

**RURAL WATER SUPPLY IN INDIA**

**Willingness of Households to Pay for Improved Services and Affordability**



**The World Bank**

Policy Paper extracted from the World Bank Study on Review of Effectiveness of Rural Water Supply Schemes in India, June 2008

**June 2008**

# Rural Water Supply in India: Willingness of Households to Pay for Improved Services and Affordability

There is an impression that the willingness to pay (WTP) and affordability of rural households for water supply is not sufficient to cover the operation and maintenance (O&M) cost of supply. This has often been the basis for not charging, or not adequately charging the rural households for water supply, with the consequence that most schemes lack funds for adequate O&M. In the 10-state study on the *Effectiveness of Rural Water Supply Schemes* undertaken by the World Bank at the request of the Government of India, the willingness to pay and affordability aspects for improved water supply services have been important issues for investigation.

A study on the willingness to pay provides an indication of the value that consumers place on improved water supply and an assessment of the demand for service improvement. A study of affordability provides guidance on tariff setting, helping to ascertain how far the consumers will be able to pay the cost of improved services.

## Methodology for Assessing Willingness to Pay

The contingent valuation (CV) method has been used in the study to assess the willingness to pay for improved services by rural households. This method has found wide application in empirical studies to assess the demand for improved water services.<sup>1</sup> This study has used the payment card or checklist contingent valuation method, in which the respondent is asked to indicate the maximum amount s/he would be willing to pay from an ordered set of values, ranging from zero to 'Rs X or more' per month. Several variants of the payment card method are in use, including the recent *payment ladder* method. From an ordered set of values (payments), the respondent indicates the amounts that s/he would *definitely pay* (ticks) and the amounts that s/he would *definitely not pay* (crosses).

For the study, two formats were used—payment card and payment ladder. The payment card format was used to elicit respondent willingness to pay for improved services of handpump, while the payment ladder format was used to elicit respondent willingness to pay for improved piped water supply. Using a simple payment card method for handpump users allows for several service improvement options including a switch

<sup>1</sup> See, for instance, J. Ahmad, B. Goldar, S. Misra and M. Jakariya, *Fighting arsenic, listening to rural communities: Willingness to pay for arsenic-free, safe drinking water in rural Bangladesh*, New Delhi, Water and Sanitation Program, 2003; James F. Casey, James R. Kahn, and Alexandre Rivas, 'Willingness to pay for improved water service in Manaus, Amazonas, Brazil,' *Ecological Economics*, 58 (2), 365-372, 2006; Dale Whittington, S.K. Pattanayak, J. Yang, and K.C. Bal Kumar, 'Household demand for improved piped water services: Evidence from Kathmandu, Nepal,' *Water Policy* 4, 531-556, 2002.



to piped water systems and add-on facilities (such as a fluoride or arsenic filter) with the existing handpumps.

The improvements in water service scenarios and the structure of payment card differed between piped water users and handpump users. For piped water users, the improvement scenario was specified as better operation and maintenance of the infrastructure or replacement of the existing scheme by a new, better functioning scheme.

In both cases, the respondent was to get better services in terms of more water, longer hours of supply, regular supply, and so on. The capital cost contribution that the responding household will have to make for the improvement in the services was specified. For handpump users, the improved services were specified as better maintenance of the handpump. Other options were also explored, such as a new handpump, or a new piped water scheme in the village. In several fluoride-affected states handpump users were offered the option of getting fluoride-free

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water and their willingness to pay for such measures assessed. Similarly, in arsenic-affected districts of West Bengal, the handpump users were offered the option of getting arsenic-free water and their willingness to pay for such measures assessed.

Econometric models were estimated to relate willingness to pay with the socio-economic characteristics of respondents and their families, household income, and other variables representing the level of services they are currently receiving. The estimated econometric models were used to derive the mean willingness to pay of households.



## How Much are Rural Households Willing to Pay?

The estimates of the willingness to pay obtained from the survey data indicate that the amount that households are willing to pay in general is sufficient to cover the O&M cost of improved services. The households are also willing to contribute to the capital cost of improving the scheme.

The households using private connections are in general willing to pay about Rs 60 (US\$1.4) per month, ranging between Rs 30 to Rs 70 per month for improved services (Figure 1). The households using standposts of piped water schemes are in general willing to pay about Rs 20 (US\$0.5) per month, ranging between Rs 13 to Rs 24 per month towards the O&M cost of improved schemes. Households using private connections are willing to contribute on an average Rs 500–850 (US\$11–19), while the households using standposts are willing to pay about Rs 400–700 (US\$9–16) towards the capital cost of improved schemes.

