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Willingness to Pay for Improved Water Supply Services in Morbi City: A Case Study

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Abstract — *Unreliable water supply is a prime issue in developing countries like India. The study was undertaken to investigate peoples' perception and preferences for domestic water supply services by using Willingness to pay (WTP) survey. In Morbi city, Annual water tariff was found to be very low this hampers the optimal management of water supply services in the city. A survey was conducted on 210 households by using contingent valuation method. Closed ended questionnaires were prepared to identify WTP of the residents of Morbi city. The study revealed that more than 71% consumers were ready to pay higher on proposed tariff. The study is useful for planning a water supply system for the ever increasing urban population of the city. A contingency evaluation based study on WTP for improved solid waste disposal and sewerage services and maintaining the same for the city may be conducted on the similar lines.*

Keywords- *Willingness to pay, Contingent Valuation Method (CVM), Water supply, Water tariff, Water quality.*

I. INTRODUCTION

In the olden days humans required water for drinking, bathing, cooking etc. on the other hand with the advancement of civilization the usefulness of water has increased tremendously, and now we have reached such a stage that without well-organized public water supply scheme, it is impossible to run the present civic life.

Unreliable water supply is major public health concern in developing countries (Casey, 2006). An estimated 80% of all diseases and over 1/3rd deaths in developing countries are caused by the consumption of contaminated water (Brar, 2013). People have been wasting their significant time and money to fetch water. Therefore good water supply is necessary to reduce water borne diseases and improve health, productivity and welfares of human beings (Moffat, 2011). In Developing countries, urban water supply services are bad and are continuously getting worse (Casey, 2006). Government have been allocating large funds for water supply projects; however most of the projects fails to achieve their require goal mainly because of lack of knowledge of public health benefit from improved water supply services, consumers' beliefs, consumers' affordability, public participation and involvements in the design and management policies of water supply system (Ifabiyi, 2011).

For the sustainable development of water supply projects, Willingness to Pay (WTP) study is very much important to draw out information regarding valuation of water supply services (De Oca, 2003). In the present era, every society gives emphasis to each resource in monetary terms but the valuation of natural resources is much difficult, especially for water (Filippidis, 2005). Wondimu, 2012 showed that WTP has been proved as best studies for the valuation of water supply services. Contingent Valuation Method is also used world over to evaluate water supply services by directly asking consumers for their WTP.

The present way of thinking of a majority of the population is that providing water to all is a state's responsibility but the rapid rate of urbanization undoubtedly represents a major challenge for those accountable for the provision of the basic water and sanitation services that are so vital for the health, dignity and economic well being of the urban population. Therefore, in future, the professional involved in the water supply sector would require skill, to understand resource interrelationships and their limits, and also to help develop strategies that avoid conflicting, individualized behaviour that could lead to depletion and pollution of water.

The governments always strive hard for the equitable distribution of water among the needy people but this requires huge money. Provision of water to communities is costly and communities need to be willing to share cost with authority for better water supply services (Chowdhury, 1999).

About 1.9 lac population (Census 2011) of Morbi city forms it epicenter for economic activity and development (Casey, 2006). The water supply system in Morbi city was first established in 1961(www.gsdma.org). Since establishment of water supply system appropriate improvement has been carried out to cater water to the increasing population. However, the people of Morbi city have been facing the problems of reliability, quality and quantity issues from the city's water supply system.

The main sources of water supply in Morbi city are Machchhu Dam-2 and raw water from Narmada Project based pipelines. In summer season, very seldom there is water in Machchhu Dam- 2 and therefore the alternative sources of water supply is raw water from Narmada Project based pipelines.

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In the Morbi city, there are two conventional water treatment plants having capacity of 12.5 MLD and 43 MLD respectively. They were established in the year 1970 and 2003 respectively. 12.5 MLD Filter plant is in a bad condition but still it is being utilized. The condition of most of the water supply infrastructure is also very poor.

Morbi was declared as district in May, 2013. In the state of Gujarat the water tariff were reformed in May, 2010 in which the domestic and commercial water tariff rates were raised to Rs. 600/year and Rs. 2700/year from Rs. 180/year and Rs.900/year respectively. Thus, even now the monthly water tariff as compared to other services like electricity, fuel etc is meager. This results in colossal Shortfalls in revenue recovery which does not allow the utility to even operate and manage the existing supply network. The shortfall in revenue recovery of the city is presented at Table-1.

Table 1. Shortfall in Revenue Recovery in Morbi city

Sr. No.	Year	Shortfall in Revenue Recovery at particular year (Rs. Lac)
1	2011-12	114.10
2	2012-13	71.11
3	2013-14	55.91
4	2015-16	35.73

The Morbi Nagarpalika cannot sustain this huge loss every year. Furthermore, owning to such precarious condition it is imperative for the authorities to make suitable policies changes that would allow them to recovery at least the operation and maintenance cost of water supply system and also to facilitate new water supply infrastructure for the city.

