the all cost but a little part of that. After a sometime in 1990s they started to increase peoples participation in projects based on the flaws learned in supply driven approach that was in practice. In that time a lot of participation approaches are introduced, type and level of participatory approach was used to be set by the project management (Gomez & Nakat, 2002). Pricing water supply was to get revenue but it could take all costs in phase of transition. Transition is phase when the cost is applies to a subsidize product and it can be possible with peoples WTP. Water utilities in India were in this phase (Majumdar & Gupta, 2009).

In Benin demand-side management approach (DMA) is used since 2005. In demand-side management approach more responsibility is given to local population for identifying the water problem and its solution. They are responsible for choosing facilities; they are also involved in projects. Government and development agencies provide subsidies for construction. But operating and managing cost borne by the local communities (Arouna & Dabbert, 2012). Research indicates that if the communities get involved in projects then these will be more beneficial and peoples get best services at low costs. Government of less developed and developing countries cannot ensure best services to its public, then community participation is only the way to ensure best public services. In Pakistan Orangi Pilot Project (OPP), Lodhran Pilot Project (LPP), Changa pani projects are the best examples of participated projects. Lodhran Pilot Project was started in 1999 after inspired by Orangi Pilot Project that was started in 1980 in Karachi. In LPP the people re participate for sanitation services mainly. But Japan Social Development Fund (JSDF) awarded US $ 1.1 million for this program. Before program a manhole cover cost PKR 1700 and after participation this covers only PKR 500. Besides, peoples feel ownership that facilitated the maintenance and operation of the service (Ali, 2002; Robinson, 2005).

2.4 Determinants of the demand for safe drinking water

Willingness to pay is linked to income of family. As the statistics of World Bank tells us that the normally a family can spend 4 percent of their income for drinking water. It was found that in Ethiopia people were paying 1.5 percent of their annual income for water supply (Tarfasa & Brouwer, 2011). In China mostly urban area water supply was subsidized by government. Wang et al. (2008) analyzed in China that willingness to pay 1.5 percent to 2 percent of their monthly income but the willingness to pay of poor people were high as 6 percent of their monthly income. They analyzed that poor people were willing to pay less in absolute term but their willingness to pay very much high relative to their income. Another research in China shows that people were willing to pay only 0.67 percent and 0.70 percent of their annual disposable income to improve the lake water quality that they used to drink (Zhang, 2011). Um et al. (2002) study in Korea found that people paid just 0.54 percent of their monthly income for drinking water services. In Punjab province of Pakistan, on average people were willing to pay 1.7 percent of their annual income for water and sanitation services. That differs according to their income level as the rich people are ready to pay 0.60 percent of their income but the poor people were ready to pay 5 percent of the income to get safe and improved drinking water. Their willingness to pay is highly negatively related to income (World Bank, 2007). Ahmad et al. (2003) analyzed in Bangladesh that people were willing to pay almost 1.1 percent of their average monthly income to get public stand posts and for domestic connection they were ready to any 1.9 percent of their monthly income.

In analyses of Rethymno citizens shows that they were willing to get improved and continuous water services. In this analysis people who had already tap water service, the affected by last year water cuts and the more water quality conscious were willing to pay less and the people who has no water connection, women and people who have children under age 18 were more willing to pay for proposed water scheme (Genius et al., 2008). In largest cities of Punjab Pakistan people were highly demand quality water supply services as 98 percent households express interested to this kind of services but in relation to improved quality and nonstop water service (World Bank, 2007). Lee and Kwak (2007) analyzed the current situation of drinking water quality and practices to make it safe to health. They hold survey in Seoul Metropolitan, Korea of 810 respondents and counted that they were used four types of practices for water purification as 49 percent of them used boiled water, 37 percent used filtered water, 10 percent used bolted water and 4 percent used to bring water from springs.

Lee and Kwak (2007) analyzed in Seoul Metropolitan, Korea the child and education were highly and positive significant to boiled water. The head of house had high school diploma or had a child less than 7 years of age will prefer to use boiled water as compare to bring water from springs. As some studies like Lee and Kwak (2007) and Rosado (1998) analyzed that the spend money for water treatment and they prefer to pay if they get some improved drinking water. Even water service parameters such as timing and duration, interruption in service, quantity supplied, and distance from availability of tap may affect people's WTP. Some research is done on the different attributes of the water supply services as Hensher et al. (2005) took a survey for drinking water and wastewater services. They presented two service options to the respondents they had to choice one of them. The drinking water service is consists on these attributes as frequency of service interruption in a year, the average time of service interruption, time of day when the service is interrupted, prior notification for interruption in service, phone information service when service is unavailable and total amount of water bill in a year. Their average drinking water and wastewater service bill was A$759 for residential customers. The marginal willingness to pay decreases to reduce the interruption frequency as number of interruptions increases. On average the respondents were willing to pay A$41.51 to reduce the number of interruption if there were two interruption in a year but they were willing to pay only A$9.58 if there were twelve interruptions in a year. Same the case to the time of interruption as they were willing to pay A$4.38 to reduce the time of interruption when they face 24 hour interruption while they were willing to pay A$36.50 to reduce the time if the interruption is of 2 hours. Prior notice of interruption was very much important to customers and on average they were willing to pay A$142 for it. Berg. and Nauges (2012) analyzed safe drinking water impact on housing prices. The result shows that a household without water connection were willing to pay LKR 810 per month more to get connected.

Jalan et al. (2003) analyzed education, gender, income and newspaper effects on demand and willingness to pay for safe drinking water. The education had effect on willingness to pay as it increased to Rs 81 to Rs 497 by increasing schooling level from lowest to 14+ years. Gender wise education effect as same level of schooling year increases from 3.5 to 10.5 had increment 50 percent and 21 percent in willingness to pay of female and male respectively. Reading newspaper of female increases her willingness to pay by 40 percent. Sattar et al.

(2007) used linear regression equation by OLS to find the effects of different variables on willingness to pay. The decision maker who read newspaper once a week, only 26.28 percent of them used water without purification. The percentage of water use without purification is 46.95 and 16.75 for male and female decision makers respectively. People who watch television mostly used chlorine. Willingness to pay of illiterate people is PRs 215.18 less than the willingness to pay of 16 years of education or more. And willingness to pay of people had 13-15 years of schooling is PKR 46.85 less than the people have 16 years or more schooling. On average willingness to pay was PKR 69.14 high of a person who reads newspaper once a week. A person belongs to medical sector was willing to pay PKR 203.3 more from others. Females are PKR 100.59 more willing to pay then men.

2.5 Methodologies for estimating the demand for safe drinking water

Lee and Kwak (2007) used defensive expenditure (averting expenditure) for the quantitative prove for willingness to pay for water quality and analyzed the current situation of drinking water quality and practices to make it safe to health. The averting expenditure dose not occurs if the quality of water is sufficient to drink. Rosado (1998) used defensive expenditure approach to get willingness to pay for improved quality if drinking water quality in state of Espirito Santo, Southeast of Brazil. In this people used expenditure to defense from the pollution or affect by using marketed products for any environmental quality. In case of water purposes use water filters, boiling, chlorine etc to be safe themselves from waterborne diseases. In Kolkata near about 75 percent spending on water services were being financed by subsidy. In a projected situation consumer surplus is difficult to measure, that is why here used averting cost expenditure to measure the willingness to pay. It was analyzed that in residential area 77 percent households are currently using some techniques to purify water but in slum area no any such practice is seen (Roy et al., 2004). Berg. and Nauges (2012) analyzed safe drinking water impact on housing prices. They used hedonic price method for get difference of house of same characteristics but only the water was available in one of those. A large proportion as 90 percent of households without water connection was satisfied. Only 31 percent of water connected households has 24 hour water supply service. Harapap and Hartono (2007) used averting behavior method and found that people were spending a lot of money for water treatment and in urban area of Indonesia availability of pipe water increased the rent of house by 9.1 percent.

Willingness to pay capture the effect in utility level (indifference curve) between two time periods in monetary terms, the time period is depends reflect the current time and the proposed future time with improvement in environment (Fujita et al., 2005). Contingent valuation method used to measure project benefits in monetary terms by asking people's attitude for that project by a survey, as in Japan such type of studies are conducted to determine cost and benefit analysis public investment projects (Fujita et al., 2005). Contingent valuation method estimates the environmental valuation given by respondents of a specific area at a given time period (Fujita et al., 2005). Contingent valuation method (CVM) is a most popular technique for environmental valuation (Imandoust & Gadam, 2007). It is used to determine the public’s willingness to pay based on the consumer demand theory (Wang et al., 2008). Contingent valuation method captures public’s reaction at each pricing level. Policy makers can set a price to balance the public’s water need and generating revenue to recover cost and investment (Wang et al., 2008). Contingent valuation method is mostly used and widely acceptable technique for estimating total economic value of public goods and services, that other economic valuation techniques cannot accommodate properly (Hagos et al., 2012). Contingent valuation method is only method which is used worldwide to determine the economic value of environmental goods and services (Perman, 2003). Contingent valuation method is used for water resources valuation because it is based on expressed behavior but the other methods are revealed behavior (Mmopelwa et al., 2005). Its results are easy to interpret, understand and use for policy purposes. Contingent valuation method includes socio-economic variables of an individual that reveals information on reliability and validity of its results that increases confidence in practical application (Haab & McConnell, 2002). Contingent valuation method also used in developing countries as well as developed countries (Imandoust & Gadam, 2007).

2.6 Hypothetical markets and estimation of demand for basic services

In Bangladesh people used different ways to purify water and they spend a lot of money on it. Operating and management cost varies from TK 10 – 50 for stand posts and TK 30 – 100 for domestic connection. And the initial capital cost is ranging TK 200 – 1000 for stand post and TK 500 – 3000 for domestic connection. People were willing to pay TK 51 and TK 87 for operating and management cost public stand posts and domestic respectively and TK 960 and TK 1787 for initial cost for public stand posts and domestic respectively that was 1.7 percent and 3.2 percent of their respectively annual income. This shows that people were ready to pay so high prices to get safe drinking water (Ahmad et al., 2003). Fujita et al. (2005) analyzed that the water supply not satisfactory due to time restriction and low pressure. Now they were paying on average Sols 20.8 per person/month that is almost 2.4 percent of their monthly income on average. And they were willing to pay 65.1 percent additional if the water problems removed and they get quality water supply. Imandoust and Gadam (2007) analyzed that pollution caused by population growth and decreases consumer's utility. Water quality of Pune River was reported dirty by 76 percent respondents. Therefore the average willingness to pay for improving water quality was Rs. 17.55 (Indian rupee) or almost 0.40$ per family per month. Moreover 78 percent of peoples were willing to participate in 'Pavana Action Plan' for improving water quality of river and then tackle the problem. A research in India using bivariate probit and multinomial logit model found the mean willingness to pay Rs 303 (Jalan et al., 2003). Harapap and Hartono (2007) found that drinking water availability and quality of Indonesia was not up to mark. People's willingness to pay for safe drinking water in urban area was Rp. 6,850 per month, which is less than their current total expenditures, occurred on water treatment practices.

Kaplowitz et al. (2012) analyzed in Costa Rican Community the people were currently charged on average Colones (¢) 938 per household in survey data. However, they were willing to pay ¢ 2479 ($4.66) that was 1.7 percent of their average monthly income. In Rethymno, citizens were willingness to pay for improved and continuous water supply people were recorded their willing to pay more € 10.64 that was 17.67 percent of their current water bill. This shows that people were willing to get improved and continuous water services (Genius et al., 2008). In large urban areas of Punjab Pakistan 98 percent households express interest in improved quality of water supply services and nonstop water service. They were willing to pay on average PKR 160/ month ($2.7) for this kind of water supply project (World Bank, 2007). In Lahore people getting piped water and they were willing to pay $7.50 to $9 per month to safe and improved water quality that was three to four fold of their current water bill (Akram & Olmstead, 2011). A large proportion as 88 percent urban population of state of Espirito Santo, Southeast of Brazil had access to water supply services and now they were willing to pay more $ 0.98 for getting safe drinking water (Rosado, 1998).

A study in Sri Lanka analyzed that the people without water connection were willing to pay LKR 810 per month that is 6.6 percent of their monthly income to get connected to water supply services (Berg. & Nauges, 2012). Majumdar and Gupta (2009) examined that household on average demand 180 liter per day to meet their basic needs. They were willing to pay only Rs. 59.68 monthly for water services because now they were almost getting water free of cost. In Kanye a town of Botswana the water supply services was in shape of standpipe. They survived 135 households and 99 percent of them were willing to pay for private connection. The average willingness to pay for a private connection was P 171.50 (Pula). The variation in bid is P10 to maximum P600 (Mbata, 2006). In Kolkata existing water supply services were not sufficient as for quality and quantity. Near about 75 percent spending on these services were being financed by subsidy. Al large percentage of population, as 77 percent households in residential area was currently using some techniques to purify water. The estimated average household expenditure was Rs. 168.72 per month. But there was a wide variation (Roy et al., 2004).

