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WILLINGNESS TO PAY FOR URBAN WATER AND SANITATION IN INDIA BARODA CASE STUDY AND GUIDELINES FOR FUTURE STUDIES

Chetan Vaidya

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WILLINGNESS TO PAY FOR URBAN WATER AND SANITATION IN INDIA

– BARODA CASE STUDY AND GUIDELINES FOR FUTURE STUDIES

Chetan Vaidya*

SUMMARY

The issue of appropriate pricing and cost recovery from water supply and sanitation service has become very important. A major concern within this area of study relates to an understanding willingness to pay (WTP) for these services. The past policies for pricing of water and investment planning often do not capture willingness to pay for water services. Recent methodological developments use contingent valuation methods and measure compensating investments to assess WTP for such services. One such study has recently completed for Baroda city. This paper has briefly presented the Baroda and other WTP studies. It has also given guidelines for conducting such studies in Urban India.

NEED FOR WTP STUDIES

Inadequate availability of water for domestic purpose is a major problem in developing countries. Recognising this problem, international funding agencies and governments have undertaken a number of programmes for improving water supply. Most of these initiatives are based on an approach that government should subsidise the water supply as the households are too poor to pay and to achieve equity public funds should be spread thinly. Some international agencies do not accept this "welfare state" approach. The World Bank and other agencies suggest an alternative. They contend that people can and will pay 3 to 5 per cent of their monthly income for water supply.

Both the approaches concentrate on supply to the neglect of demand and neither have has successfully solved the problem (World Bank WDR Team, 1993). In this context a research programme grounded on recognition that policy and planning should be built on a better understanding of what improvements in their water supply services people want and are willing to pay. The research team set out to investigate determinants of water demand for improved water services such as socio-economic background, characteristics of existing and proposed system, price, distance and reliability. Many of the studies sponsored by the World Bank to investigate these issues. They were carried out in Brazil, Nigeria, Zimbabwe, Indonesia, Morocco, Pakistan, India, etc. Major findings of these studies have been presented in the next section. Second section has described the Baroda study. Third and final section has identified some methodological issues.

REVIEW OF WTP STUDIES

Rural Water Supply, Pakistan

The purpose of a study in Punjab, Pakistan was to examine impact of rapid economic development of large village in Sheikhupura and Faisalabad districts for water supply policy in rural areas (Altaf 1993).

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* Professor of Architecture and Planning, M.S. University of Baroda

+ Author is thankful to Dr Meera Mehta for her help in developing methodology for the Baroda Case Study.

The World Bank Water Demand Research Team used both indirect (revealed preference) and direct (contingent valuation) methods to study how households made their choices about water sources. The indirect approach used discrete choice, econometric techniques to model households' decisions and to derive estimates of welfare charge from the actual choices that households made. The direct approach involved asking people who did not have an improved water source whether they would use a new source if it were provided under specified conditions and how much they are willing to pay.

Three sets of characteristics jointly influence a household's willingness to use, or to pay for, an improved water supply:

- The socio-economic and demographic characteristics of the household, including education of family members; occupation; size and composition of family; and measures of income, expenditures and assets.
- The characteristics of the existing or traditional source of water versus those of the improved water supply, including the cost (both financial and in time required to collect water), the quality, and the reliability of the supply.
- Households' attitudes toward government policy in the water supply sector and their sense of entitlement to government services.

The response of a household to a new, improved water supply is not, due to any one set of determinants alone, but to their joint effect. It is this 'jointness' that is modeled in the multivariate analysis.

The study revealed some consistencies in the way villagers choose their water sources and amounts they are willing to pay for improvements. Following four types of villages have been identified by the study:

Type I : High willingness to pay for connection and low willingness to pay for public taps

Type II : A few will pay the full cost of private connections and the majority will pay the full cost of public taps.

Type III : Households are willing to pay for improved service but improvement is not very costly.

Type IV : Low willingness to pay for improved water service.

If planners and donors are willing to spend the time and resources necessary to understand local water demand and supply better, the outlines of a new formula for rural water supply policies can be discerned. In this new paradigm the appropriate policies would be different in each of the four different types of communities.

Emerging from a low level equilibrium in Rural Water Supply, Kerala

New water supply systems in rural towns of developing countries tend to be designed as inexpensive communal systems with a few public taps or deep wells. Such systems are often poorly maintained and have much less impact on use patterns of the intended beneficiaries than is expected.