This study intends to critically examine the consumers' Willingness to Pay for the improvement in the city's water supply. The results of the study would be useful for the utility to accordingly frame policies that would help them sustainably operate the city's water supply system and also to built future facilities.

II. METHODOLOGY

Willingness to pay is one of the most widely used instruments for measuring environmental quality. This instrument has particularly been employed in conducting CVM (Wedgwood, 2003).

CVM was first developed in the US in the 1960. CVM is used in the field of environmental economics and statics. Many literatures have been proved that CVM is used for the valuation of natural resources and has two fundamental approaches (Filippidis, 2005). Filippidis, 2005 had deduced that indirect approach is totally based on observing information while direct approach such as CVM is totally based on directly asking questionnaires to respondent. Both close and open ended questionnaires can be prepared based on the market scenario to draw up information regarding the water resources. Though, CVM method has some critics such as respondent may understate or overstate their WTP (Moffat, 2011). Moreover, some issue of biases in the study is also unavoidable, however well designed the questionnaires happens to be (Casey, 2006).

The author(s) conducted a WTP survey using CVM in two parts. In first parts of the survey author had personally contacted people to accumulate Information regarding their perception, preference and problems related to domestic water supply. A questionnaire was then designed to carry out the survey.

The study uses primary data. The data were collected using a structured questionnaire. The designed questionnaire was pre-tested and modified before the conduct of actual survey. In Second Part of the survey the author(s) interviewed each respondent in their mother tongue (Gujarati).

Sample size for 93% confidence level and $\pm$ 7% precision was determined using a simplified formula given by Yamane (1967) (Eq.1) (Israel, 1992)**.**

$$n = \frac{N}{1 + N(e)^2} \quad \text{.....(Eq. 1)}$$

Where, n = Sample size
N =Total Population
e = Level of precision

Total 210 Respondents were surveyed out of which 204 were analyzed later as certain responses were vague and misleading or no responses by the consumer. The survey provided required data regarding consumers' level of satisfaction, information about available enough water storage capacity and rain water harvesting facilities, their perception about supplied water quality, quantity and Pressure and their WTP for Improvement in water supply services.

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III. RESULTS AND DISCUSSION

The responses of the consumer regarding the water supply system of the Morbi city is presented at Table-2.

Table 2. Domestic Water Supply Questionnaires and their Responses

Sr. No.	Description	Yes/No	Total Responses	Total Non-Responses
1	Are you Getting Drinkable Water?	Yes	35%	8%
		No	57%	
2	Are you getting water with enough pressure?	Yes	35%	6%
		No	59%	
3	Are you using electric motor?	Yes	77%	5%
		No	18%	
4	Are you getting sufficient Water?	Yes	73%	5%
		No	22%	
5	Have you enough water storage capacity?	Yes	83%	6%
		No	11%	
6	Have you any rain water harvesting facilities available?	Yes	33%	5%
		No	62%	
7	Level of satisfaction from domestic water supply system	Satisfy	57%	6%
		Not Satisfy	37%	

3.1 Water quality

The recorded responses showed that about 57% people were not getting drinkable water. While 35 % people were getting drinkable water, however, they were also using water purification appliances such as R.O. plant, bottle filtered water, water purifier etc. to cope up with the water quality issues.

The study also revealed that, More than 35 % people relied on filtered bottle water to cope with unreliable water supply. About 8% people were not interested to give any response because they believed such survey of no use to them.

3.2 Pressure

Study also showed that about 59% people are not getting water with enough pressure and therefore they are forced to use electric motor for getting enough water to fulfill their water demand. The author(s) attributes lack of water pressure in water supply to large number of illegal water connection in domestic water supply system.

3.3 Quantity of Water

The results shows that about 73% people were getting water in enough quantity, while 18% people had to spent large amount of time and money for the collection of water from other resources. The result also reveals that the certain areas of the city were not receiving enough quantity of water due to lack of pressure in water supply.

3.4 Storage Capacity

In Morbi city, on an average the inhabitants received water for 30 to 45 minutes on daily basis. The study also revealed that 83% household had enough water storage capacity. This goes to show that people were getting sufficient quantity of water. About 11 % household did not have enough water storage capacity this would render wastage of additional water due of lack of adequate storage facilities.