Um et al. (2002) reported that the water quality of Korea was not bad to drink but people here not preferred to drink untreated water. A large portion of respondents as more than 78 percent reported to unpleasant with this water situation. And no one of the respondents use to drinking untreated water. They were willing to pay on average more $4.10 to $6.10 per month to get upgraded water services. In China lake served 33 million people. According to our survey 58 percent of respondents were not satisfied with the quality of the lake water. The females were more willing to pay for the improvement of water quality of the lake. The average willingness to pay is 141CNY or USD 21.83 that was only 0.67 percent and 0.70 percent of their annual disposable income to improve the lake water quality that they used to drink (Zhang, 2011). In China water supply was subsidized by government. The willingness to pay shows that on average they were willing to pay between 2.5 – 3 Yuan/ton that was 1.5 percent to 2 percent of their monthly income but the willingness to pay of poor people were high as 6 percent of their monthly income.(Wang et al., 2008).

Ahmad et al. (2003) analyzed in Bangladesh that people were willing to pay almost 1.1 percent of their average monthly income to get public stand posts and for domestic connection they were ready to any 1.9 percent of their monthly income. In Punjab province of Pakistan, on average people were willing to pay 1.7 percent of their annual income for water and sanitation services. That differs according to their income level as the rich people are ready to pay 0.60 percent of their income but the poor people were ready to pay 5 percent of the income to get safe and improved drinking water (World Bank, 2007). Some research is done on the different attributes of the water supply services as Hensher et al. (2005) took a survey for drinking water and wastewater services. They presented two service options to the respondents they had to choice one of them. The marginal willingness to pay decreases to reduce the interruption frequency as number of interruptions increases. On average the respondents were willing to pay A$41.51 to reduce the number of interruption if there were two interruption in a year but they were willing to pay only A$9.58 if there were twelve interruptions in a year. Same the case to the time of interruption as they were willing to pay A$4.38 to reduce the time of interruption when they face 24 hour interruption while they were willing to pay A$36.50 to reduce the time if the interruption is of 2 hours. Prior notice of interruption was very much important to customers and on average they were willing to pay A$142 for it.

Chapter 3. Methodology

This chapter has discussed the methodology that implied in this research. Section 3.1 consists the discussion about the description of study area followed by section 3.2 describing the existing water services in area and in section 3.3 data collection methods and sampling technique are discussed and later in section 3.4 presents the data analyses methodology consisting on descriptive analysis and estimation model.

3.1 Description of study area

Punjab is the most populated province in Pakistan. This province is more developed in water sector with the 55 percent of population has access to safe water availability. Surface and groundwater are the main source of water consumption. The situation of water is more alarming at villages and peri-urban areas. Majority of households are not connected to piped water services. Multan is the oldest city of subcontinent. The city contains six towns. It lies on fertile belt very much suitable for agriculture. The stream of the area is river Chenab, which lies west of the city. This is main source of recharge of the ground water and surface water in that area. The depth of ground water is near about 10 meters and the quality of ground water is fresh. The water table is dropping approximately one foot (0.3m) per year (Government of Punjab, 2006).

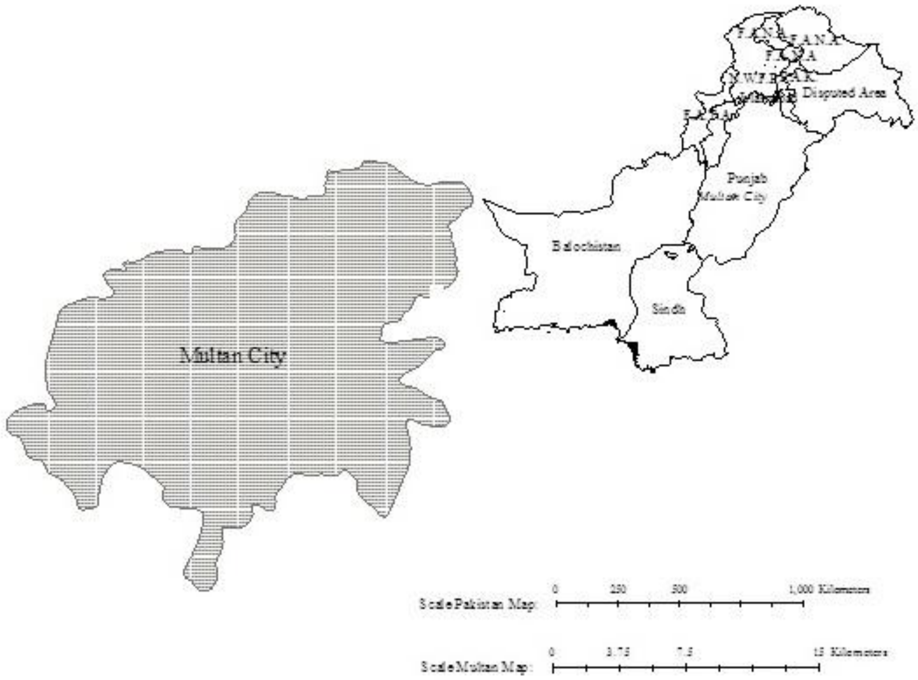

Figure 3.1: Map of Multan city

3.2 Description of the existing water service delivery and coverage

Water supply and sanitation services are provided by Water and Sanitation Agency (WASA) in urban area. WASA used to install deep tube wells as 400-600 meter for getting safe water. In Multan district 11 percent population have access to piped water (PSLM, 2011). WASA reported to cover 70 percent urban population with piped water supply. A main problem in Multan is the contamination of shallow private wells with arsenic, viruses and bacteria and the infiltration of contaminated water into the distribution lines. Population of the area is 1,846,558 projected for 2013 based on the census of 1998. And the household size was 7.47 persons per household. And the estimated household in the area are 247,000.

Table 3.1: Coverage of urban water and supply situation in Multan City

Coverage	2001/02	2002/03	2003/04	2004/05
Households (Water)	33,010	32,097	33,689	33,516
Households (Sewerage)	116,787	116,787	126,400	126,017
Number of Households	121,182	124,732	128,387	132,149
Connection Ratio (W)	27%	26%	26%	25%
Connection Ratio (S)	96%	94%	98%	95%

Source: Urban Water Supply and Sewerage Reform Strategy (Government of Punjab, 2006)

3.3 Methods of data collection

The study was carried out based on primary information collected from households, key informants and institutions responsible for the provision of drinking water supply. To understand the customer side of story, a structured questionnaire was administered at household level. Whereas, the service providers view was obtained through interviews from the officials of the institutions responsible for providing drinking water. Since both customer and service providers have their own worldviews, they could show only the aspects of their own interests in their attempt to legitimize their answers. In order to cope with this issue, key informant interviews were also considered in an attempt to get impartial view of the water supply issues in the study area.

3.3.1 *Sample survey through structured questionnaire*

Customer context of drinking water supply and demand was inquired through execution of a structured questionnaire. Questionnaire was in fact the operationalization of the conceptual framework (Figure 1.1) presented in Section 1.3. Besides, profile information the key parameters included in questionnaire comprised information on customer’s priority of drinking water in overall need basket, their awareness about the importance of drinking water, satisfaction with the quality and supply drinking water that they were consuming at the moment, the kind of improvement they demanded in the quality and supply of drinking water, their willingness to pay for the demanded improvements and trust in the ability of different institutions to provide quality drinking water service. Altogether 38 parameters/questions were investigated. Both open and close ended types of questions were included in the questionnaire. Close ended questions asked data on ratio and ordinal scales whereas the open ended questions asked statements about the reasons and explanation of responses of close ended questions. The willingness to pay was judged by asking multiple bound questions using the methodology adopted by Loomis and Ekstrand (1997), Welsh and Poe (1998) and discussed in Alberini and Cooper (2000). Before the actual survey, questionnaire was pretested on 20 respondents. The information obtained during pre-testing of the questionnaire was only used to modify the language to avoid possible misunderstandings of the question. Final version of questionnaire is given as Appendix C.

3.3.1.1 Sampling and selection of the respondents

In order to get the general understanding of the water supply and demand for improvement, the questionnaire was administered among a sample of 210 households. The sample size was determined using stratified sampling technique at a confidence level of 95 percent and ±7 percent margin of error. Most part of the city comes in two of its towns namely Shah Rukun

Alam and Mumtazabad. As both of these towns were having almost equal population, the sample was equally disturbed between both of towns. Due to the lack of proper sampling framework and large population, it was not possible to use true random sampling. An attempt was made to select households randomly at an interval a certain number. However, most of the times, the selected households were not very cooperative in responding the survey questions. Therefore, all those who volunteered to participate in survey were considered.

3.3.2 *In-depth Interviews*

In order to get the in-depth understanding of water service delivery, interviews were conducted with officials of agencies involved in water and sanitation services. Besides interviewing key informant interviews were also conducted with the knowledgeable persons from the area in order to obtain more insights on the background of the answers of the close ended questions asked during questionnaire survey.

3.3.2.1 In-depth interviews with officials (OI)

Interviews with eight officials from four departments were conducted in order to obtain the detailed information regarding the issues and options for improving the drinking water services and quality. These officials included 'WASA' Deputy Director Recovery, Assistant Director Planning and Development, and in Water Supply Department Executive and Assistant Executive Engineers. They were asked about the water situation in the city, current water system, capacity and quality of the system, duties and role of their department, future development plans and financing system. Other officials which were interviewed included Junior Research Officer of Public Health Engineering Department (PHED), Research Assistant in Environmental Protection Department (EPD) and Research Officer Pakistan Council of Research in Water Resources (PCRWR). The interviews were conducted in their offices and without any confidential settings as these officials themselves discourage setting confidentiality. They were discussed about provision of safe drinking water the role of their departments in drinking water quality and services, current status of drinking water quality and services and previous studies in this sector.

3.3.2.2 In-depth interviews with households

Besides questionnaire survey that comprised mostly close ended questions, in-depth information was obtained through Key Informant Interviews. The main theme of these interviews is to understand the problem and to view the people's attitude towards water supply system, and their perception of water service and quality. Individuals are selected of diverse backgrounds. Five people were selected for face-to-face interviews from each town, keeping in mind who can give us the needed information. The interviews are conducted in a confidential setting. Each interview lasted for duration of about 15 to 20 minutes. Interviews started with an introduction, then key question related to current issues leading to probing questions that consist of their thinking of causes, problems and their suggested solutions. The interviews were documented in the notes.

3.4 Methods of data analyses

Data analyses is a structure that directs us to use different methods to analyze the gathered data and available information (Bryman et al., 2005; Creswell, 2013). Data analysis is actually based on our research problem statement. This is based on what type of data is and what to find out from that data. As for our data was based on people's behavior, analyzed by

Likert scale, and Multiple Bound Discrete Choice (MBDC) questions, both quantitative and qualitative data analyses techniques were used, because any techniques cannot be used to all type of data (Bryman et al., 2005). As the questionnaire was mostly coded already, data was directly compiled in Statistical Package for the Social Sciences (SPSS), for analysis.

3.4.1 *Descriptive analysis and weighted average indexes*

Descriptive analysis mostly comprised cross-tabulation, frequencies and percentages was conducted to assess the general messages of the survey data., In order to meaningful and generalized conclusions, frequencies were converted into Weighted Average Indexes. These indexes were constructed for the parameters like, priority of different services in household need basket, Status of water supply and quality and rankings and similar kind of variables.. The detail of methods that used to interpret is given in Appendix A.