Donors and government officials are beginning to focus on financial issues, especially the generation of revenues through domestic connections, as a way to escape from the

problems created by this traditional approach. This emerging consensus brings consumer behaviour as an important part of the design of water systems.

This study examines willingness to pay for yard taps, or house connections, in several towns in the state of Kerala (Singh and Ramasubbrao, 1993). This situation can be described as a low level equilibrium trap, and it characterizes piped water supply systems in much of the developing world. Systems provide a low level of service with few yard taps. Because there are few connectors and because tariffs are low, little revenue is generated. The water authority can afford to maintain the system up to a level at which the liability of service is low, forcing consumers to supplement piped water from traditional sources. The study used contingent valuation methods to analyse the potential for a yard tap-based strategy to work in Kerala by testing the sensitivity of households to the monthly tariff for water from a yard tap, the cost of connecting the house to the water main, and paying more for improved quality of service. The conginent valuation method allowed respondents to consider hypothetical changes in water supply characteristics and to respond to questions about the effect of the cost of a connection, the monthly tariff, and improved quality of service on the decision to purchase yard tap.

The analysis suggests that there is indeed potential for the system to rise out of its current trap. The real constraint in preventing hook-ups by respondents who are deterred by the high cost of a connection is probably credit market conditions rather than the connection cost itself.

Five Per cent Rule For Improved Water Service, Morocco

Most utilities and donors assume that, as long as the cost of potable water to the household falls below 5% of household income, then it is "affordable" and the household will make a connection to the system and be able to pay the subsequent recurrent charges. One paper presents an empirical test of the "Five Per cent Rule" using the contingent valuation method of determining willingness to pay (WTP) for improved water service for a sample of households in five small cities of Morocco (Mcphail, 1993).

Results from the WTP surveys show that many low income households are willing and able to pay more than 5% of total household expenditures for individual water service. Therefore the policy in many developing countries to provide subsidized (or free) standpost water supplies to portions of the population may be incorrect. The most important finding from the research is that households, even though they had free and reliable standpost water service, were willing to spend well in excess of 5% of total household expenditures to finance an individual metered water connection and the subsequent monthly commodity charges.

Water Vending System and WTP, Onitsha Nigeria

Most people in Onitsha, Nigeria obtain their water from an elaborate and well-organised water vending system which is run by the private sector (Wittington and Lauria 1991).

It should be relatively easy for the water authority (ASWC) to capture a large share of the water vendors' market - even if the prices charged for water from the piped system are high enough to cover the full costs of supply. The results of the household survey, however, indicate that people perceive the water available from tanker trucks and small retail water vendors to be better in quality than the water available from the old public system. Therefore, in order to increase its market share, the ASWC must not only offer a lower priced product than the vendors, but also provide a better product in terms of both water quality and reliable service. This study has demonstrated that the willingness of households to pay for improved water services in Onitsha is surprisingly high.

Improved Sanitation System, Kumasi, Ghana

A contingent valuation survey was conducted in Kumasi, Ghana, to estimate households' willingness to pay for two types of improved sanitation services; improved ventilated pit latrines and water closets connected to a sewer system (Whittington and Lauria, 1993). Most households were willing to pay more for improved sanitation service than they were currently paying for their existing sanitation system (mostly public and bucket latrines), but in absolute terms the potential revenues from households are not large (about 1-2% of household income). The results of the study confirm the conventional wisdom that conventional sewerage is not affordable to the vast majority of households without massive government subsidies. On the other hand, it appears that only modest subsidies are required to achieve relatively high levels of coverage with on-site sanitation (improved ventilated pit latrines). This is because improved ventilated pit latrines are much cheaper than conventional sewerage and because most households are willing to pay about a much for a ventilated pit latrine as for a water closet connected to a sewer.

Households' responses to unreliability of urban water supply

In 1991, micro-level research on household responses to deficient water supply by public utilities was undertaken in Faisalabad (Pakistan), Istanbul (Turkey), and Jamshedpur (India) (Bell and Joh, 1994). These surveys revealed that nearly all households in the three cities are dependent on multiple sources of water, including house taps, wells, tubewells, public taps, rivers and street vendors. Not all alternatives are available to all households. Because access to a source increases with income, poorer households bear a disproportionate share of the burden of deficient infrastructure. The private expenditures incurred for water supply indicate consumers' willingness to pay for reliable water.