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3.5 Rain water harvesting facilities

Out of the total sampled households, 33% households had rain water harvesting facilities such as Small underground sump; water tanks etc. and were storing water during rainy season for their future use. Remaining 62 % people were not storing water during rainy season which is about 2/3 of the total sampled household. Due to lack of knowledge and awareness of people regarding the importance of storing rainwater for future they did not store rain water. The results are very encouraging and the situation can be even bettered if the residents are educated and trained to utilize the rain water for their future needs.

3.6 Level of satisfaction

The results show that about 57% people were satisfied from the Nagarpalika's water supply system, while 37% people were not satisfied from the Nagarpalika water supply system. There was an evident false sense of threat in the minds of 6% people who did not respond to the questionnaire, because they perceived that a negative response would cost them adversely and that they may not receive good services from the Nagar Palika in future.

3.7 Willingness to Pay

The study showed that more than 72% consumer were willing to pay for improved water supplies for both type of rate such as flat type rate as well as volume type tariff rate. Economic, social and attitude factors were identified as the governing factors controlling people's WTP.

a) Household WTP based on Annual Flat Rate

The results of the Household WTP based on Annual Flat Rate are presented at Fig.1. Household WTP survey of 204 household showed that more than 40 % people were ready to pay less than Rs.100 per year more on annual flat tariff rate basis, while About 7 to 8% people were ready to pay more than Rs.400 per year more on annual flat tariff rate basis.

Remaining 18% people were willing to pay between Rs.100 to Rs.400 per year more on annual flat tariff rate basis for the improvement of water supply services. Another 20% people did not willing to pay quantity based rate because they believed that no improvement in the present water supply system is required.

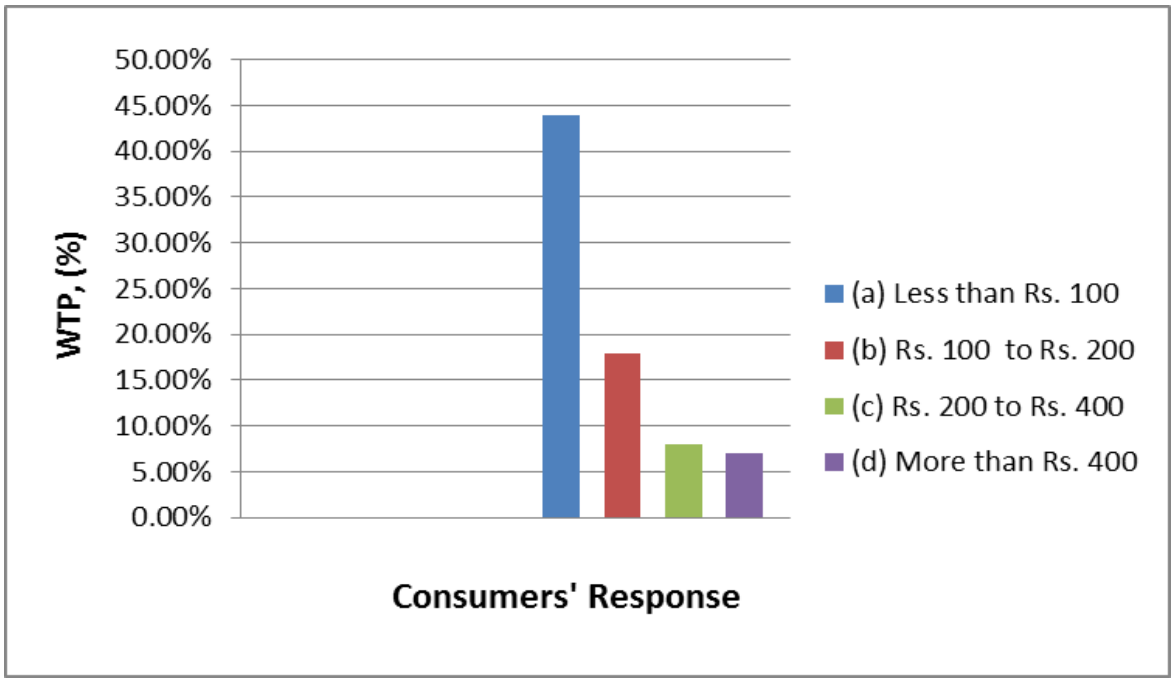

Fig.1. Household WTP based on Annual Flat Rate

b) Annual WTP based on volumetric tariff rate

The Results of the annual WTP based on volumetric tariff rate is presented at Fig. 2. The Study showed that more than 35 % people were ready to pay less than Rs. 5 per cubic meter of water and about 7 to 8% people were ready to pay more than Rs. 15 per cubic meter of water. Remaining 18% people were willing to pay between Rs. 5 to Rs. 15 per cubic meter of water. 18% people perceived these prices to be adequate for the improvement of water supply services. Another 22 % people did not want to pay more. They believed that this type of survey could not improve the water supply services as they had enough doubt on the abilities of the authority to operate and maintain water supply services sustainably.