3.4.2 *Econometric analysis*

In this study contingent valuation method is used. The motive to estimate the level of awareness among the households and other factors affects the willingness to pay for improved water supply services. To achieve this it is necessary to quantify the perceived level of water quality and services in the society. Finally, estimate people's attitude and response to current water services and quantify willingness to pay for proposed improved water services. Willingness to pay depends on per-capita income, children in family, daily drinking water requirement, access to water, schooling, consciousness of drinking water quality, expenditure on drinking water, satisfaction with drinking water supply, primary source of drinking water, and water quality test. To model this, Logit regression technique will be applied where willingness to pay will be dependent variable and other factor affecting it like per-capita income, children in family under 14 years of age, consciousness of drinking water quality, expenditure on drinking water, satisfaction with drinking water supply, and water quality test are taken as explanatory variables. The effect of explanatory variables on dependent variable is modeled as under and the description of the variable and their units had been provided in:

$$\text{WTP} = f\ (\text{X}_1, \text{X}_2, \text{X}_3, \text{X}_4, \text{X}_5, \text{X}_6)$$

Let us consider the following representation of the willingness to pay for safe drinking water model;

$$\text{WTP} = \frac{1}{1 + e^{ln\ zi}}$$

$$\ln zi = \beta_0 + \beta_1(\text{X}_1) + \beta_2(X_2) + \beta_3(X_3) + \beta_4(X_4) + \beta_5(X_5) + \beta_6(X_6)$$

Table 3.2: Description of variables in the model of WTP for improved water supply

Legend and caption of the variables		Unit	Expected signs
X1=	Per-capita monthly income of family	PKR	+
X2=	Monthly expenditure on drinking water	PKR	+
X3=	Under 14 year members in family	Number	+
X4=	Consciousness of drinking water quality	Likert scale	+
X5=	Water quality Test (tested =1, other-=0)	Dummy	+
X6=	Satisfaction with drinking water supply and quality	Likert scale	–

Chapter 4. Context of drinking water demand and supply

This chapter attempts to understand different aspects of water delivery in Multan. Having this contextual information is important in determining demand for improved water service delivery and people's WTP for it. This chapter has been organized into following sections. In Section 4.1, importance to safe drinking water in his daily life household basket has been highlighted. In Section 4.2, sources of drinking water in order of their priority as primary source, secondary source and tertiary source are explored. In section 4.3, customer perception of the quality of their existing drinking water has been discussed. In Section 4.4, consumers' awareness about waterborne diseases linkage to health has been analyzed. In section 4.5, household's satisfaction with current drinking water quality and services is understood.

4.1 Consumer priority of safe drinking water in the household need basket

The demand pattern for different services was almost similar in both of the towns, due to their socioeconomic and locational characteristics and service provisions. The population of both towns was educated and belongs to the upper middleclass gentry of Multan City. As both of the selected towns were adjacent, this was also one of the reasons for similarity in the behavior of the residents. Respondents ranked the services which affect their everyday living such as Safe drinking water, hospital, Solid waste and sanitation services higher than those providing them the recreation such as parks and playground, and comfort and amusement such as paved streets and streetlights (Table 4.1). However among these services the safe drinking water got the highest rank in both of the towns indicating the top priority among all of the public services. When asked about the reasons behind such tendency, majority of the respondents revealed that it is the essentials of life and if drinking water is not safe, they cannot live a healthy life. For most of the respondents, the concept of healthy life was nothing without safe drinking water. For some respondents, the reason for ranking the drinking water at highest priority was their experience with waterborne diseases. For them, demand for safe drinking water was actually a strategy to preempt waterborne disease.

The above understanding can be crosschecked even if taken a broader look of the information on the household's ranking of different basic services (Table 4.1). A closer look at the top four priorities reveals these are directly related to health and hygiene issues. The top ranking of Safe Drinking Water in fact implies the preventive tendencies of the communities over the curative tendencies. Although all results are not presented in tabular form, the preliminary cross-tabulation of the survey information revealed some of the important insights on the tendency to keep drinking water as the top priority. When consider the gender and preferences given to safe water then found that male rank water in top priority are relatively higher than the number of female. Respondents family status shows the tendency to rank water at top was higher in earning respondents than those who were dependent. It makes almost obvious that awareness to the importance of safe drinking water change people mindset. To the extent possible, breadwinners in the responding households tend to provide safe water to their families as an important household need. The household survey reveals that families having children are more conscious about safe drinking water than those having only adult members. However, with increasing number of children, the priority for safe drinking water was decreasing. Cross-tabulation of the information with number of children reveals that 52 percent of the families having one child gave top priority to drinking water as the corresponding figure for those having two children was 46 percent, three children was 36 percent and four children it was only 23 percent. Besides, the survey results reveal that 57 percent of households who had laboratory tests of their drinking water ranked safe drinking water as their first priority and 24 percent rank it as the second priority but the even 39 percent of those who had never tested their drinking water from laboratory also ranked safe drinking water as their first priority public service.

Table 4.1: Ranking of different services in the basic need basket of a household

Services	SRA (n=105)		Mum (n=105)		Both (N=210)	
	WAI	SD	WAI	SD	WAI	SD
Sanitation service	2.70^{III}	1.819	2.21^{III}	1.708	2.45^{III}	1.777
Solid waste management	1.61^{IV}	1.334	1.50^{IV}	1.526	1.55^{IV}	1.431
Safe drinking water	4.18^{I}	0.896	3.95^{I}	1.204	4.07^{I}	1.065
Hospital	3.16^{II}	1.682	3.08^{II}	1.900	3.12^{II}	1.790
Park	1.27^{V}	1.476	1.46^{V}	1.670	1.36^{V}	1.575
Play ground	0.91^{VI}	1.367	1.14^{VI}	1.614	1.03^{VI}	1.496
Paved streets	0.62^{VII}	1.004	0.88^{VII}	1.174	0.75^{VII}	1.097
Street lights	0.53^{VIII}	0.867	0.80^{VIII}	1.060	0.67^{VIII}	0.975
Library	0.00	0.000	0.03^{IX}	0.293	0.01^{IX}	0.207

Source: Household Survey, 2013

Note:
- Figures in the table are weighted average indexes (WAI) and their standard deviations (SD).
- High index value indicates importance of a service in a household's basic need basket (Appendix A 1)

4.2 Sources of drinking water available to the community

Multiple sources of drinking water were available to the households living in the study area. These sources included privately installed boreholes in homes, government provided filter plants at hamlet level, in house water taps connected to public water supply and commercially supplied bottled water in shape of dispenser size containers. Among these sources, the government provided pipeline for drinking water was the most availed source followed by government provided filter plant service and household level borehole water source (Table 4.2). The major reasons for the pipeline supply being the primary source of drinking water was its affordability, availability within house (convenience) and perceived better quality. It was noteworthy that despite the local perception of better quality water filter-plants, households ranked it as the second important source of drinking water for them. This was due to the fact that fetching water from the filtration plant required labor and time that was not as convenient as the tap connected to public water pipeline available inside homes.

It was observed during the field survey that many houses had installed boreholes as alternate water sources used only when tap water supplied through public water supply was unavailable. The primary reason for such tendency was the view that the water services are not fully reliable they can face any time the shortfall in service and quality of water can be affected due to shortfall of electricity at supply time, leakage of pipe line or any other reasons. However, for other using electric water pump to abstract groundwater was costlier than from piped supply especially when the quality of the latter was also better. It worth mentioning that water from piped supply is a multipurpose service and is used for all drinking, cooking and washing. Even the one third who used to fetch their drinking water from filter-plant (Table 4.2), were also having tap water connection in their homes. These households were using water from filter-plants for both cooking and drinking purposes while water from piped supply was used only for washing purposes. Bottled water was not used by any of the surveyed household as their primary source of drinking water (Table 4.2). This was essentially because of the fact that most of them were unable to afford it. However, those who reported bottle water as their 2nd and 3rd important source of drinking water were actually using it while outside their homes. Inside use of bottled water was also reported for some members of their households who were sick, babies or guests.

Table 4.2: Major sources of drinking water

Water source	SRA (n=105)				Mum (n=105)				Both (N=210)			
	1st	2nd	3rd	Rank	1st	2nd	3rd	Rank	1st	2nd	3rd	Rank
Pipeline	50.5	28.6	2.9	0.86^{I}	46.7	28.6	7.6	0.82^{I}	48.6	28.6	5.2	0.84^{I}
Borehole	16.2	16.2	14.3	0.68^{III}	14.3	30.5	15.2	0.66^{III}	15.2	23.3	14.8	0.67^{III}
Filter-plant	33.3	25.7	6.7	0.80^{II}	39.0	20.0	9.5	0.81^{II}	36.2	22.9	8.1	0.80^{II}
Bottled	00.0	17.1	20.0	0.48^{IV}	00.0	10.5	12.4	0.48^{IV}	00.0	13.8	16.2	0.48^{IV}
None	00.0	12.4	56.2	-	00.0	10.5	55.2		00.0	11.4	55.7	

Source: Household Survey, 2013

Note:
- Figures in under headings '1st, 2nd and 3rd' are percentages and under 'Rank' are WAI
- See (Appendix A 2) For further details on the interpretation of WAI values

4.3 Customer view of existing drinking water quality

Laboratory testing of their drinking water for its fitness to human consumption was not a common practice in the study area. Less than one third of the surveyed households reported to have obtained the laboratory reports of the quality of their drinking water. Among these, about two fifth have found it fit for human consumption while for the remaining two third it was unfit for human consumption. Majority of the respondents were simply unaware of the chemical and bacterial content of their drinking water. They relied on their sensory appraisal of the drinking water that they were using in their family. Therefore, they never sent the samples of their drinking water to laboratory for quality tests and consider it as fit for their drinking (Table 4.3). Among the five parameters of drinking water quality, they perceived the quality of their existing drinking water very good in terms of odorlessness and good all in terms of turbidity, colorlessness, taste and hardness (Table 4.3). No difference was found among both of the towns except that overall quality of drinking water was perceived slightly better in Mumtazabad when compared with Shah Rukn-e-Alam (Table 4.3). The reason behind this scenario is that both of the town are posh area and adjacent to each other, and their socio economic characteristics are same.

Table 4.3: Customer view of their drinking water quality

Quality parameter	SRA (n=105)		Mum (n=105)		Both (N=210)	
	WAI	SD	WAI	SD	WAI	SD
Taste	3.65^{G}	0.820	3.83^{G}	0.740	3.74^{G}	0.784
Turbidity	3.84^{G}	0.709	3.91^{G}	0.761	3.88^{G}	0.735
Color	3.90^{G}	0.854	3.81^{G}	0.952	3.85^{G}	0.903
Hardness	3.42^{G}	0.907	3.49^{G}	0.889	3.45^{G}	0.897
Odor-free	4.23^{VG}	0.835	4.14^{VG}	0.937	4.18^{VG}	0.887
Overall Quality	3.81^{G}	0.825	3.836^{G}	0.8558	3.82^{G}	0.8412

Source: Household Survey, 2013

Note:
- Figures are weighted average Indexes and their standard deviations. Higher values of WAI indicate better state of water quality parameter.
- See (Appendix A 3) For further details on the interpretation of WAI values

4.4 Customer's awareness of health and water linkages

High priority to drinking water among the household need basket (Table 4.1) was perhaps because of the impressive level of knowledge about waterborne diseases among the surveyed households (Table 4.4). About two third of the respondents from both towns could identify the diseases caused by unsafe drinking water. While identifying some of the diseases correctly, a little more than one fifth of the respondents misidentified a disease as waterborne that has nothing to do with intake of unsafe drinking water. Only 15 percent of the respondents could be viewed as completely unaware as none of them could correctly identify even a single disease associated with the intake of unsafe drinking water. It can be observed that the respondents from Shah Rukun-e-Alam town were more aware on waterborne diseases when compared with those of the Mumtazabad town (Table 4.4). Even level of misperception of diseases as caused by the intake of unsafe drinking water and complete lack of awareness was more among the respondents from Mumtazabad town than those from Shah Rukun-e-Alam town (Table 4.4). However, the overall trend of responses indicate significantly high level of awareness on water and health linkage in both of the towns as is reflected form their knowledge of diseases caused by the intake of unsafe drinking water.

Table 4.4: Awareness of waterborne diseases

Diseases		SRA (n=105)		Mum (n=105)		Both (N=210)	
English Name	Local Name	*F*	%	*f*	%	*f*	%
Correctly reported Diseases							
Diarrhea	Ashal	54	51.4	45	42.9	99	47.1
Hepatitis	Warm jigar	28	26.7	28	26.7	56	26.7
Arsenicosis	Gurdy, Jildi sartan	30	28.6	13	12.4	43	20.5
Hydatid disease	Phe-phola	24	22.9	17	16.2	41	19.5
Cyanotic	Yarqan	47	44.8	32	30.5	79	37.6
Campylobacteriosis	Shikam been	31	29.5	23	21.9	54	25.7
Incorrectly reported diseases							
Measles	Khasra	00	00	2	1.9	2	1.0
Other Diseases		44	41.9	51	48.6	95	45.2

Source: Household Survey, 2013

Note: - A correctly reported disease is the one when a disease reported as a waterborne was indeed a waterborne disease; the incorrect answer is the otherwise.