In Jamshedpur, the connection charges for piped water vary between Rs.50 and Rs.500. The residents of the periurban areas, served by the local municipal authorities, incur capital costs of Rs.1500 to Rs.2000 for digging wells and Rs.4500 to Rs.9000 in installing tubewells to avoid dependence on the (unreliable) public water supply. Despite the existence of a piped water system, at least 17 per cent of the population meets 90 per cent of its water needs from wells and handpumps. Over and above the monetary costs that consumers bear, households in Jamshedpur spend, on average, two hours a day fetching and storing water. The burden of these activities falls in nearly all cases of women.

Time Spent on Collecting Water, Ukanda, Kenya

This paper presents two procedures for estimating the value that households assign to time they spend collecting water. Both approaches are used to derive estimates of the value of time spent collecting water for a sample of households in Ukanda, Kenya (Whittington and Xinming, 1990). Each of the households in the sample faced a choice between three water sources: a kiosk which sells water by the bucket, vendors who deliver water to the home.

The first approach described in the paper for estimating the value of time assumes that a household's water source choice decision is based on two factors: the price of water at the source and the time spent collecting water from the source. The results of the "revealed preference" analysis suggest that households which chose a kiosk assigned an average value was about 50 per cent higher than the market wage for unskilled labour. The average value of time spent collecting water for those households which chose vendors was over twice the wage rate for unskilled labour. The second approach presented in the paper for estimating the value households assign to the time spent collecting water is based on a multivariate analysis of the determinants of households' water source choice decisions. This estimate is about 20 per cent higher than the market wage rate for unskilled labour.

The results of both of these approaches yield surprisingly high values relative to the wage rate for unskilled labour. One of the most important policy implications of the findings are that the value of time saved from improved water supply may be much higher than previously believed.

Baroda Case Study

Most of the WTP studies have been conducted for rural water supply schemes. Baroda study is one of the few studies conducted in urban areas. It is the first WTP study conducted in Urban India (Vaidya, 1995). Findings of the study have been summarised in this section.

Baroda had a population of one million in 1991. Baroda Municipal Corporation (BMC) is implementing a Rs.66 crores water supply improvement scheme. HUDCO has sanctioned a loan worth Rs.47 crores for this scheme. BMC has suggested revisions in tariff rates of water. However, it is necessary to ascertain effectiveness of these rates. In this background the study of demand and willingness to pay for water and sanitation was carried out.

Methodology

As in the case of WDR Team this study used both indirect (revealed preference) and direct (contingent valuation) methods to analyse how households make their choices about water and sanitation services. The indirect method used the revealed preferences of households through the actual choices and investments made by households in situations where no piped water is available and in others where it is not adequate. It covered aspects related to nature of capital investments made and the operation and maintenance costs incurred by the households and/or communities.

Contingent Valuation method was used to estimate for Willingness to Pay based on the current levels and preferences identified, hypothetical choices and related price ranges were worked out for each major user category. Using the approach of contingent valuation, the household responded to these hypothetic choices. Households, with house connection, may be willing to pay additional charge for improved pressure, quantity or quantity of water. Households without house connection may pay for improved public standpost or new house connection. In addition, the payments can be made in terms of one time house connection and monthly water charge. Information regarding WTP was collected in step by step manner.

A survey of 550 households from different zones and type of housing was carried out. Detailed survey of 200 households among the sampled households was carried out for estimating WTP. In addition, case studies of different user groups was conducted. For estimating demand from industrial sector survey of 40 units was carried out.

Water Supply Project

Baroda city derives water from four sources which is equal to 173 MLD. Per capita supply has decreased from 158 litres per day in 1981 to 170 lpd in 1991. The water is supplied for domestic, commercial and industrial purposes. Non-domestic supply accounts for nearly 25 per cent of the total supply. Subsidy in water supply is estimated to be about 47% in 1992-93 (Table 1).

Table 1 : Subsidies in water supply – Baroda

Rs./1000 litres	89-90	90-91	91-92	92-93
Cost	1.40	1.52	1.77	2.32
Revenue	0.63	0.69	0.90	1.24
% of subsidies	55	55	49	47

Source: Mehta and Satyanarayan (1993)

Baroda Municipal Corporation is presently engaged in water augmentation scheme. BMC is planning to take up a water network improvement scheme of Rs.10 crores and sewerage improvement system scheme. With augmentation of the water supply system, total quantity of water produced will increase from 173 to 285 MLD by the year 1996-97. Total current expenditure is estimated to increase by Rs.20 crores (Table 2). This includes increase in loan charges by about Rs.8 crores per year. Therefore, during the process of sanctioning the loan, HUDCO has insisted upon revision in water tariff.