Among households currently using handpump schemes, the average willingness to pay for better maintenance of the existing public handpumps is about Rs 6 (US\$0.1) per month and ranges from Rs 5 per month in Uttar Pradesh, Orissa, and Tamil Nadu to Rs 8 per month in Kerala, and Rs 11 per month in Punjab. For new handpumps, the average household willingness to pay for the maintenance of the handpump ranges from Rs 6 per month in Uttar Pradesh to Rs 9 per month in Kerala, Maharashtra, and West Bengal. The average across states is about Rs 8 (US\$0.2) per month. In areas affected by fluoride or arsenic, the households using handpumps show concern about water safety and willingness to pay for the use of filters. In West Bengal, for example, the households in arsenic-affected areas are willing to pay Rs 8 per month on average for better maintenance of the existing handpump or a new handpump, and would pay



Rs 20 per month if the handpump scheme is well maintained and is supplemented with household arsenic filters. They would pay Rs 11 per month if the handpump scheme is well maintained and is supplemented with a community arsenic filter. In Tamil Nadu, similarly, households are willing to pay on average Rs 5 per month for better maintenance of the existing handpumps, and would pay Rs 5 extra per month for having a community fluoride filter and about Rs 10 extra per month for a household fluoride filter. The implication is that households are ready to pay for the use of fluoride and arsenic filters in areas where these are needed. This contribution can cover, at least partly, the cost of the maintenance of the filters.

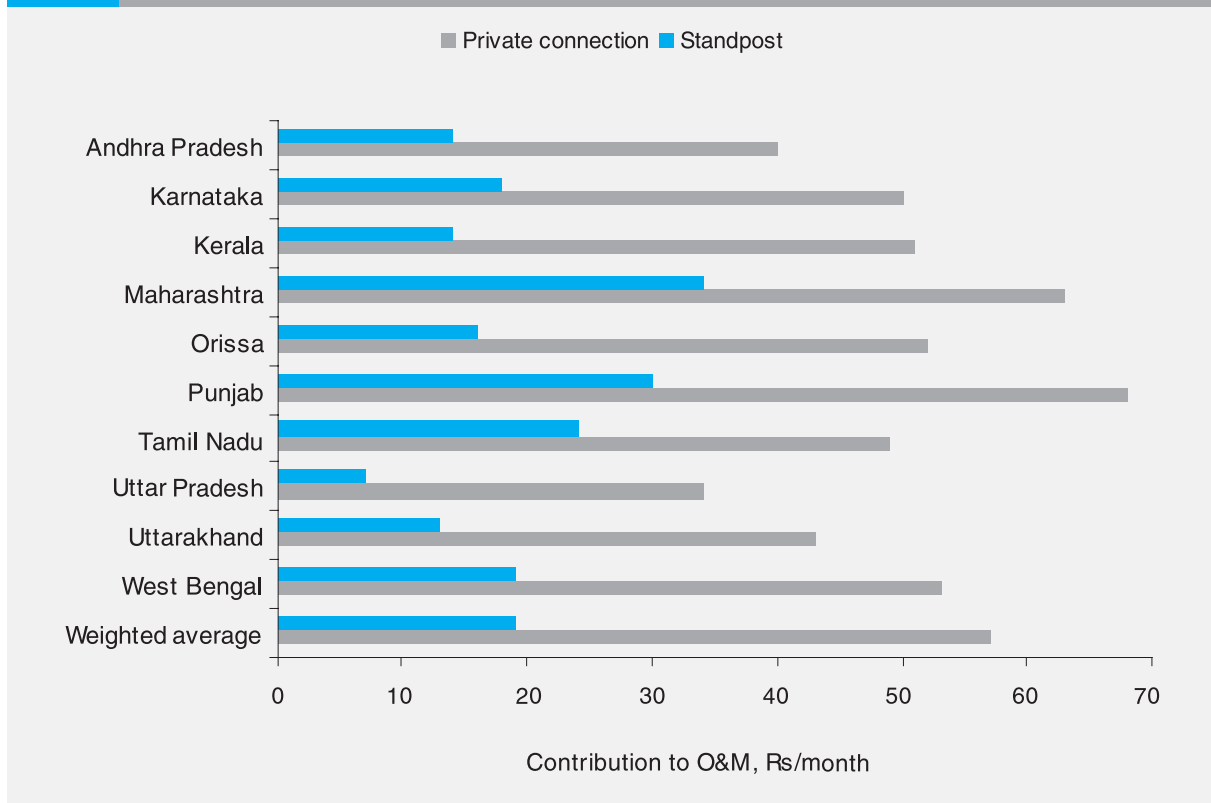
## Methodology for Assessing Affordability