4.4.1 ***Sources of awareness on health and water linkage***

While it was interesting to see that communities in both of the towns had impressive levels of awareness on the linkage between safe drinking water and health, it more important to understand how they obtain such information. Unquestionably, the formal education appears to be the most important source of awareness in both towns. However, the remaining sources of awareness have almost common pattern across both of the town in their relative importance in terms of raising awareness in the study area (Table 4.4). It was observed throughout the study area that after education, the television and interaction with doctors and hospitals as the second and third important sources of awareness about safe drinking water and health linkage. Although like television, newspapers was also a kind of media but its importance was ranked at fourth. Low effectiveness of newspapers in spreading awareness regarding the importance of safe drinking water compared to television was obviously because of the frequent interaction with the latter. It was generally observed throughout the fieldwork that viewership of television is more than the readership of newspapers. However, most surprising finding is the low ranking of self-observation at fifth in Shah Rukun-e-Alam town and sixth in Mumtazabad town (Table 4.5). Informally, it was noticed that self-observation was not a source of awareness but it was more like a verifying element. Once informed of the importance of safe drinking water for their everyday healthy life from other sources, people could formally observe and validate it through self-observations.

Table 4.5: Sources of awareness about safe drinking water

Sources	SRA (n=105)		Mum (n=105)		Both (N=210)	
	WAI	SD	WAI	SD	WAI	SD
Formal Education	4.49^{I}	1.539	4.33^{I}	1.758	4.41^{I}	1.650
Newspaper	3.17^{IV}	1.672	3.20^{IV}	1.678	3.19^{IV}	1.668
Television	4.24^{II}	1.229	4.14^{II}	1.244	4.19^{II}	1.234
Doctors & hospitals	4.09^{III}	1.744	4.00^{III}	1.721	4.04^{III}	1.729
Friends and Relatives	2.44^{VI}	1.358	2.78^{V}	1.467	2.61^{V}	1.421
Self-observation	2.56^{V}	1.544	2.51^{VI}	1.563	2.54^{VI}	1550

Source: Household Survey, 2013

Note:
- Weighted average index, the highest value shows the highest ranked source.
- Super script on WAI shows the rank of that product in the relevant town. For detail (Appendix A 4).

4.4.2 *Awareness of safe drinking water in action: Storage of water*

Although awareness is fundamental but it does not guarantee that people will act. From supply to storage and usage, there can be various loop holes where water can get contaminated. Since WASA provides multi-purpose water, people mostly stored it in roof top tanks made either from concrete or plastic. However, in most of the cases, people used small insulated plastic tanks (coolers) to store their drinking water (Table 4.6). However, almost equal number of surveyed households could drink water directly from the roof top tanks. The trend was almost similar across both towns, except that in Mumtazabad the number of those drinking water directly from roof top was slightly higher than those storing in cooler (Table 4.6). Reportedly, almost always the water sources are covered. More than 80 percent of those using coolers reported to clean these storages on weekly basis. Rooftop tanks, mud pot and underground tank are the least preferred source of the storage of drinking water in both towns (Table 4.6). On average, the frequency of cleaning underground and roof top tanks was twice a year; while for mud pots, it was less than a week.

Table 4.6: Storage practices of drinking water

Storage practices	SRA % (n=105)	Mum % (n=105)	Both % (N=210)
Cane / water cooler	43.8	40.0	41.9
Mud pot	1.9	3.8	2.9
Roof top plastic tank	39.0	41.9	40.5
Roof top cemented tank	14.3	13.3	13.8
Underground cemented tank	1.0	1.0	1.0
Total	100	100	100

Source: Household Survey, 2013

4.4.3 *Awareness of safe drinking water in action: Water treatment*

In the study area, it is not uncommon to experience occasional episodes of the supply odorous and yellowish water. Many households were aware of these problems and rightly reported this as leakage of water supply lines with sewage. Despite this, it was surprising to note that that the practice of water treatment was rare (Table 4.7). In a few cases where water treatment was reported, it was almost always boiling. Despite availability of affordable household filtration plants, only one of the surveyed households reported to have installed it. Similarly, only one of the household in Mumtazabad reported using chlorinated tablets. One reason for the lack of interest in water treatment can be the access to government sponsored filter plants. These filter plants were the primary source of drinking water for more than one third of the surveyed households and on average the 2nd important drinking water in the study area (Table 4.5). Since these household perceive their drinking water already filtered and fit.

Table 4.7: Water treatment practices

Water source	SRA (n=105)				Mum (n=105)				Both (N=210)			
	Boi.	Tab.	Fil.	Non.	Boi.	Tab.	Fil.	Non.	Boi.	Tab.	Fil.	Non.
Pipeline	7	0	0	79	7	1	1	78	14	1	1	157
Borehole	6	0	1	42	3	0	0	60	9	0	1	102
Filter plant	0	0	0	69	0	0	0	72	0	0	0	141
Bottled	0	0	0	39	0	0	0	24	0	0	0	63

Source: Household Survey, 2013

Notes: - Figures are the sum of frequencies of primary, secondary and tertiary drinking water sources.
- Abbreviations Boi, Tab, Fil, Non indicate Boiling, Tablets, Filter and None, respectively

4.5 Satisfaction with the existing drinking water quality and supply

Perception about the quality of existing drinking water (Table 4.3) itself is a good proxy of understanding community's satisfaction with drinking water. However, besides the quality of drinking water, satisfaction may have other parameters such as the quantity and duration of water supplied, reliability in terms of scheduling, and convenience in water collection such as water tab available inside or outside home and cost of water supply. The results of household survey clearly indicate that all parameters of water supply were considered satisfactory. Among these, the Cost has brought high degree of satisfaction among the consumers (Table 4.8). While the construct of satisfaction with water supply itself is highly indicative, one could notice while interacting with customers that cost has been the main determinant of satisfaction with other parameters of water supply. This implies that at the current cost structure, the existing arrangements of quantity and duration and reliability and convenience of supply were satisfactory (Table 4.8). It was further revealed that there were flat rate water charges according to plot size and has nothing to do with the quantity of water consumed. Reportedly, water charges varied between PKR 36 per month (USD 0.33) to PKR 250 per month (USD 2.40) per household. Among the latter four parameters, the satisfaction with reliability, although still satisfactory, appears to be relatively low. From the in-depth inquiry of this issue, it emerged out that it was connected with the problem of uncoordinated load-shedding of electricity. As a result, sometimes the customers were unable to catch up with the changes in the timing of water supply.

Table 4.8: Overall satisfaction with different aspects of existing water supply

Water Supply	SRA (n=105)		Mum (n=105)		Both (N=210)	
Parameter	WAI	SD	WAI	SD	WAI	SD
Quantity	0.56^{S}	0.553	0.64^{S}	0.593	0.60^{S}	0.664
Duration	0.50^{S}	0.615	0.27^{S}	0.677	0.39^{S}	0.705
Reliability	0.02^{S}	0.621	0.00^{N}	0.856	0.01^{S}	0.846
Convenience	0.49^{S}	0.640	0.33^{S}	0.860	$0. 41^{S}$	0.866
Cost	1.11^{HS}	0.827	1.05^{HS}	0.872	1.08^{HS}	0.866
Overall Satisfaction	0.54^{S}		0.46^{S}		0.50^{S}	

Source: Household Survey, 2013

Note:
- Figures in table are weighted average indexes. Higher the value of the index, the higher is the satisfaction.
- For construction and interpretation of index values and superscripts see (Appendix A 5).

Chapter 5. Determinants of WTP for safe drinking water supply

The preceding chapter provided a contextual analysis of drinking water. This chapter brings in those bits and pieces in an integrated framework to provide a model for understanding peoples WTP for improved drinking water. Based on all of these contextual understanding, the chapter moves on to Section 5.1 to ask towards determining the local demand for improvements in drinking water. This is followed by Section 0 where the actual demand function has been derived. Finally, in Section 5.3, community trust in institutions for providing quality water services has been assessed. In doing so, this chapter will present inferential analysis of the correlates of willingness to pay. It has been divided into 3 sections. In Section 5.5, theoretically and conceptually consistent correlates of willingness to pay have been tested through bivariate correlation. Section 5.6 provides one step advance analysis where Willingness to pay has been modeled against 6 independent variables by using Logit regression techniques. Section 5.7 is a kind of reconciliation between our auxiliary theory developed in our Conceptual Framework (1.3) and our empirical findings. Together with the Chapter 4 this chapter will pave the way for Chapter 6 where this study will be concluded with recommendation for the improvement for of drinking water supply in urban areas of Pakistan in general and Multan City in particular.

5.1 Demand for improvements in drinking water quality and supply

Despite high level of satisfaction with water quality and supply, people could come with the demand for some of the improvements. Out of five improvements emerged out of our survey, three namely, installation of generators, efficient customer care and increase supply timing were the supply related improvements; while installation of filters, and chlorination were related to quality of water (Table 5.1). When asked about the reasons behind such tendency, majority respondents revealed that reliable and efficient services are sufficient they can bring better quality drinking water from filtration plants. Seemingly, demand for improvement in supply parameters has exceeded that of the quality parameters (Table 5.1). The reasons high demand for improvement in supply side can be partly understood from the relatively low level of satisfaction with the reliability of water supply and occasional failure to catch up changing water supply schedule. It was also observed during the field that the complaint redressed mechanism of government sponsored water supply service needed improvement.

Table 5.1: Demanded improvements in drinking water quality and supply

Proposed Improvements	SRA (n=105)		Mum (n=105)		Both (N=210)	
	WAI	SD	WAI	SD	WAI	SD
Installation of generators	3.70^{I}	1.501	3.62^{I}	1.631	3.66^{I}	1.564
Increased service timing	2.90^{III}	1.467	3.00^{III}	1.461	2.95^{III}	1.462
Efficient Customer Care	3.34^{II}	1.399	3.04^{II}	1.441	3.19^{II}	1.425
Installation of filters	2.27^{IV}	1.318	2.26^{IV}	1.468	2.26^{IV}	1.391
Chlorination	1.93^{V}	1.423	1.99^{V}	1.418	1.96^{V}	1.417

Source: Household Survey, 2013

Note:
- Figures in table are the weighted average indexes (WAIs) and standard deviations (SD).
- Higher WAI reflect high demand for an improvement, shown through superscripts see (Appendix A 1).

Low ranking of demand for improvement in quality of water can be understood in the context of customers' high degree of satisfaction with the quality of their existing water supply that demonstrated through the sensory appraisals (Table 4.3). Nevertheless, there was still a feeling that agencies supplying water could improve the quality of water through filtration and chlorination (Table 5.1). However, from the interviews with officials and other knowledgeable persons revealed that installation of filters would not be a practical solution as water would be re-contaminated during its course through pipelines which are leaked at many places and could mix-up with sewage. According to them, filters at drinking water taps within household would be much better option and is something that each household needs to install on individual basis. According to official schedules chlorination is used once a year for cleaning the pipelines' in rainy season. Over chlorination may lead to adverse impact on the health of customer as it has carcinogenic effect as well as impact on environment.

5.2 Willingness to pay for improvements in drinking water quality and supply

Respondents were made realized that the kind of improvements they demand in the supply and quantity of water requires additional funds. They were told that government lacking funds may not afford the demanded in the current price structure. Thus they were made realized that the demanded improvements need the consumers to pay. With this premise, they were asked for their willingness to pay for the demanded improvements. Results revealed that an overwhelming majority of them were in fact willing to pay for the demanded improvement in the supply and quality of their drinking water (Table 5.2, also see Table 5.1). In response to various bids ranging between PKR 50 to 250, respondents demonstrated variation in their WTP. It was observed that increase in bid amount was negatively associated with willingness to pay. Even those who shown their willingness to pay the highest bid, i.e. PKR 250, were on average unconfident on paying in the reality. Within the bounds of certain degree of surety and confidence, it would be safe to expect that significant majority of the respondents would pay PKR 100 in addition to the amount they are paying at the moment. Given the structure of the questions, one cannot determine exactly which service account for bulk of the additional payment. However, information in Table 5.1 shows that most of this additional payment will pertain to improvement in reliability of supply and establishment of customer care.