Table 2 : Water supply project cost – Baroda

(Rs. in lacs)

Year	Loan charges	O&M	Total current expenditure	Water produced (MLD)
1992-93	523	940	1463	173
1996-97	1296	2200	3497	285

Source: Mehta and Satyanarayan (1993)

The percentage revisions of water charges vary from 10 to 90 per cent for domestic sector and for non-domestic sector. They range from 10 to 70 per cent. Assessment of revision of charges reveals that even with the revision the level of cost recovery for water sector ranges between 36 to 53 per cent. If the Corporation wants to achieve self-sufficiency in water sector, then charges will have to be revised nearly 165 per cent addition to already proposed charges (Mehta and Satyanarayan, 1993)

As there is need for increasing water charges, it is necessary to assess the willingness to pay for different groups particularly industrial and domestic users. The domestic demand has to be assessed for new connections and monthly water charges. Implications of the study findings are given here.

Industrial Sector

Water demand for industrial sector has been separately analysed for large and small/medium sized units. The survey of large scale industries show that most industries cannot afford to rely solely on BMC water supply (Klink, 1992). The results of the survey reveals the following things. Operation and maintenance cost are a substantial part of total average cost of non-municipal water supply. Industries using tubewell water as standby have average costs higher than BMC, considering quality of tubewell water. Minimum cost rules are not the only factor in these investment decisions. Benefits of having an own supply system given unreliable municipal supply play an important role.

Many of the small and medium industries have also made investment in private sources (70%). They need additional municipal water, however, are not WTP to pay more than present charge of water. Therefore, BMC may not be able to cross-subsidise domestic users beyond a certain limit.

Domestic Water Situation

(a) Source: Conventional method of analysing sources of water as individual house connection, public taps, tubewell/bore does not indicate the true situation. Households are using a combination of methods to obtain water. Existing sources of water supply reflects water supply situation. Therefore, special code was developed for source of water supply. Distribution of households by source of water is given in Table 3. It reveals that though 176 thousand households have access to house connection only 40 thousand use it exclusively.

Table 3 : Distribution of household by source of water – Baroda

Source	% of HH	No. of households
1. Municipal house connection		
(a) Individual	18.9	39700
(b) Shared	7.0	14700
(c) Individual/shared with handpump/pump/ underground storage	29.4	61700
Sub-total (1)	55.3	116100
2. Bore/tubewell		
(a) Individual/shared municipal and bore	16.0	33600
(b) Private/shared bore	3.0	6300
Sub-total (2)	19.0	39900
3. Public source		
(a) Individual/shared municipal with public sources	12.9	27000
(b) Public handpump/standpost	12.9	27000
Sub-total (3)	25.8	54200
Total	100.0	210000
House connection (1+2a+3b)	84.2	176700

About 15 thousand have to share it with other households. Other 62 thousand have to use handpump, pump and underground storage to use water from house connection. As many as 60 thousand households with house connection have supplement this supply with bore or public sources.

Water supply from all sources is estimated to be 95 lpcd and 71% it is from house connection. Only 18% of the total households are satisfied with existing level of municipal supply. Every third household in the city has to spend time for collection of water. As many as 70 thousand households in the city, on an average, spend one hour per day for water collection. Most of this time is spend by women and children. Opportunity cost of this time at Rs.one per hour is estimated to be Rs.2.6 crores per year.

Expenditure

Expenditure on water has been assessed in terms of municipal and non-municipal payment. About 70% of households are paying water charges. Annual payment to the corporation is Rs.102 per household. About 49% of households have made capital expenditure on bore, filter, pump, underground storage, etc. Average non-municipal expenditure is Rs.1345 per household. Total non-municipal expenditure in the city is calculated to be Rs.28 crores. It is about 40% of original cost of the water supply augmentation scheme.

Table 4 : Annual expenditure on water supply Baroda

Type	Per household* (Rs.)	All households (Rs. in crores)	% expenditure to HH income
a) Municipal	102	2.14	0.26
b) Non-municipal	437	9.18	1.10
Total	539	11.32	1.36

* Capital cost annualised at 15% interest with 10 years repayment. Per household cost among all households.