There is limited literature on the methodology to assess how much a household can afford to pay for water supply and sewerage services.<sup>2</sup> The Asian Development Bank has suggested a norm of 5 percent of household income, and the World Bank a norm of 3–5 percent. In a number of studies undertaken in the UK, the affordability criteria is taken as 3 percent of income.<sup>3</sup> This

<sup>2</sup>Available literature on 'affordability' aspects includes: 'Water prices in CEE and CIS Countries: A toolkit for assessing willingness to pay, affordability, and political acceptability', Danish Cooperation for Environment in Eastern Europe, Ministry of Environment, March 2002; and 'Towards defining and measuring affordability of utilities', Discussion Paper, Public Utility Access Forum, UK, no date.

<sup>3</sup>See, for example, Paddy Hillyard and Fiona Scullion 'Water affordability under the water reform proposals', School of Sociology and Social Policy, Queen's University, Belfast, Bulletin No 9, September 2005; John W. Sawkins and Valerie A. Dickie, 'Affordability of water and sewerage services in Great Britain', Department of Economics, School of Management and Languages, Heriot-Watt University, Edinburgh, 2002; and Martin Fitch, 'Unaffordable Water', Centre for Utility Consumer Law, University of Leicester, July 2003.

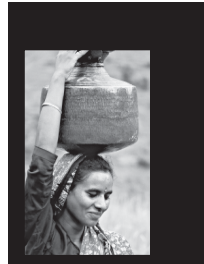
Figure 1 Willingness to Pay for Improved Services—Piped Water Users



Source: Computed from household survey data.



The underlying assumption is that if poor households can pay 3 percent of their income towards the water bill, then households with higher income can also spend 3 percent of their income on the water bill



criteria has been estimated by taking twice the median spending of households on water charges as a percentage of disposable income, and alternatively by taking the ratio of the water bill to the income of the bottom 30 percent of households (in terms of income). The underlying assumption is that if poor households can pay 3 percent of their income towards the water bill, then households with higher income can also spend 3 percent of their income on the water bill.

The methodology applied for ascertaining the affordability norm for the UK (based on the observed ratio between the water bill and the



income of the bottom 30 percent of households) has been adapted and used in the study to assess the issue of affordability of rural water supply schemes in the 10 states surveyed. If this methodology is to be strictly followed, then the monthly payment made by households for piped water supply schemes as a ratio to their income should be computed for the bottom 30 percent of households, and on that basis the affordability norm should be derived. However, three modifications have been made to arrive at a more rigorous assessment of affordability:

- Rather than considering only the bottom 30 percent of households, the relevant ratio has been separately computed for the bottom 20 percent, 40 percent, and 50 percent of households.
- Along with the monthly payment made for piped water, other water-related expenses (for example, the repair and maintenance of their own tubewell or dug-well, and the repair of public water sources) have been considered.
- A number of households are neither making any payment for the water they get from the supply schemes, nor do they incur any expenses on their own water sources or public water sources. Such households have been excluded from the computation of the

affordability norm, as this will lead to an the underestimation of affordability.

The affordable payment for a private connection has been computed by taking the average income of rural households and applying the affordability norm, and the affordable payment for standpost users has similarly been computed by taking the average income of the BPL (below poverty line) households.