Table 5.2: Willingness to pay for improvements in drinking water supply

Willing to pay	SRA (n=105)		Mum (n=105)		Both (N=210)	
	f (%)	Sureness	*f* (%)	Sureness	*f* (%)	Sureness
At all	89 (84.7)		85 (81.0)		174 (82.8)	
PKR 50	89 (84.7)	1.96^{SS}	83 (79.0)	1.88^{SS}	172 (81.9)	1.92^{SS}
PKR 100	76 (72.4)	0.90^{S}	63 (60.0)	0.69^{S}	139 (62.2)	0.80^{S}
PKR 150	55 (52.4)	0.28^{S}	39 (37.1)	0.02^{S}	94 (44.8)	0.16^{S}
PKR 200	38 (36.2)	0.11^{S}	27 (25.7)	0.15^{S}	65 (31.0)	0.13^{S}
PKR 250	15 (14.3)	-0.55^{NS}	12 (11.4)	-0.46^{NS}	27 (12.9)	-0.51^{NS}

Source: Household Survey, 2013

Note:
- Respondent's willingness to pay at different package.
- Sureness is the WAI of the level certainty that a respondent would actually pay the bid which is also shown three superscripts (Appendix A 5).

5.3 Trust in institutions for supplying improved drinking water

Different levels of government were engaged in water supply. Since Multan City is a major urban settlement of Punjab province, the Water and Sanitation Agency (WASA) was the major institution responsible for managing water supply in the city. However, the Tehsil Municipal Administration, (TMA) was also engaged in the supply of drinking water through filtration plants. It is however important to understand the differences in the service provision by both of the agencies. The WASA supplies multipurpose water through pipeline connections that can be used for drinking, cooking as well as washing purpose. On the contrary, TMA supplies water through filtration plants at central locations in hamlets. The water provided through TMA filter plants is used only for drinking and cooking purposes. The private sector water services included the bolted water and water dispenser, supplied door to door. One can understand that respondents demand drinking water by considering a balance between cost and quality.

Table 5.3: Trust in institutions to supply safe drinking water

Institutions	SRA (n=105)		Mum (n=105)		Both (N=210)	
	WAI	SD	WAI	SD	WAI	SD
WASA	3.55^{I}	0.832	3.43^{I}	0.853	3.49^{I}	0.843
NGO	3.27^{III}	0.669	3.09^{IV}	0.681	3.18^{III}	0.679
Local Community	3.46^{II}	0.941	3.25^{II}	0.830	3.35^{II}	0.891
Private Organization	3.02^{IV}	0.990	3.15^{III}	0.907	3.09^{IV}	0.950
TMA	0.00^{V}	0.000	0.08^{V}	0.549	0.04^{V}	0.389

Source: Household Survey, 2013

Note:
- Weighted average index, the highest value shows the highest prioritized institute.
- Super script over WAI shows the rank of that product in the relevant town (Appendix A 1).

Given the current socioeconomic factors in the study area, the WASA provided pipeline is the primary source of drinking water followed by TMA filtration plants (Table 4.2). Respondents trusted in government (WASA and TMA) higher than themselves as a Community, NGO and Private Organization for providing quality drinking water. When asked about the reasons behind such tendency, majority respondents revealed that government agencies can initiate larger level operations and thereby reduce cost of supply and update system infrastructures and thereby ensure reliable supply. Whereas some respondents also reveal that there is more negligence and corruption in government sector but they can't afford to high prices expected by private organizations. Engagement of communities in drinking water supply did not get much appreciation as community perceived high transition costs for them in managing these services.

5.4 Demand function of willingness to pay for improved drinking water

In response to various bids ranging between PKR 50 to 250, respondents demonstrated their WTP. It was observed that increase in bid amount was negatively associated with willingness to pay. As the amount of bid increases the percentage of respondents WTP is decreases. The overall demand function of all respondents is presented in (Figure 5.1). This situation is also described in section 0 (Table 5.2).

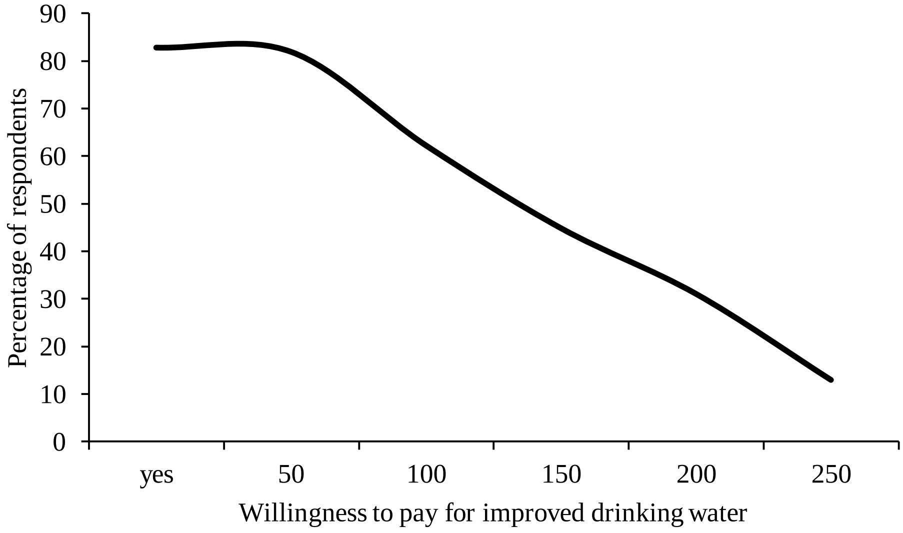

Figure 5.1: Demand function of WTP for improved drinking water

5.5 Correlates of WTP for improved drinking water supply

Theoretically consistent variable were assessed individually for their correlation with WTP in order to get the clues of causality. It emerged out that per capita income of family, total expenditure on drinking water, number of children aged 14 and below, quality consciousness of drinking water, water quality test, daily drinking water requirements (in liters), pipeline as a primary source of drinking water were significantly correlated with WTP for safe drinking water. Although signs of most of the variables in bivariate correlation were consistent with the relationship hypothesized in the conceptual framework (Section 1.3), some of them appear to be problematic. For example the index values of satisfaction with the existing water service and quality and household's access to adequate amount of drinking water appears to be positively correlated WTP. Although strength of relationship of both variables is statistically insignificant, it gives an impression that customers having access to adequate amount of drinking water and those satisfied with existing quality and service of drinking water would be WTP if they demand some improvement. This is apposite to what was expected during the initial conceptualization where it was hypothesized that access to inadequate amount of drinking water and low degree of satisfaction with drinking water supply and quality would raise customers' WTP for improvement in drinking water. However, given the weakness of bivariate correlation technique and statistically low strength of statistical correlation, one cannot conclude anything with certainty.

Table 5.4: Bivariate coorelates of WTP for improved drinking water supply

Abb.	Y	X1	X2	X3	X4	X5	X6
Y	1						
X1	0.507[a]	1					
X2	0.492[a]	0.477[a]	1				
X3	0.189[a]	-0.187[a]	-0.091	1			
X4	0.254[a]	0.246[a]	0.109	-0.067	1		
X5	0.239[a]	0.028	0.073	0.075	0.267[a]	1	
X6	0.078	0.098	0.074	0.068	0.028	-0.004	1

Notes:
- Superscript 'a & b denote the significance of 2-tailed correlation at 0.01 & 0.05 levels, respectively; Number of cases (N) is 210
- See Table 3.2 for complete names of variables abbreviation Y and X1 to X9

5.6 Determinants of WTP for improvements in drinking water in logistic regression

Income is positively associated with willingness to pay for improvement in drinking waters and is statistically significant across all models of high amount of bid (Table 5.5). Nevertheless given the small values of coefficients in all models, increase in income will increase the likelihood of willingness to pay be a very small proportion. Almost similar is the case with expenditure on drinking water except that the variable is statistically significant only in the model having WTP PKR 100 as a dependent variable. The reason behind very small coefficient of income can be explained by the fact that people spend very small percentage of their incomes on drinking water. This is not only evident from my study (Table 5.5) but also inlined in studies conducted in various studies such as in Korea (Um et al., 2002), Bangladesh (Ahmad et al., 2003) and China (Wang et al., 2008) are just the names of only a few.

Table 5.5: Determinants of WTP in Logit regression

	Model 1 WTP (Y/N)	Model 2 WTP 50 (Y/N)	Model 3 WTP 100 (Y/N)	Model 4 WTP 150 (Y/N)	Model 5 WTP 200 (Y/N)	Model 6 WTP 250 (Y/N)
Per capita income (in PKR)	0.000065 (0.00006)	0.000088 (0.00006)	0.000281[b] (0.00007)	0.000142[a] (0.00004)	0.000172[a] (0.00004)	0.000220[a] (0.00006)
Water expenditure (in PKR)	0.000098 (0.00026)	0.000069 (0.00026)	0.000553[b] (0.00026)	0.000181 (0.00021)	0.000196 (0.00026)	0.000202 (0.00036)
No of Children under 14 years of age	0.133403 (0.16229)	0.127325 (0.15966)	0.365384[b] (0.15738)	0.220406[c] (0.13070)	0.321236[b] (0.16040)	0.611358[b] (0.22319)
Quality conscious (Scale)	0.682531[b] (0.22790)	0.627632[b] (0.22408)	0.973123[a] (0.25152)	0.816652[b] (0.25754)	0.863321[b] (0.39019)	0.957165 (0.60468)
Water quality test (dummy)	0.872115 (0.58502)	1.018307[c] (0.58240)	0.130995 (0.39688)	0.338465 (0.37281)	0.804390 (0.50706)	1.426399[c] (0.76281)
Satisfaction with existing water quality	-1.634546[b] (0.67266)	-1.801033[b] (0.66504)	-0.418009 (0.56764)	-0.603322 (0.54857)	-0.365666 (0.77072)	-0.875654 (1.11857)
Constant	-1.037238 (1.11552)	-0.894809 (1.11023)	-6.081462[a] (1.34311)	-5.476038[a] (1.24583)	-7.955611[a] (1.90785)	-10.662088[a] (3.10454)
Nagelkerke R^2	0.202	0.221	0.391	0.297	0.385	0.497
Chi square	27.160	30.844	72,123	50.951	52.533	50.526
P value	0.000	0.000	0.000	0.000	0.000	0.000

Note:
- Entries are Logit coefficients. Values in parentheses are standard errors.
- Superscript 'a, b & c denote the significance at 1%, 5% & 10% levels, respectively.
- Number of cases (N) is 210

Increase in the number of children under the age of 14 years increase the likelihood of willingness to pay. Despite positive association, the coefficient of this variable is significant only in Model 3 (WTP 100), Model 4 (WTP 150), Model 5 (WTP 200), and Model 6 (WTP 250) (Table 5.5). The most plausible explanation for this variable is the fact that children are more vulnerable to waterborne diseases compared to adults (Buchanan, M.K., 2006 cited in Changa Pani, 2011). Therefore, parents might prefer preempting such diseases through precautionary measures, such as through providing them the clean water to drink. Among all variables however, the most important variable is the households quality consciousness of drinking water, which is not only statistically significant across all models except Model 6 (WTP 250) but has also higher coefficient. The relation of household's quality consciousness of drinking water to WTP is positive that is quite reasonable, as consciousness increases respondents WTP rises.

Two other variables, which are also important, are the satisfaction of household with the quality of their existing drinking water and awareness of actual quality of their drinking water measured through the laboratory test of drinking water quality. As expected, the higher levels of satisfaction with existing water quality is reduce the likelihood of households to demand and pay for further improvements. Conceptually, those already satisfied with quality of something may find it unimportant to demand further improvements. However, despite the theoretically consistent signs of coefficients, it is significant only in Model 1 and Model 2. A household having laboratory test reports of the quality of their drinking water is more likely to be willing to pay than those who lack it. Given the fact that in many instances of laboratory tests, the quality of drinking water was unsatisfactory (4.3), people may feel willing to pay for relative improvements. However, coefficient of this variable was significant only in Model 2, and Model 6. The detailed extended models by variation the variables are presented in Appendix B tables (B 2, B 3, B 4, B 5). Comparing these models we can understand the main leading variables are less effective of variation of more and extra variables. However the other variables have negligible effect on the model but variation of variables show the significance and strength of the model.

5.7 Robustness of WTP model for improved drinking water supply

To check the robustness of model a comparison of expected signs (Table 3.2) with actual signs of the models (Table 5.5) was done to assess the extent to which our empirical results fit with our auxiliary theory of WTP as developed in the Conceptual Framework (Figure 1.1) developed in the introductory chapter.

5.7.1 *Reconciliation of Auxiliary theory with empirical findings*

The hypothesized direction of the relationship of different independent variables with independent variable, i.e. WTP (Table 3.2) fit reasonably well with the empirical results obtained through questionnaire survey. All of the signs of the coefficients of independent variables in both, initial and extended, models are consistent with those conceptualized before the commencement of this study. This supports that the suggested model reflects the real world mechanism of people’s willingness to pay reasonably well (Table 5.6).