Annual expenditure has been estimated under certain assumptions (Table 6). Total annual expenditure for all households of the city is Rs.11.3 crores and out of it only 19% made to the municipal corporation. Implicit rate for municipal and non-municipal water supply works out to be Rs.3.0 per 1000 litres which is two times the municipal rate (Rs.1.5 per 1000 litres). Annual expenditure as percentage of household income is calculated to be 1.36. It is only 0.26% for municipal expenditure. It is not surprising that 65% of households have expressed that municipal corporation should charge for water supply. Monthly electric charge is Rs.160 per month per HH which is 4.5% of the income.

WTP for water

Households without house connection account for 16% of total households. About 85% of them have expressed willingness to pay (WTP) for improved standpost and average monthly payment works out to be Rs.7.5 per household. Among households with house connection, 63% are WTP for better pressure and corresponding figure for improved quality is 11%. Average monthly WTP for improved pressure is Rs.25 per household which is about 3 times the present rate. Improved pressure along could bring an additional income of Rs.2.26 per year (Table 5).

Table 5 : Additional income from improved pressure - Water supply project, Baroda

Households desiring improved pressure	Indicator
i) % of households with house connection	63
ii) No. of households (lacs)	1.11
iii) Additional amount (Rs./month)*	17
iv) Annual additional charge (Rs. in crores)	2.26

* excluding present charge

Households with house connection were asked how they will respond if monthly water charge is increased without any increase in the supply level. As many as 79% of the households have expressed that they would continue to use house connection if monthly charge is increased from present Rs.8 to 25 per household. Perhaps it reveals that the households have the affordability to pay much higher water charge than present level.

About 58% of households are WTP one time connection charge. Average connection charge is Rs.726 per HH (among households who are willing to pay). Total capital revenue from these connections will be Rs.8.8 crores. Little over 95% households have expressed WTP monthly charge of Rs.23.9 per HH. Annual water charges are estimated to be Rs.5.8 crores.

Annual WTP per household has been estimated as 15% interest on capital charge plus annual maintenance charge. It is calculated as Rs.339 per household (among all

household). Households are willing to pay 3.4 times of present municipal expenditure. However, expressed WTP is only 60% of present expenditure on water. Total revenue from water supply will be Rs.7.11 crores per year.

Annual WTP is 0.85% of household income (Table 8). It decreases with rise in income . It is for the lowest income group (below Rs.1500) and the corresponding figure for the highest income group (above Rs.6000) is 0.49%. WTP for the highest income group is Rs.439 and it is only 1.6 times WTP for the lowest income group (Rs.275). There is limited scope for cross-subsidy among different income groups.

Table 6 : WTP for water as percentage of income – Baroda

HH income group (Rs.)	No. of households	Annual WTP (Rs./HH)	% WTP to HH income	WTP to average WTP (in each class)
Upto 1500	35700	275	1.90	0.81
1501-3000	81900	340	1.26	1.00
3001-4500	39900	326	0.72	0.96
4501-6000	33600	363	0.58	1.07
6000+	18900	439	0.49	1.30
	210000	339	0.85	1.00

Inspite of the fact that expressed WTP is more than three times the present municipal payment, domestic sector alone will not be able to meet the current expenditure due to increase in loan and O&M changes (Table 9).

Table 7 : Current expenditure and revenue for water supply sector in Baroda – 1996-97

Annual current	Amount (Rs. in crores)
a) Expenditure**	33.49
b) Revenue from domestic sector*	8.45
c) Net Gap	24.94

* Assuming increase in number of households by 2.4% per year and WTP to increase by 20%.

Procedure for New Connection

Procedure for obtaining new connection is very time consuming and cumbersome. Households have to take help of licenced plumbers for obtaining this permission. There is reasons to believe that some households have paid speed money for this purpose. It is estimated that about 10% of the house connection in the city are unauthorised. House connections are extended to only authorised residents whereas GEB has the policy of extending electricity even in unauthorised residential areas.

Role of neighbourhood groups

A large number of community based systems are operating in the city. These include community managed distribution of municipal water among different flat owners in GHB colony, management of common bore in unauthorised low income colony, and payment for public standposts in slum areas. A community based low cost infrastructure financing association is also working in the low income area.

