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WATER AND SANITATION FOR ALL: PARTNERSHIPS AND INNOVATIONS

Estimating willingness to pay for WATSAN

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By 2001, 49 cities in India are estimated to have populations of over a million (Sivaramkrishnan et. al., 1993). The living and working environments in these cities are seriously impaired by shortages in water supply and sanitation. The major constraints are insufficient finances and institutional ineptitude in planning and managing the city's growth and demand for services (Davey et. al, 1996) Recent writings propound that service delivery is limited by the traditional emphasis on supply (Fox, 1994; Kessides, 1993). The move to a 'demand-oriented' approach recommends studies of willingness to pay for the following reasons:

- Willingness to pay is considered the best indicator of service demand as it corresponds to the users' affordability and levels of services preferred.
- Willingness to pay studies are of potential use in setting prices for maximum cost recovery.

Studies in some African and Asian countries have found willingness to pay for water supply and sanitation dependent on the nature of existing services, levels of satisfaction of the consumer with the existing services and socio-economic factors such as household income, size, education and affordability (Altaf, 1994a, 1994b; Altaf et. al., 1993; Griffin et. al., 1995; Lovei and Whittington, 1993; McPhail, 1994; North and Griffin, 1993; Singh et. al., 1993, TDRI and HIID, 1995). In this paper, the authors explore whether willingness to pay is also affected by the long history of subsidy of the piped networks, and the alternatives used to augment or substitute piped supply in Indian million plus cities.

Premises

The Eighth Five Year Plan (1992-97) of the Govt. of India aimed to cover 100 percent of the urban population with piped water: household connections with an average of 140 lpcd (liters per capita per day) in areas within the jurisdiction that are covered by a sewerage system, 70 lpcd in areas with on-site sanitation 40 lpcd to slums served by public stand posts. In terms of sanitation, 100 percent coverage by sewerage is the target for million plus cities with treatment of sewage.

Indian million plus cities are characterized by the presence of multiple systems of water and sanitation that include piped water and sewerage in the planned areas and different kinds of on-site water and sanitation services in the urban fringe areas and slums. Service charging is in the form of user charges where the water supply is metered and as a proportion of property tax in other situations. In both instances, the amounts recovered from service charges are a fraction of the cost of providing the services, due to the highly subsidized pricing for the services.

Given the existing patterns of services some issues in measuring willingness to pay for progressive improvement of services are:

- Different kinds of service improvements are required in different areas of the city depending on the existing levels of services. Areas with piped services require improvement of the networks and sewage treatment, areas with on-site services require eventual coverage by piped networks and slums require individual connections rather than communal shared services.
- Accordingly, households connected to piped networks must be charged an improvement fee and a higher consumption charge for improved services for both water supply and sewerage.
- Households with on-site services must be connected to piped networks for water supply and sewerage and therefore charged a connection fee and a recurrent consumption charge.
- Slum households must be charged for individual water connections and sanitation facilities. The connection charge would be initial followed by a recurrent consumption charge that is subsidized until a minimum level of consumption that corresponds to the basic needs standards set by the Public Health Department of the Government of India at 140 lpcd. Consumption over this minimum will be charged according to the normal rate.
- Willingness to pay will be affected by satisfaction with present levels of services, costs incurred on service augmentation/substitution, historic pricing systems and socio-economic characteristics such as household size, composition and income, assets owned, education and occupation of household head.

Method

Ahmedabad and Bangalore are selected as the case studies, as their populations are between 3 and 5 million and they demonstrate patterns of growth that are emerging in other fast growing cities in the country. In order to get a comprehensive picture of the typical metropolitan city, four communities were selected in each city based on the nature of services in use, socio-economic characteristics of residents and jurisdiction of the area. Two communities

were selected in areas with piped networks for water and sewerage, one with predominantly middle income and the other with largely higher income residents. One slum community was selected within the municipal jurisdiction and one urban fringe community was selected just outside the municipal jurisdiction but within the metropolitan area. The contingent valuation method was used to explore factors influencing willingness to pay.

After a reconnaissance of the status of water and sanitation in both cities, the survey communities were selected in consultation with concerned officials in the city government or parastatal agencies, local consultants and NGO staff working in the water and sanitation sector. The sample size selected was 100 - 125 households in accordance with contingent valuation requirements. Beginning from an arterial road in the neighbourhood, every fifth plot was surveyed as with points on a grid. Where the plot was occupied by an apartment block, one apartment was selected at random. The surveys were conducted during May and June 1996. The surveyors were selected from a group of graduate students in local civil engineering colleges with knowledge of water and sewerage infrastructure and past experience in surveying. The group was trained intensively for the first week and monitored throughout the survey period.