Table 5.6: Expected and actual signs of the WTP model for improved water supply

Caption of variables		Unit	Signs		
			Expected	Actual*	
				Model 1	Model 2
Y:	Maximum willingness to pay	PKR			
X1:	Per-capita income of family	PKR	+	+	+
X2:	Expenditure on drinking water	PKR	+	+	+
X3:	Under 14 year members in family	Number	+	+	+
X4:	Consciousness of drinking water quality	Likert scale	+	+	+
X5:	Water quality Test	Dummy	+	+	+
X6:	Satisfaction with drinking water supply	Likert scale	–	–	–
X7:	Daily drinking water requirement	Liters	+	..	+
X8:	Access to water	Likert scale	–	..	–
X9:	Pipeline as primary source of drinking water	Dummy	+	..	+

Notes * Model 1 is the initial model (**Error! Reference source not found.**); while Model 2 is the xtended model (**Error! Reference source not found.**)

Chapter 6. Summary, Conclusions and Recommendations

Based on the contextual information provided in Chapter 1 and determinants of peoples willingness to pay in Chapter 5, this Chapter summarizes the study, draws major conclusion and subsequently provides some of the recommendations to improve the quality and supply of drinking water. Section 6.1 provides summary of the findings and is followed by Section 6.2 that draws major conclusions of the study. Based on that, Section 6.3 makes recommendations. Finally, Section 6.4 indicates directions for future research on WTP for improved drinking water quality and service.

6.1 Summary

This study analyzed the status of drinking water supply and quality and customers willingness to pay for improvement in drinking water supply and quality in Multan city. Required information was collected from through stratified sample of selected 210 households from Shah-Rukun-e-alam and Mumtazabad. The contextual information was analyzed through descriptive statistics and weighted average indexes whereas the demand function for hypothetical improvements was determined using multiple bound choice Contingent Valuation Method (CVM) and Logit regression. The findings revealed that respondent accorded high importance to safe drinking water compared with other household needs. This was because of their high level awareness about the link between health and safe drinking water. Respondents used multiple sources of drinking water. Tap water, water from public filtration plants and borehole were the primary, secondary and tertiary water sources, respectively, in the study area. Most of the households perceived the quality of their existing drinking water as good for drinking purposes. Such perception was not well grounded as most of them relied on their sensory appraisals of water quality and only a little more than one fourth of them had tested their water from laboratory. In such situation, despite awareness insignificant attention has been devoted to in-house water treatment. Situation of drinking water storage was relatively satisfactory as about half of the respondents were using insulated and simple plastic canes cleaned on weekly basis while most of the remaining households were storing it in rooftop tanks cleaned twice a year. Almost all of those bringing water from publically installed filter plants were storing it in cane. While half of those using tap water for drinking purposes were storing it directly from supply line before it is released into rooftop tank for washing purposes. The remaining half of the households using tap water were storing it in rooftop tanks and using it for all purposes including drinking.

Despite high level of satisfaction with water quality and supply, people could come with the demand for some of the improvements. Seemingly, demand for improvement in supply parameters has exceeded that of the quality parameters. Even in service improvement, high demand was observed for improving reliability through installation of generators and establishment of customer care. Most of the respondent realized government budget constraints in providing demanded improvement. Within the bounds of certain degree of surety and confidence, it would be safe to expect that significant majority of the respondents would pay PKR 100 in addition to the amount they are paying at the moment. Most the WTP in this study is explained by level of people's awareness about the water and health consciousness. Among the most significant variable leading to major increase in peoples WTP included per head income, number of children under 14 years age, knowledge about health and water linkage, knowledge about the actual water quality tested through laboratory explained major proportion for their WTP for improved drinking water quality and supply.

6.2 Conclusions

Life is unimaginable without water. Clean drinking water is one of the major determinants of a healthy life. Thus access to clean drinking water has been regarded as a right of every human being. Since right over clean drinking water is well acknowledge everywhere, governments attempt to provide it at nominal charges as can also be seen in the case of Multan City and elsewhere in Pakistan. However, constrained by the lack of sufficient funds, government often face difficulties in making it sure the provision of right for clean drinking water to everyone in their countries. In such situations, user payment for quality drinking water emerges out as one of the option. This study, while confirming the findings of similar studies carried out in different parts of the world; support the hypotheses that income of household determines peoples WTP for improvements in the quality and supply of drinking water. However, given the fact that everywhere expenses on water make just tiny portion of the overall household expenditures, increase in income after a certain level may not play any significant role in people WTP for improvements in drinking water quality and supply. The findings of this study goes on to support the argument that health consciousness and awareness explains most of the variation in their WTP for drinking water. Most of the willingness to pay was because of the averting behavior to avoid health consequences of unsafe water intake. For example, the number of family members aged below 14 year determined significant variation in households' WTP as people in the study area were aware that children are more prone to waterborne diseases compared to adults.

Like most of the studies, this study also confirms that major source of awareness on health and water linkage comes from formal schooling. However, additionally people get such information from various sources such as newspapers, family and friends and also doctors were also important in creating such awareness. Despite awareness often than not people relied on their sensory appraisal and considered their water quality good if the water they were using was free of odor, turbidity, color and smell. Thus they remain unaware about the other water quality parameters such as chemical composition and microbes which cannot be observed through normal human senses. These people thereby remain in an illusion that they had been using safe drinking water but might in fact be using contaminated water for drinking purposes. Those aware of actual water quality through laboratory tests would certainly be more WTP than those who remain ignorant of this aspect of water quality as emerged out of the results of this study. Thus any policies for increasing peoples' WTP must make arrangements to inform people about the actual water quality of their existing water use based on detailed laboratory tests.

6.3 Recommendations

There is certainly a need to raise the water charges as existing water charges at a flat-rate may not be economically feasible in Multan city and similar situations. Based on the findings of the study following key recommendations can be offered. Since this study did not carry out economic analysis of the demanded improvement, it is suggested that the concerned agencies such as WASA and TMA must evaluate possible improvement which can be offered by raising existing water charges within the range of PKR 50 –100 per month.

6.3.1 *Recommendations for improving drinking water supply*

- People at present have demonstrated high degree of satisfaction with government institutions in provision of clean drinking water. However, what they concern is about the reliability which is essentially because of unreliable electricity supply due to high levels of load-shedding. Government may improve reliability either by installing generators or devise a mechanism through which people can be informed about changing water supply schedules in face with unreliable electric supply.

- The second and entirely missing aspect of government sponsored water supply is the customer care. People felt the need of customer care due to various reasons some of which were the information about changing schedule, supply of contaminated water due to mixing of water supply and sewage lines and other technical problems. A friendly customer care cell may increase faith of customer there by increase their WTP.

6.3.2 *Recommendations for improving water quality*

- Despite being aware of the importance of water for a healthy life, people seems to be satisfied with existing water quality based on their sensory appraisal of water they are using at the moment. There is a missing dimension of water quality that most of the respondent either do not know or do not bother much about it. This is the complete information about both observable and unobservable aspects of the quality of their water. Government may launch mobile water testing laboratory visiting and testing in house water quality at source and provide on spot result of that test. Given the limited revenue from the water supply, government may consider alternatives such as providing people awareness about the non-observable aspects of water quality through television, newspaper and clinics.

6.4 Directions for future research

- Although people seem to be WTP in addition to the amount they are paying at the moment. The official of water supply agencies however report that even the recovery rate for meager water charges at the present is very low. Therefore, the future research may search for understanding the reasons for low recovery rate? Are their problems on the part of supplying agencies or customers themselves are not paying but they have just quoted the bids?
- Given the nature of questions, this study cannot determine for which demanded improvement how much people are willing to pay. Therefore, it is suggested that if there are a couple of options for improvements, questions may be asked for different packages of improvement in order to determine exactly how much people are WTP for each of the improvements. Here the first package should start with the most demanded services while subsequent package should include an additional service. Done in this ways would make it possible to determined what percentages of bid pertain to the payment for any particular service.
- This study selected two out of six towns in Multan City which are the most posh areas of the City. With a slight different in the wealth status, both of towns were almost similar. Therefore, no significant variation in the responses could be observed It could be good if rich and poor towns could be included to portray a general pictures of the WTP of the residents of Multan City.

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Appendix A. Equations and their explanations

A 1: Methods for priority index

Explanation	Research asks them questions about the priority of different things and they tell their priority for that aspect and after that give them rank according to their priority level. As the codes are given below. Then for more explanation the range by weighted average index is constructed.	
Codes / Ranking	5	1st priority of people
	4	2nd priority of people
	3	3rd priority of people
	2	4th priority of people
	1	5th priority of people
	0	No any priority
Final Index Range	0.00	Have no any priority
	0.01 to 1.00	Very low priority
$PI = \frac{\Sigma p}{n}$	1.01 to 2.00	Low priority
	2.01 to 3.00	Normal priority
	3.01 to 4.00	High priority
	4.01 to 5.00	Very high priority
Output	Table 4.1, Table 5.1, Table 5.3	

A 2: Sources of drinking water

Explanation	Codes are assigned to primary, secondary and tertiary source of drinking water.	
Codes	1.00	Primary source of drinking water
	0.66	Secondary source of drinking water
	0.33	Tertiary source of drinking water
Explanation $PSDW = \frac{\Sigma(f_n * C_n)}{\Sigma\{(f_1 * C_1) + (f_2 * C_2) + (f_3 * C_3)\}}$ $Rank = \frac{\Sigma(PSDW)}{100} * n$	This research analyzes the frequency of primary, secondary and tertiary source of drinking water of each source. Then multiplied the frequency to their relative assigned code as mention above and add them. After that divide that numbers with their sum to get the percentage. That percentage shows all sources of drinking water's percentage share in relative the primary, secondary and tertiary sources. Rank column presents overall rank of major sources of drinking water. The value of rank is in between "0 – 1". This value is find out by dividing the sum of multiplied frequencies of a source of drinking water by sum of all sources multiplied frequency. The highest value in rank column shows the highest rank in	
Output	Table 4.2	

A 3: Water quality

Explanation	The Semantic Differentials Index used to check people's view to drinking water quality. For more explanation The range by weighted average index is given below.		
Final Index Range and superscripts	0.00 to 1.00	Worst quality	W
	1.01 to 2.00	Bad quality	B
	2.01 to 3.00	Normal quality	N
$WQ = \frac{\Sigma q}{n}$	3.01 to 4.00	Good quality	G
	4.01 to 5.00	Very high quality	VG
Output	Table 4.3		

A 4: Sources of awarness

Explanation	Seven point likert scale index is used to rank the sources of awareness. Codes are given and then finally find WAI and the index range and codes are given below.	
Codes	0	Not a awareness source
	1	Least important source
	2	Less important source
	3	Important source
	4	Very important source
	5	Highly important source
	6	The most important source
Final Index Range	0.00	Not a source of awareness
	0.01 to 1.00	Least important source
$SA = \frac{\Sigma ps}{n}$	1.01 to 2.00	Less important source
	2.01 to 3.00	Important source
	3.01 to 4.00	Very important source
	4.01 to 5.00	Highly important source
	5.01 to 6.00	The most important source
Output	Table 4.5	

A 5: Satifaction index

Explanation	Five digit likert scale use to collect information about satisfaction and the codes and final index range of WAI are given below.				
Codes	-2	Worst quality		Definitely no	
	-1	Bad quality		Probably no	
	0	Normal quality		Doubtful	
	+1	Good quality		Probably yes	
	+2	Very high quality		Definitely yes	
Final Index Range and superscripts	-1.01 to -2	Strongly dissatisfied	SD	Strongly not sure	SNS
	-0.01 to -1	Dissatisfied	D	Not sure	NS
	0	Neutral	N	Neutral	N
$SI = \frac{\Sigma sc}{n}$	0.00 to +1	Satisfied	S	Sure	S
	+1.01 to +2	Highly satisfied	HS	Strongly sure	SS
Output	Table 4.8			Table 5.2	

Appendix B. Diagnostic statistics

B 1: BPLM test is applied to check the heteroseckdascity in model

Independent variables	Unstandardized Coefficient		t-test	Sig.
	B	SE		
(Constant)	-2068.727	96.565	-1.723	0.086
Per-capita income of family	6.350	0.003	5.682	0.000
Expenditure on drinking water	-7.538	0.008	5.090	0.000
Under 14 year members in family	1300.505	7.294	4.460	0.000
Consciousness of drinking water quality	-4079.153	13.684	1.892	0.060
Water quality Test	55003.184	25.887	2.780	0.006
Satisfaction with drinking water supply and quality	42599.708	35.813	-0.198	0.843
Daily drinking water requirement	-409.572	1.574	0.816	0.415
Access to required amount of drinking water	-3713.416	18.498	-0.348	0.728
Pipeline as primary source of drinking water	-19794.811	23.556	0.443	0.658

Notes: Residual sum of square is dependent variable

R Square	0.055
F. test	1.291
Significance	0.244

R Square of residual sum of square is 0.055.