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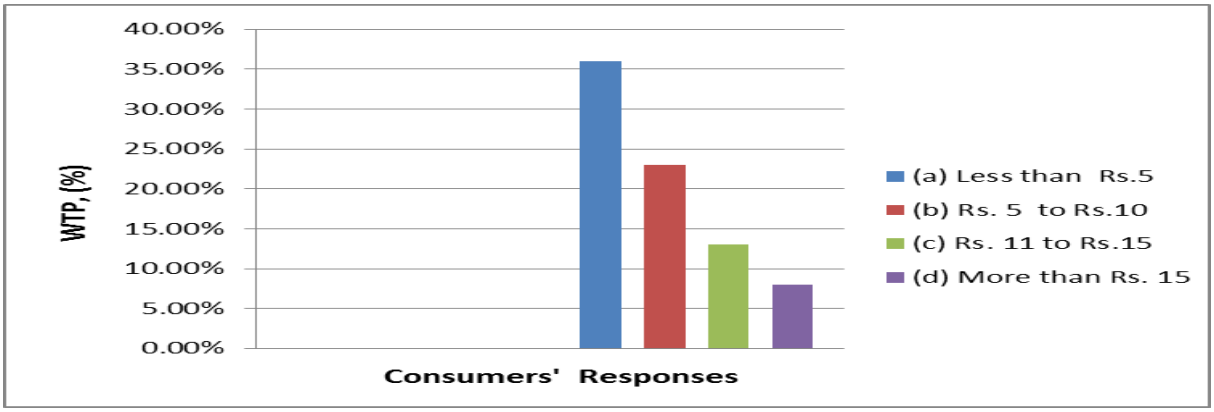

Fig.2. Annual WTP based on volumetric tariff rate

IV. CONCLUSIONS AND RECOMMENDATIONS

The results of the study clearly shows that on an average 35 % consumer from the study area were not getting water with enough pressure and quantity, and also the quality of water was unacceptable. The people therefore had to rely on bottle filtered water, use of electric motor to draw more water from the supply lines, and use of various water purifiers and R.O. plants. The consumer also had to incur significant cost for storing water due to intermittent water supply.

Economic, social and attitude factors were identified as the governing factors controlling people's WTP. Study also revealed that 71% people were willing to pay less than Rs.5 per cubic meter of water and less than Rs.100 per year more on annual water tariff for improved water supply. By using results of this study authority can develop better pricing policies which results in higher revenue generation and a better management of the city's water supply system.

A contingency evaluation based study on WTP for improved waste disposal and sewerage services and maintaining the same for the city may be conducted on the lines similar to the present study.

REFERENCES

1. Brar, A. S. (2013). Consumer behaviour and perception for efficient water use in urban Punjab.
2. Casey, J. F. (2006). Willingness to pay for improved water service in Manaus, Amazonas, Brazil. Ecological Economics, 58(2), 365-372.
3. Chowdhury, N. T. (1999). Willingness to pay for water in Dhaka slums: A Contingent Valuation Study. IUCN-The World Conservation Union, Association of Green Accounting, Environmental Economics in Bangladesh, 105-116.
4. De Oca, G. S. (2003). Assessing the willingness to pay for maintained and improved water supplies in Mexico City. Working Paper-Centre for Social and Economic Research on the Global Environment, 1-31.
5. Filippidis, E. I. (2005). A willingness to pay survey for improved water supply conditions in Taxiarchis municipal district of Halkidiki prefecture, Greece. NEW MEDIT (CIHEAM).
6. Ifabiyi, I. P. (2011). Willingness to pay for water at household level in Ilorin, Kwara State, Nigeria. Global journal of human social science, 11(2), 15-25.
7. Israel, G. D. (1992). Determining sample size. University of Florida Cooperative Extension Service, Institute of Food and Agriculture Sciences, EDIS.
8. Moffat, B. M. (2011). Households willingness to pay for improved water quality and reliability of supply in Chobe ward, Maun. Botswana Journal of Economics, 8(12), 45-61.
9. Wedgwood, A. &. (2003). Willingness-to-Pay Surveys: A Streamlined Approach: Guidance Notes for Small Town Water Services. In K. S. Alison Wedgwood, Willingness-to-Pay Surveys: A Streamlined Approach: Guidance Notes for Small Town Water Services (p. 234). WEDC, Loughborough University, 2003.
10. Wondimu, S. &. (2012). Determinants of individual willingness to pay for quality water supply: The case of Wonji Shoa Sugar Estate, Ethiopia. Water and Society, 153, 59.
11. http://gsdma.org

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