The survey questionnaire was designed in accordance with the specifications laid down by the World Bank and USAID (TDRI & HIID, 1995). The expenditure norms for water and sanitation in cities with populations of over a million, based on the minimum standards set for provision of these services (NIUA, 1995) were used in the survey scenarios. The questionnaire was divided into 5 parts:

I. Water sources and water use practices: that document present level of services and costs incurred by the user;
II. Scenario and bidding game for new/ improved service: where a scenario of a new or improved service is presented to the respondent followed by an ascending or descending bidding sequence to elicit the willingness to pay for the changed service.
III. Sanitation facilities being used documents nature of sanitation, problems associated if any and costs incurred.
IV. Scenario and bidding game for sanitation: Similar to section II for water supply, a scenario is presented for new/improved sanitation based on present system in use, followed by a similar bidding game to elicit willingness to pay for the service.
V. Socio-economic and household characteristics: The final section lists information on household size, income, assets, education and occupation of household head and basic housing characteristics.

Descriptive statistics are used to demonstrate patterns of service consumption in the samples surveyed. Multiple linear regressions indicate significant factors correlated to willingness to pay. The explanatory variables are socio-economic characteristics, water consumption patterns, costs of services and reasons for not wanting to pay higher prices for water supply and sanitation.

Findings

Implications of heterogeneous service consumption patterns

Tables 1-6 present the patterns of service consumption in the surveyed samples at Ahmedabad and Bangalore. Service use, household income and other socio-economic characteristics at Ahmedabad, are consistent within one community while at Bangalore, each community displays mixed patterns of service use and is also a mix of different income groups. The high and middle income groups in both cities use supplementary water supply sources and augment the public supply by adding accessories to enhance the water supply. The poor use only what is available. Tables 7-10 present the mean willingness to pay for the different services offered to each community in accordance with a progressive improvement strategy.

On ascertaining service needs

Service augmentation implies that the high income communities at both Ahmedabad and Bangalore demand continuous water supply throughout the day. The middle income groups within the city and in the fringe areas also aspire to a 24 hour water supply. Water quality is upgraded by filtering or boiling. The patterns of water consumption of the lower income groups do not reflect their needs. As the water supply at the public stand posts is limited to a few hours daily, these residents are not always able to receive sufficient water. The areas with sewerage do not experience the shortfall in waste water disposal. The fringe areas without sewerage install on-site sanitation services. In the slums, the concern is more basic with the provision of facilities for sanitation.

On determining affordability

The higher and middle income groups in both cities have the affordability to enhance their services corresponding to their income levels and needs for services. However, the lower income groups cannot afford either large initial investments or high monthly charges.

The augmentation or substitution of the piped network supply indicates that a higher level of service is desired than that offered by the public agencies. Correspondingly, the extra expenditure on service augmentation and substitution suggests an affordability for a higher level of services. However, the survey findings indicate that when a higher level of service is proffered, the willingness to pay is linked to several factors other than level of service desired and affordability. Historic patterns of service pricing and use of alternative water supply sources dampen the willingness to pay.

Factors affecting willingness to pay

The regression analyses (Tables 7-13) indicate that willingness to pay for water and sanitation is dependent on

different factors among the different communities. For each community, the willingness to pay the one time initial cost for a new water or sewer connection, an improvement in water supply, or the installation of an individual toilet in the slums is first presented followed by that for the willingness to pay for recurrent monthly charges. There are also differences in the patterns observed in the two cities as well as between the two services of water supply and waste water disposal. Common factors are that willingness to pay is related to consumption, affordability and the nature of services in use at present. Where the services are supplemented with accessories, the willingness to pay tends to be lower, also indicated by respondents unwilling to discontinue other sources of water supply even if improved water supply is introduced.

At Bangalore, the respondents indicated willingness to pay that was responsive to consumption, however at Ahmedabad affordability and the use of other sources were more significant. This can be explained by the differences in the current systems for service pricing in the two cities. At Ahmedabad as water charges form a proportion of the property tax that has not been revised in several years, the charges paid are not reflective of consumption. However, the cost of using the accessories is reflective of water consumption. This pattern is prevalent in all the communities except the poor. The poor expect subsidies and free water in both cities. However, where the free water is in very short supply as at Ahmedabad, willingness to pay for the service is higher.