Many community based system have been observed in low income areas. However, in some high income areas, neighbourhood groups have not been able to help themselves. These high income groups continue to have low level of municipal services. It is felt that neighbour groups play an important role in obtaining municipal services in different areas.

Sanitation

A very large proportion of households have access to sewered connection (63%). About 14% use toilets with septic tanks/soak pits. Another 6% have no facility. As many as 73% of the household are satisfied with existing system. Thus unlike water supply, sewerage service is not perceived as a major problem. Annual expenditure on sanitation is Rs.136 per household and only 26% of it on non-municipal aspects such as septic tank/soak pits.

As a large proportion of households are satisfied with existing sewerage system, only 27% want to pay connection charges. Average charge per household is Rs.161 (among all households). Annual WTP for sanitation is Rs.144 per household. Total annual payment is estimated to be Rs.3.0 crores. It reveals that major sewerage improvement schemes cannot be taken up with huge subsidies. Therefore, it will be necessary to combine water and sanitation charges. Monthly WTP for the two sectors is Rs.40 per HH. The WTP as percentage of income is 1.21%. It ranges between 0.72 to 2.7% and decreases with rise in household income.

Determinants of WTP

Multiple regression analysis was carried out to identify determinants of the WTP. These are identified as: Attitude towards water charges, household income and non-municipal expenditure on water supply.

Recommendations

The principle of full cost recovery is in consonance with the new economic policy. Households are also willing to pay. For sustainability of the water supply system BMC should accept the principle of full cost recovery and achieve it gradually over the next few years. There are also recommendations of the recent Working Group on Financial Issues and Cost Recovery, set up by Ministry of Urban Development, Government of India.

Strategy to improve cost recovery in water supply and sanitation sector in Baroda is presented in Tables 8 and 9.

Table 8 : Strategy for water supply – Baroda

Category	No. of households	Strategy
(A) Households without house connections (HC)		
i) WTP for HC	23000	Encourage new connection. Group loan for connection charge.
ii) Low WTP for HC	11000	Improved standposts with payment
(B) Households with house connection		
i) Water problems and WTP	134000	Improved pressure and quantity of supply
ii) Less water problems and low WTP	42000	Awareness programmes for increased water charges

Table 9 : Strategy for Sanitation – Baroda

Category	No. of households	Strategy
(A) Households without sewerage system		
i) Low WTP for improvement	21000	Low cost sanitation with loan facility
ii) WTP for improvement	57000	Encourage new connections. Group loans if necessary.
(B) Households with sewerage connection and Low WTP	142000	Awareness programme for increased charges. Linkages with water charges.

Specific recommendations are:

(a) Increase local knowledge about cost of the services

(b) Launch campaign on improved water supply at appropriate prices

(c) Raise water charges

(d) Integrate water and sanitation charge

(e) Shift distribution to local groups

(f) Involve ward committees

(g) Regularise unauthorised connections

(h) Simplify procedures

(i) Need to Market water and sanitation

(j) Support community based infrastructure finance system

(k) Delink service taxes from ARV

Implications of the study

Total investment in public issues of companies in Baroda during 1993-94 was about Rs.300 crores. It was 2.3% of total investment in the country. They have the affordability and WTP to pay for improved water supply. Issue is how to capture this WTP in terms of the cost recovery. A campaign should be launched in the city with the theme of "Improved Water Supply at Appropriate Price". This should be followed up with improvement in supply, increase in water charges, simplification of procedures, etc.

BMC should also develop a long-term strategy for water and sanitation sector considering consumer preferences and need for mobilising resources at market rates. Orientation of such a strategy should be towards what the consumer want rather than supplying what the agency feels is the requirement (Mehta 1995). This study of WTP provides inputs for developing such a strategy. Emphasis should change from large scale investments to small

investments. Appropriate phasing and access of the poor to the minimum level of services at affordable prices should be other concerns of such a strategy.

GUIDELINES

The WTP study conducted in Baroda has brought out many methodological issues and guidelines (Vaidya). These have been identified in this section.

(a) Selection of households

Most of the World Bank sponsored WTP studies are in rural areas. The sample sites were selected from villages with and without improved water supply. However, in the urban areas, there are few areas without municipal supply. About 60 to 80 per cent of households have individual water supply connection. Most of the households not covered by individual connection are located in slum or fringe areas. They can be easily identified. Type of house (traditional structure, flat, tenement, bunglow, hut, etc.) is an important consideration for determining demand for water and willingness to pay. It has to be considered during selection of the households.