$n*R^2 = 210 * 0.055 = 11.55$

χ^2 (0.05) 9-1= χ^2 (0.05) 8= 15.51

15.51 > 11.55

This shows there is no heteroseckdascity.

B 2: Extended Determinants of WTP in Logit Regression 1

	Model 1 WTP (Y/N)	Model 2 WTP 50 (Y/N)	Model 3 WTP 100 (Y/N)	Model 4 WTP 150 (Y/N)	Model 5 WTP 200 (Y/N)	Model 6 WTP 250 (Y/N)
Per capita income	0.000105[c]	0.000122[b]	0.000258[a]	0.000119[a]	0.000161[a]	0.000258[a]
	(0.00006)	(0.00006)	(0.00007)	(0.00004)	(0.00005)	(0.00007)
Water expenditure	0.000076	0.000035	0.000557[b]	0.000139	0.000110	0.000057
	(0.00028)	(0.00027)	(0.00026)	(0.00021)	(0.00026)	(0.00033)
No of Children	0.250608	0.236165	0.359217[b]	0.175805	0.283257[c]	0.675857[a]
	(0.19016)	(0.18837)	(0.16434)	(0.13237)	(0.17101)	(0.24882)
Quality conscious	0.721787[a]	0.660469[a]	0.972858[a]	0.929548[a]	1.046620[a]	1.112920[c]
	(0.24637)	(0.24240)	(0.26204)	(0.27558)	(0.43573)	(0.66828)
Dummy test water	0.989154	1.156848[b]	0.228308	0.477265	1.016886[b]	1.654486[b]
	(0.60231)	(0.59728)	(0.40950)	(0.38421)	(0.53179)	(0.79123)
Overall satisfaction with existing water quality	-1.421135[b]	-1.585995[b]	-0.394434	-0.762676	-0.380162	-0.511109
	(0.68821)	(0.67970)	(0.58030)	(0.57201)	(0.82477)	(1.19053)
Education of respondent	-0.102436	-0.086817	0.052133	0.042407	0.037573	-0.004312
	(0.08501)	(0.08256)	(0.06507)	(0.05810)	(0.07498)	(0.10227)
Age of respondent	-0.012818	-0.002297	0.024316	0.040839[b]	0.054081[b]	0.035850
	(0.02404)	(0.02379)	(0.02117)	(0.02085)	(0.02867)	(0.04106)
Gender of respondent	0.490155	0.373547	-0.042842	-0.048019	-0.372693	-0.936061
	(0.73051)	(0.72096)	(0.51584)	(0.49321)	(0.67260)	(0.97656)
Family status of respondent	-1.356363[c]	-1.477432[b]	-0.671588	-0.240478	-0.601619	-0.914791
	(0.72230)	(0.71251)	(0.46883)	(0.45801)	(0.64387)	(0.96683)
Constant	-2.237965	-2.597247	-8.215111[a]	-7.778617[a]	-11.438852[a]	-13.821218[a]
	(2.08971)	(2.06533)	(2.00276)	(1.97220)	(3.10885)	(4.85461)
Nagelkerke R^2	0.243	0.266	0.408	0.317	0.415	0.527
Chi square	33.115	37.601	76.085	54.869	57.133	53.925
P value	0.000	0.000	0.000	0.000	0.000	0.000

Note:
- Entries are Logit coefficients. Values in parentheses are standard errors.
- Superscript ‘a, b & c denote the significance at 1%, 5% & 10% levels, respectively.
- Number of cases (N) is 210

B 3: Extended Determinants of WTP in Logit Regression 2

	Model 1 WTP (Y/N)	Model 2 WTP 50 (Y/N)	Model 3 WTP 100 (Y/N)	Model 4 WTP 150 (Y/N)	Model 5 WTP 200 (Y/N)	Model 6 WTP 250 (Y/N)
Per capita income	0.000104[c] (0.00006)	0.000121[c] (0.00006)	0.000258[a] (0.00007)	0.000119[a] (0.00004)	0.000160[a] (0.00005)	0.000243[a] (0.00007)
Water expenditure	0.000074 (0.00028)	0.000035 (0.00027)	0.000557[b] (0.00026)	0.000140 (0.00021)	0.000122 (0.00027)	0.000094 (0.00036)
No of Children	0.247066 (0.18975)	0.232768 (0.18801)	0.359221[b] (0.16437)	0.175125 (0.13199)	0.272014 (0.16594)	0.617662[a] (0.23522)
Quality conscious	0.693405[a] (0.24094)	0.638142[a] (0.23717)	0.975762[a] (0.25974)	0.930233[a] (0.27525)	1.031037[b] (0.43314)	1.027230 (0.66950)
Dummy test water	0.953611 (0.59738)	1.133519 (0.59405)	0.227635 (0.40942)	0.476397 (0.38407)	1.021763[b] (0.53299)	1.642243[b] (0.79993)
Overall satisfaction with existing water quality	-1.417413[b] (0.68892)	-1.580357[b] (0.68002)	-0.395573 (0.58013)	-0.764734 (0.57163)	-0.402536 (0.82269)	-0.559153 (1.20245)
Education of respondent	-0.094671 (0.08376)	-0.081016[b] (0.08147)	0.050994 (0.06361)	0.041513 (0.05736)	0.032932 (0.07455)	-0.012412 (0.10227)
Age of respondent	-0.012278 (0.02385)	-0.001929 (0.02367)	0.024247 (0.02115)	0.040742[b] (0.02082)	0.053748[b] (0.02849)	0.037935 (0.04029)
Family status of respondent	-1.108460[c] (0.60765)	-1.291223[b] (0.60549)	-0.692557[c] (0.39534)	-0.263390 (0.39283)	-0.762699 (0.57100)	-1.247513 (0.89223)
Constant	0.719445 (1.57257)	0.550820 (1.55825)	-6.888008[a] (1.69347)	-7.306008[a] (1.69760)	-10.225417[a] (2.67127)	-11.721430[a] (4.04693)
Nagelkerke R^2	0.240	0,264	0.408	0.317	0.413	0.519
Chi square	32.680	37.339	76.078	54.859	56.810	53.032
P value	0.000	0.000	0.000	0.000	0.000	0.000

Note:
- Entries are Logit coefficients. Values in parentheses are standard errors.
- Superscript ‘a, b & c denote the significance at 1%, 5% & 10% levels, respectively.
- Number of cases (N) is 210

B 4: Extended Determinants of WTP in Logit Regression 3

	Model 1 WTP (Y/N)	Model 2 WTP 50 (Y/N)	Model 3 WTP 100 (Y/N)	Model 4 WTP 150 (Y/N)	Model 5 WTP 200 (Y/N)	Model 6 WTP 250 (Y/N)
Per capita income	0.000098	0.000120[b]	0.000276[a]	0.000142[a]	0.000183[a]	0.000251[a]
	(0.00006)	(0.00006)	(0.00007)	(0.00004)	(0.00005)	(0.00007)
Water expenditure	0.000057	0.000032	0.000585[b]	0.000184	0.000184	0.000162
	(0.00027)	(0.00027)	(0.00026)	(0.00021)	(0.00026)	(0.00037)
No of Children	0.231361	0.230275	0.384295[b]	0.220543[c]	0.335595[b]	0.655125[a]
	(0.18768)	(0.18559)	(0.16261)	(0.13204)	(0.16432)	(0.22842)
Quality conscious	0.703658[a]	0.640053[a]	0.926160[a]	0.811906[a]	0.833787[b]	0.902560
	(0.24072)	(0.23615)	(0.25479)	(0.25949)	(0.39392)	(0.62958)
Dummy test water	0.984013[c]	1.138541[b]	0.149273	0.337543	0.810796	1.471512[c]
	(0.59306)	(0.59070)	(0.40392)	(0.37351)	(0.50994)	(0.77133)
Overall satisfaction with existing water quality	-1.418407[b]	-1.580928[b]	-0.306959	-0.591010	-0.192096	-0.494532
	(0.68743)	(0.67987)	(0.57693)	(0.56284)	(0.80384)	(1.18973)
Education of respondent	-0.086687	-0.079863	0.031903	0.004191	-0.022381	-0.052078
	(0.08231)	(0.08023)	(0.06119)	(0.05412)	(0.06822)	(0.09173)
Family status of respondent	-1.147473[c]	-1.297639[b]	-0.589150	-0.051544	-0.426138	-0.947853
	(0.60239)	(0.60032)	(0.38350)	(0.37695)	(0.53536)	(0.81039)
Constant	0.267652	0.480901	-5.927033[a]	-5.472794[a]	-7.468157[a]	-9.731650[a]
	(1.30760)	(1.30148)	(1.44750)	(1.35002)	(2.03503)	(3.23733)
Nagelkerke R^2	0.238	0.264	0.402	0.297	0.390	0.511
Chi square	32.417	37.333	74.735	50.975	53.263	52.161
P value	0.000	0.000	0.000	0.000	0.000	0.000

Note:
- Entries are Logit coefficients. Values in parentheses are standard errors.
- Superscript ‘a, b & c denote the significance at 1%, 5% & 10% levels, respectively.
- Number of cases (N) is 210

B 5: Extended Determinants of WTP in Logit Regression 4

	Model 1 WTP (Y/N)	Model 2 WTP 50 (Y/N)	Model 3 WTP 100 (Y/N)	Model 4 WTP 150 (Y/N)	Model 5 WTP 200 (Y/N)	Model 6 WTP 250 (Y/N)
Per capita income	0.000079 (0.00006)	0.000099c (0.00006)	0.000270a (0.00007)	0.000129a (0.00004)	0.000168a (0.00004)	0.000241a (0.00006)
Water expenditure	0.000103 (0.00027)	0.000060 (0.00027)	0.000540b (0.00026)	0.000126 (0.00021)	0.000107 (0.00026)	0.000100 (0.00036)
No of Children	0.198968 (0.17971)	0.188394 (0.17875)	0.382023b (0.16204)	0.191211 (0.13152)	0.282271c (0.16534)	0.614466a (0.23326)
Quality conscious	0.622496a (0.22993)	0.578508a (0.22751)	0.982926a (0.25849)	0.923636a (0.27307)	1.017269b (0.42900)	1.023001 (0.66905)
Dummy test water	0.919101 (0.59367)	1.109085c (0.59150)	0.232303 (0.40949)	0.472539 (0.38371)	1.013619c (0.53326)	1.648119b (0.79741)
Overall satisfaction with existing water quality	-1.486084b (0.68337)	-1.636278b (0.67509)	-0.330441 (0.57767)	-0.713598 (0.56916)	-0.366574 (0.81895)	-0.572929 (1.19892)
Age of respondent	-0.006668 (0.02294)	0.002470 (0.02295)	0.020004 (0.02051)	0.035710c (0.01957)	0.048646c (0.02598)	0.040014 (0.03647)
Family status of respondent	-1.081396c (0.59645)	-1.260504b (0.59562)	-0.663719c (0.39356)	-0.226797 (0.38947)	-0.719734 (0.55990)	-1.266732 (0.88207)
Constant	-0.014609 (1.43578)	-0.065543 (1.43385)	-6.363668a (1.54382)	-6.773626a (1.51136)	-9.716716a (2.38690)	-11.880045a (3.83122)
Nagelkerke R^2	0.231	0.257	0.406	0.314	0.412	0.519
Chi square	31.324	36.299	75.437	54.334	56.613	53.017
P value	0.000	0.000	0.000	0.000	0.000	0.000

Note:
- Entries are Logit coefficients. Values in parentheses are standard errors.
- Superscript ‘a, b & c denote the significance at 1%, 5% & 10% levels, respectively.
- Number of cases (N) is 210

Appendix C. Questionnaire

Pakistan Institute of Development Economics Islamabad

Center of Environmental Economics and Climate Change

Willingness to pay for drinking water quality and services in Multan city of Pakistan

Information for the respondents

This survey is being carried to write a thesis required for my M.Phil degree in Environmental Economics from the Pakistan Institute of Development Economics, Islamabad. It requires information on the existing situation of drinking water services provided to the resident of Multan City, improvement that are demanded by them and their willingness to pay for the said improvement in the quality and service of drinking water supply. This interview is completely confidential and strictly for academic purposes. Your name will never be linked with your answers. This survey is consists of 37 easy questions and will require less than 40 minutes to complete.

I request you to cooperate with my team by providing them with the requisite information.