In terms of sanitation the most significant factor was that willingness to pay for sewerage closely followed the willingness to pay for water. However sewerage is not considered as essential as water supply and willingness to pay for this service is lower, even though the regressions indicate that the willingness to pay for sewerage can be explained with much more confidence than that for water supply.

Conclusions

Strategies for service provision will have to consider the different alternatives that are in use to augment and substitute public piped water and sewerage. Where alternatives are in use, residents will continue to use these even after piped networks are extended in these areas. As dependence on on-site services for water is responsible for the rapid depletion of ground water, the introduction of the piped systems is essential. Moreover, this has to be accompanied by regulation or incentives to discontinue alternative sources of water supply. Planning for service coverage in the million plus cities has to phase the use of on-site services in the newly developing areas if there is a time frame and regulations to cover them with piped services.

Increasing monthly charges for water supply and sewerage is also likely to be a contentious issue. Even though respondents expressed willingness to pay for improvements in services, the continued use of alternatives is likely to lower the amount of water consumed and paid for from the public supply. Sewerage charges will continue to be a part of the water charges as lower willingness to pay is expressed for sewerage.

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Note

For appendix and tables 6 to 13, please see author.

TABLE 1 WATER SUPPLY HOURS (MEAN)

	PUBLIC SUPPLY HOURS/DAY		PUMP HOURS/DAY		ADJUSTED SUPPLY HOURS/DAY	
	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore
HIG	3.5	2.00	3.78	1.97	24.00	18.66
MIG	3.5	2.00	1.90	2.12	23.99	16.78
Slum	3.5	2.00	0.00	0.00	3.00	3.18
Fringe	3.5	2.00	3.21	2.57	22.77	17.76

TABLE 2 TYPE OF AUXILIARY USED TO AUGMENT/ SUBSTITUTE PUBLIC PIPED SUPPLY

	UG TANK		OH TANK		IN TANK		MOTOR PUMP		WATER FILTER	
	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore
HIG	100.00%	77.50%	100.00%	83.33%	6.73%	5.00%	100.00%	84.17%	82.69%	75.00%
MIG	93.40%	56.70%	49.06%	58.76%	3.77%	41.24%	41.51%	64.95%	14.15%	56.70%
Slum	0.00%	25.71%	0.00%	16.19%	0.00%	0.00%	0.00%	37.14%	0.00%	40.95%
Fringe	46.67%	33.71%	57.14%	84.27%	45.71%	6.74%	37.14%	86.52%	20.00%	86.52%

TABLE 3- ALTERNATIVE WATER SOURCES IN SAMPLED HOUSEHOLDS

	PRIVATE BORE-WELL		COMMUNITY BORE-WELL		PUBLIC STAND-POST		OTHER	
	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore
HIG	9.61%	54.99%	1.06%	0.00%	0.00%	1.67%	0.00%	5.82%
MIG	1.88%	4.12%	98.11%	0.00%	0.00%	1.96%	0.94%	7.21%
Slum	0.00%	4.76%	0.00%	40.95%	93.13%	45.71%	1.35%	9.51%
Fringe	0.00%	65.17%	95.23%	1.12%	0.00%	17.98%	0.00%	10.11%

TABLE 4 - WATER USES OTHER THAN BASIC NEEDS IN SAMPLED HOUSEHOLDS

	VEHICLE WASHING (%)		PLANTS (%)		LAWNS (%)		PETS (%)	
	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore
HIG	94.23%	100.00%	49.04%	99.17%	24.04%	1.67%	10.58%	6.67%
MIG	86.79%	69.07%	12.26%	63.91%	8.49%	22.68%	0.00%	22.68%
Slum	0.00%	16.19%	0.00%	12.38%	0.00%	0.00%	0.00%	0.00%
Fringe	54.28%	87.64%	48.57%	85.39%	26.67%	13.48%	3.00%	59.55%

TABLE5 MEAN EXPENDITURE ON WATER SUPPLY (1996 PRICES)*

	ACCESSORIES (RS.)		FILTERS/PURIFIERS (RS.)		MONTHLY (RS./MONTH)	
	Ahmedabad	Bangalore	Ahmedabad	Bangalore	Ahmedabad	Bangalore
HIG	8,513.71	11,926.09	3,289.18	1,173.54	144.324	78.47
MIG	3,216.06	12,179.09	352.83	170.41	61.74	58.81
Slum	0.00	11,457.50	0.00	210.05	19.75	37.35
Fringe	2,200.00	10,685.71	510.95	352.81	68.99	18.93

* Average value for the households in the sample that had the accessories and water purifiers.