Households with existing water supply connection are also expected to pay 2 to 3 times more than the present water tariffs. Therefore, bidding game/willingness to pay questions have to be asked to even those households who are presently getting adequate municipal supply. In addition, households with existing water connection may be ready to pay one time fixed cost for improved water supply in future.

The main criterion for the selection of households could relate to existing level of services and preferences. The actual variables for selection of the households may relate to zone (availability of public supply, level of supply, etc.) and house type (slums, tenements, bungalows, flats, old city, etc.).

(b) Source of Supply

Generally, source of urban water supply is analysed in terms of house connection, bore/tubewell, public standpost, handpump, etc. However, in urban India households use a number of methods to obtain water. Households with house connection construct underground storage to obtain additional water supply, they use electric pumps to take water from ground floor to higher floor levels, and some instal private handpumps on municipal pipe line to draw additional water. Households also go for more than one source to obtain necessary level of water supply. Other sources include private bore, public handpumps/standpost, etc. House connections are often shared by more than one households, particularly in old city areas. Existing methods of water supply sources reflect condition of supply level. Therefore, information of source of water supply may be collected in terms of:

	Individual	Shared	Public
1. House connection			
(a) With underground storage/chokdi			
(b) With pump/handpump			
(c) others			
2. Bore/tubewell			
3. Public handpump/standpost			
4. Well/river			
5. Others			

Many households are using more than one method to obtain water. It is necessary to develop a source code which provides information on different types and combinations of water supply.

(c) Compensating investments by households

A more indirect methods using the revealed preferences of households through the actual choices and investments made by households in situations where no piped water is available and in others where it is not adequate. It will cover aspects related to nature of capital investments made and the operation and maintenance costs incurred by the households and/or communities.

For non-municipal expenditure following information may be collected:

Item	Year of investment	Capital investment	Annual maintenance
1. Water			
(a) Pump/Handpump			
(b) Bore/tubewell			
(c) Filter			
(d) Underground storage			
(e) Others (specify)			
2. Sanitation			
(a) Septic tank			
(b) Low cost sanitation			
(c) Others (specify)			

(d) Contingent Valuation method for Willingness to Pay

Based on the current levels and preferences identified, hypothetical choices and related price ranges can be worked out for each major user category. Using the approach of contingent valuation, the household responses to these hypothetic choices. Such method of questioning is often difficult to formulate. The appropriate survey method will be selected after pilot testing.

To determine Willingness To Pay (WTP) for water in urban areas is a very complex process. Households, with house connection, may be willing to pay additional charge for improved pressure, quantity or quantity of water. Households may be ready to pay a large amount for 24 hours continuous and reliable water supply. Households without house connection may pay for improved public standpost or new house connection. In addition, the payments can be made in terms of one time house connection and monthly water charge. Information regarding WTP should be collected in step by step manner. Following information can be collected:

WTP for	Households with house connection		Households without house connection	
	Fixed charge	Monthly charge	Fixed charge	Monthly charge
1. Improved standpost				✓
2. House connection	✓	✓	✓	✓
(a) Supply hours				
(i) One hour				
(ii) Two hours				
(iii) Four hours				
(iv) Six hours				
(v) Twenty-four hours				
(b) Quantity of supply lpcd (buckets/day)*				
(i) 40 (10)				
(ii) 80 (20)				
(iii) 120 (30)				
(iv) 180 (45)				
3. Improvement in				
(a) Pressure		✓		
(b) Quality		✓		

* Assuming 20 litres bucket size and five member average household size.

As far as sanitation is concerned information may be collected in terms of:

WTP for	Households with sewerage connection		Households without sewerage connection	
	Fixed charge	Monthly charge	Fixed charge	Monthly charge
1. Improved public toilet				✓
2. Sewerage House connection		✓	✓	✓
3. Low cost sanitation			✓	✓

(e) Metering

Metering of water supply is necessary for improving cost recovery and reducing wastage of water. Therefore, questions may be asked regarding preference for metering. It will also involve additional capital investment. Information may be collected regarding willingness to pay for cost of meter as one time fixed cost and additional monthly charge.

(f) Value of time spent

A large number of households, particularly women, spent time on collection of water in the urban areas. Households collecting water has a significant economic cost. It has implications on estimating the WTP. Time spent on water collection should be obtained separately for summer and other seasons. Information should also be collected about who spends this time. Revealed preference approach could to be use to estimate value of time spent of the water collection.