In case you require any further information about this survey, its purpose or even want to complain about the construct of the questions or attitude of the enumerator, you can contact the principal investigator or his academic adviser at the following numbers.

Junaid Ishaq (Principal Investigator) Phone No: +92 – 333 – 6069706

Junaid Alam Memon (Research Supervisor) Phone No: + 92 – 51 – 9248060

Questionnaire Code		← *To be given by research coordinator*
Name of Town		← *To be given by research coordinator*
Respondent Code		← *To be provided by Enumerator*
Name of Enumerator		← *To be provided by Enumerator*
Date	*DD MM YYYY*	← *To be provided by Enumerator*

I- PROFILE OF THE RESPONDENT

Q1. Name [ ] **Q2.** Age [ ] *In years*

Q3. Gender [ ] *1= Male 2= Female 3= Other* **Q4.** Status in family [ ] *1=Earning 2= Dependent*

Q5. Relationship with Household Head [ ] **Q6.** Schooling [ ] *In years*

1 = Self 2 =Wife 3 = Brother 4 = Sister 5 = Son 6 = Daughter 7 = Father 8 = Mother 9 = Son spouse 10= Daughter spouse 11= Others

Q7. Acquired area of house [ ] *Marlas*

Q8. Comparison member of household education to you

More	Equal	Less

II- PROFILE OF THE HOUSEHOLD

Q9. Please provide the details of your family members:

Age group	Male		Female	
	Earning	Dependent	Earning	Dependent
1 to 14 years				
15 to 60 years				
60 years & above				

Instructions: - *Please count the number of persons in each group*

Q10. Please provide the information about approximate monthly expenses of your family:

Expense Type		Approximate amount *(in PKR)*	Remarks *(if any)*
1. Food			
2. House Rent			
3. Clothing			
4. Water	a. Drinking		
	b. Washing		
5. Electricity			
6. Gas			
7. Sanitation			
8. Waste Management			
9. Education			
10. Transportation			
11. Entertainment			
12. Other contingencies			

Instructions:
- *'Other Contingencies' include all expenses which cannot be covered under expenses head 1 to 11.*
- *Contingencies include all expenses such as health, social gathering like marriage ceremonies, and repair and maintenance at home, home appliances and car.*

Q11. Describe the major sources of your family income:

Source of Income	Approximate amount *(in PKR)*	Frequency *1= monthly 2= quarterly 3=semi annually 4= annually*	Remarks *(if any)*
1.			
2.			
3.			
4.			

Instructions:
- *The most important source should be listed as first while least important source should be listed last.*
- *Sources of income may include items like, Formal Job; Investment in Capital Assets like shop, portions of house rented out or land given on lease, Interest from fixed deposits, remittances etc.*

Q12. Please prioritize only five of the following services while keeping in mind the overall household preference for it.

Name of Service	Order of priority					
	None	1st	2nd	3rd	4th	5th
Sanitation	☐	☐	☐	☐	☐	☐
Solid waste collection	☐	☐	☐	☐	☐	☐
Clean drinking water	☐	☐	☐	☐	☐	☐
Hospital	☐	☐	☐	☐	☐	☐
Park	☐	☐	☐	☐	☐	☐
Playground	☐	☐	☐	☐	☐	☐
Paved Streets	☐	☐	☐	☐	☐	☐
Street lights	☐	☐	☐	☐	☐	☐
Other Service *specify*	☐	☐	☐	☐	☐	☐

Instructions:
- *First priority is highest priority while 5th priority is lowest priority.*
- *In case if any service is not among the five priorities, it should be recorded as 'none' priority.*
- *Except in the case of 'none', not two services can have same priority at a time.*

III- SOURCES & QUALITY OF DRINKING WATER

Instructions
- Since this study is designed to understand the state of drinking water at a household level, all of the remaining questions pertain to drinking water.
- As a respondent, you are representing your family. Therefore, while answering any question, you must keep your family in mind and give responses that best corresponds the opinion of entire family on different issues related to drinking water.

Q13. Please provide a close estimate of the daily drinking water requirement of your family ☐ *Qty in liters*

Q14. Has your family been able to access the required amount clean drinking water?

Never	Rarely	Often	Mostly	Always
☐	☐	☐	☐	☐

Q15. Where your family does stores the drinking water? ☐ *Insert only the code as given below*

1. *Water cooler or plastic cane*
2. *Mud pot*
3. *Underground cemented tank*
4. *Roof top cemented tank*
5. *Roof top plastic tank*
6. *Other (specify)*

Is that source well covered? ☐ 1= Yes 2= No

Q16. How often your family does clean the drinking water storage mentioned in Q15?

Once a week	Fortnightly	Monthly	Quarterly	Semi annually	More than that
☐	☐	☐	☐	☐	☐

Q17. Please provide details of different sources of drinking water for your family:

Source of drinking water *1 = Piped Supply* *2 = Groundwater borehole* *3 = Filtration plant* *4 = Bottled water* *5 = Other sources (specify)*	Dependency on these sources	Available at the Distance *(in kilometers)*	Further Treatment *0 = None* *1 = Boiling* *2 = Chlorine* *3 = Tablet* *4 = Others (specify)*	Approximate total cost of treatment - *Monthly Cost in PKR* - *In the case of no treatment or boiling, write "None"*
Primary			☐☐☐☐	
Secondary			☐☐☐☐	
Tertiary			☐☐☐☐	

Instructions:
- *The major source of dirking water should be recorded as primary source and so on.*
- *In case if the source is available at home, the distance will be zero.*
- *Total dependency should be 100.*
- *If the primary source is bottled water then please answer the upcoming question keep in mind the ground water or tap water which is available.*

Q18. Describe the available drinking water quality with reference to these parameters

Quality of Service	Quality Level 1	2	3	4	5	Quality of Service
Brackish	☐	☐	☐	☐	☐	Sweet
Dirty	☐	☐	☐	☐	☐	Clean
Green	☐	☐	☐	☐	☐	Colorless
Hard	☐	☐	☐	☐	☐	Soft
Odorous	☐	☐	☐	☐	☐	Odorless

Instructions:
- *Please rank the quality as perceived by daily use of water.*
- *Please tick only one box in a row.*

Q19. Describe the drinking water practice of your family outside the home

	Never	Rare	Often	Mostly	Always
Drink available water	☐	☐	☐	☐	☐
Take water from home	☐	☐	☐	☐	☐
Purchase bottle water	☐	☐	☐	☐	☐

Q20. To what extent the quality of drinking water matter for your family?

Not at all	Low	Very Low	Moderate	High	Very High
☐	☐	☐	☐	☐	☐

Q21. What are the main reasons behind the perceived importance of drinking water

Reason 1. ______________________

Reason 2. ______________________

Reason 3. ______________________

Reason 4. ______________________

Instructions:
- *The reasons should be recorded in order of priority. The first priority comes first*

Q22. Name some of the diseases, which your family think, are caused by using the poor quality drinking water:

Disease 1	________	Disease 2	________	Disease 3	________
Disease 4	________	Disease 5	________	Disease 6	________
Disease 7	________	Disease 8	________	Disease 9	________

Q23. How you compare your awareness level of waterborne diseases with that of the key members in your family?

Much less	Less	Same	More	Much more
☐	☐	☐	☐	☐

Q24. Please Prioritize sources of awareness of your family about water and health

	Order of importance						
	1st	2nd	3rd	4th	5th	6th	Invalid
Education	☐	☐	☐	☐	☐	☐	☐
Newspaper	☐	☐	☐	☐	☐	☐	☐
Television	☐	☐	☐	☐	☐	☐	☐
Doctor	☐	☐	☐	☐	☐	☐	☐
Friends/Relatives	☐	☐	☐	☐	☐	☐	☐
Self-observation	☐	☐	☐	☐	☐	☐	☐
Other *(specify)*	☐	☐	☐	☐	☐	☐	☐

Instructions:
- *Main source of information should be recorded as 1st while not a source should be recorded as invalid*
- *Please tick only one box in a row & column.*

Q25. Has your family ever sent the samples of your drinking water to laboratory for test? ☐ *1 = Yes→* When? ☐ ago *Period in months* *0 = No → go to Q27*

Instructions: - *In case of multi laboratory tests, provide the detail of the latest test*

Q26. What was the quality of drinking water based on that laboratory test?

Fit	Unfit
☐	☐

Q27. Describe the satisfaction level of your family with following parameters of existing drinking water supply:

Name of Service	Satisfaction Level				
	Strongly dissatisfied	Dissatisfied	Moderate	Satisfied	Strongly Satisfied
Amount of water supplied	☐	☐	☐	☐	☐
Duration of Supply	☐	☐	☐	☐	☐
Reliability of Supply timing	☐	☐	☐	☐	☐
Convenience in water collection	☐	☐	☐	☐	☐
Cost of Water	☐	☐	☐	☐	☐

Instructions: - *Please tick only one box in a row.*

Q28. Please justify your response to Q27 by providing appropriate reasons:

Amount of water supplied: ____________________

Duration of water supply: ____________________

Reliability of supply timing: ____________________

Convenience in water collection: ____________________

Cost of water: ____________________

Q29. Please suggest that what improvements can be made in drinking water

Improvements in Quality	Improvements in Services
1 ____________	**1** ____________
2 ____________	**2** ____________
3 ____________	**3** ____________

Instructions: - *The improvements should be recorded in order of priority. The first priority comes first*

Q30. Please prioritize following improvements in drinking water quality and services suggested by MDA while keeping in the mind the overall household preference for it.

Improvements	Order of priority					
	None	1st	2nd	3rd	4th	5th
Install generators	☐	☐	☐	☐	☐	☐
Increase the service timing	☐	☐	☐	☐	☐	☐
Quick response to complaints	☐	☐	☐	☐	☐	☐
Install filters on tubewells	☐	☐	☐	☐	☐	☐
Clorinization	☐	☐	☐	☐	☐	☐

Instructions:
- *First priority is highest priority while 5th priority is lowest priority.*
- *In case if any service is not among the five priorities, it should be recorded as 'none' priority.*
- *Except in the case of 'none', not two services can have same priority at a time.*

Q31. Are you satisfied to WASA efforts for drinking water supply ☐ 1= Yes 2= No

Q32. In your opinion, which of the following agencies can be trusted the most for the managing drinking water supply? ☐ *Insert only the code as given below*

1. *Town Municipal Administration*
2. *WASA*
3. *MDA*
4. *NGO*
5. *Private organization*
6. *Other___________*

In case of "NGO", specify its name ____________________

Q33. Describe your family's level of trust on these institutions for water services:

Name of Institution	Trust Level				
	Strongly Distrusted	Distrust	Neutral	Trust	Strongly Trusted
WASA	☐	☐	☐	☐	☐
NGO	☐	☐	☐	☐	☐
Local Community	☐	☐	☐	☐	☐
Private Organization	☐	☐	☐	☐	☐
Other *specify*	☐	☐	☐	☐	☐

Instructions: - *Please tick only one box in a row.*

IV- WILLINGNESS TO PAY FOR IMPROVED DRINKING WATER

Hypothetical Scenario: Suppose that any agency promises to bring the above suggested improvements in the quality and services of drinking water. The agency will also ensure that the water quality will meet the international standards, and will be free from impurities like bacteria and all other type of dangerous germs.

Q34. Will your family be willing to pay for the above mentioned improvements? [ ]

1 = Yes (continue sequence)
0 = No (go to Q37)

Q35. Please quantify willingness to pay of your family for these proposed improvements

Cost	Definitely Yes (1)	Probably Yes (2)	Doubtful (3)	Probably No (4)	Definitely No (5)
I. Are you willing to pay PRS 50? *If answer is 1 to 3 then continue otherwise go to Q36*	☐	☐	☐	☐	☐
II. Are you willing to pay PRS 150? *If answer is 1 to 3 then continue otherwise go to* V	☐	☐	☐	☐	☐
III. Are you willing to pay PRS 250? *If answer is 1 to 3 then go to Q36 otherwise go to IV*	☐	☐	☐	☐	☐
IV. Are you willing to pay PRS 200? *If answer is 1 to 3 then go to Q37, otherwise go to* V	☐	☐	☐	☐	☐
V. Are you willing to pay PRS 100? *If answer is 1 to 3 then go to Q37, otherwise go to Q36*	☐	☐	☐	☐	☐

Q36. What maximum amount you are willing to pay for the suggested improvements in the drinking water facility? PKR ________

Q37. Why you are (not) willing to pay this amount for the proposed improvement

Reason 1 ____________________

Reason 2 ____________________

Reason 3 ____________________

Any other suggestion/ remarks?

____

____

____

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____

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Thanks for your cooperation