(g) Case Studies/Focus Group Interviews

Information collected through household surveys can be supplemented with the help of case studies and focus group interviews. In addition to selected sub-sample of the households, case studies may cover municipal engineers, ward level officials, field staff, plumbers, meter readers, bill collectors, etc. Focus group interviews provide useful information in case of low income areas.

Industrial Sector

It is important to note here that industrial sector often pays high water rates than the domestic sector. Industrial sector can cross-subsidise domestic low income water consumers.

Information from industrial units should be collected regarding amount of water used at present (raw and treated), investment made in developing private sources and their operation costs, municipal water charges, future requirement of water and readiness to pay for it. Quality and reliability of water supply is an important consideration for some of the industrial. Information should be collected regarding quality of water needed and willingness to pay. It is necessary to understand how important is water for manufacturing process of the unit in qualitative and quantitative terms.

Waste water disposal is another area of concern for the industrial sector. Data regarding amount of disposal generated, type of treatment, method of disposal, problems of present system, readiness to pay for improvement, etc. should also be collected. Information from large industries should be collected with the help of a checklist rather than a structured questionnaire.

Conclusion

Contingent valuation studies are not easy to carry out and are more expensive than simple water demand surveys. The finding of the earlier studies reveal that they can provide very important inputs for the water supply and sanitation planners. Considering cost of information obtained from the surveys compared to the investment required in the infrastructure, use of willing to pay studies should become an inherent part of project design and appraisal system in urban India.

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Community Consulting International (CCI)
1012 N Street, NW
Washington DC 20001-4297, USA

in association with
Technical Support Services (TSS)
1012 N Street, NW
Washington DC 20001-4297, USA

The FIRE(D) Project Office
E - 3/4, Vasant Vihar
New Delhi-110 057, India
Tel.: 91-11-6149836/6143551
Fax: 91-11-6141420/6144480
Email: fired@giasdl01.vsnl.net.in

THE FIRE(D) PROJECT

The objective of the Indo-US Financial Institutions Reform and Expansion (FIRE) project, funded by the U.S. Agency for International Development (USAID), is to support the Government of India in its efforts to strengthen domestic capital markets to enable them to serve as efficient sources of development finance. One of the components of the FIRE project seeks to expand the debt market through the financing of commercially viable urban environmental infrastructure projects, defined as those which result in the provision of affordable urban services on a full cost-recovery basis by their sponsoring municipal corporations and authorities. This Debt Market/Infrastructure component, (FIRE-D), is under the auspices of the Union Ministry of Urban Affairs and Employment with USAID support targeted to the National Institute of Urban Affairs (NIUA), the Housing and Urban Development Corporation Limited (HUDCO) and the Infrastructure Leasing and Financial Services Limited (IL&FS) as well as to selected local entities.

The FIRE-D Project is designed to foster the development of a commercially viable infrastructure finance system by channelling USAID Housing Guaranty (HG) funds to selected demonstration cities and states to assist in the financing of urban environmental infrastructure projects. HUDCO and IL&FS, acting as financial intermediaries, make loans to selected municipal corporations, state boards and authorities and private enterprises which have formed partnerships with municipal entities. Eligible projects include water supply, sanitation, solid waste management, and integrated area development schemes. NIUA acts as the advocate for policy change and the coordinator for delivery of technical assistance and training directed at the development of local government capacity in the areas of identification, development and management of commercially viable urban environmental infrastructure projects; pricing and cost recovery for urban services; and financial management systems to support accessing of capital markets. It is expected that the participating institutions will be able to replicate the policy changes and project development initiatives beyond the demonstration states and municipalities to other areas throughout India.

This USAID-funded program will make available up to $125 million from US capital markets in loans, combined with grant funds for management support, technical assistance and training. Loan guarantees must be matched with capital investment raised in the Indian debt market through FIRE's creation of innovative financial instruments.

Technical assistance, training and research support is provided by a consortium of US firms led by Community Consulting International (CCI) in association with Technical Support Services (TSS). Principal partners in the consortium include the Wall Street investment banking firm of Grigsby Branford and Company (GB&C) and the Government Finance Officers Association (GFOA) of the USA and Canada.

For more information on the FIRE(D) Project, contact the project office at the address mentioned above.

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