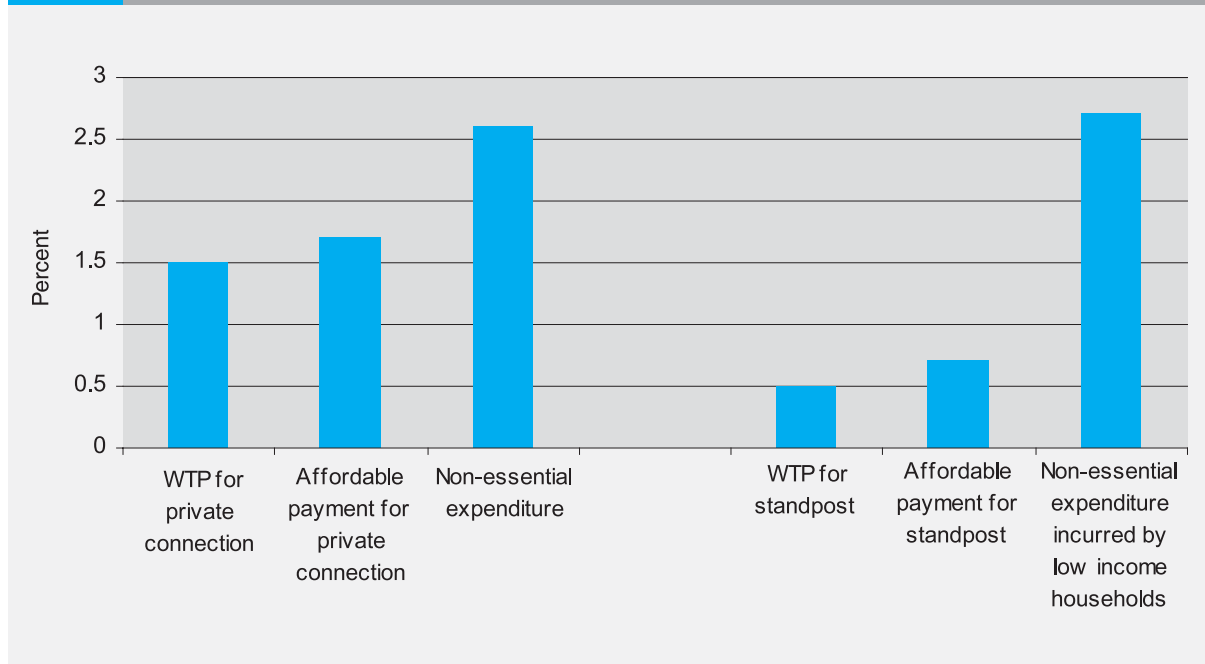
### How Much can Rural Households Afford to Pay?

Affordable payment for piped water varies across states. The monthly affordable payment per household for a private connection is assessed at Rs 30–40 in Orissa and Tamil Nadu, Rs 30–45 in Andhra Pradesh, Rs 30–50 in West Bengal, Rs 50–60 in Karnataka, Maharashtra and Uttarakhand, Rs 50–70 in Uttar Pradesh, Rs 90–110 in Kerala, and Rs 100–130 in Punjab. The monthly affordable payment per household with regard to standposts is in the range of Rs 11–13 per month in Uttarakhand and Rs 15–20 per month in Andhra Pradesh, Orissa, and West Bengal. Affordable payment is relatively higher at Rs 20–25 per month in Karnataka, Maharashtra, Tamil Nadu, and Uttar Pradesh. The level is still higher in Kerala (Rs 30–35 per month), and Punjab (Rs 40–50 per month).

There is a positive correlation between the ranks of states in terms of affordability and willingness to pay towards the O&M cost of piped water supply. Punjab tops in both affordability and willingness to pay, while Andhra Pradesh and Uttarakhand rank low both in terms of affordability and willingness to pay. However, in general, the household willingness to pay in different states is less than the assessed affordability. This is especially marked in the case of Uttar Pradesh and Karnataka.



**Figure 2** Willingness to Pay, Affordability, and Non-Essential Expenditures (percent of household income)



*Source:* Estimates of WTP and affordability are based on household survey data. Data on the expenditure on non-essential items are taken from *Level and Pattern of Consumer Expenditure, 2004–05*. NSS 61st Round (July 2004–June 2005), National Sample Survey Organisation, Ministry of Statistics, and Programme Implementation, Government of India, December 2006.

Overall, the cost of improved water supply in rural areas is within affordable limits. Almost all households using public handpumps can afford to pay Rs 5 per month to cover the cost of maintenance of the handpumps, and almost all households using standposts in piped water schemes can afford to pay Rs 10 per month to cover the cost of the proper maintenance of piped water schemes. To fully recover the O&M cost of typical piped water schemes, it would be necessary to charge private connection users at the rate of about Rs 50 per month. For new schemes, a capital contribution of Rs 600–1,500 would be necessary. Most non-BPL households can afford to pay this amount.

The average expenditure incurred by rural households on non-essential items (*pan, bidi*, other tobacco products, and intoxicants) may be taken as an alternate indicator of the amount they can afford to pay for water supply. The average expenditure on non-essential items incurred by rural households in various states is commonly more than the estimated willingness to pay and affordability for a private connection. The willingness to pay for a private connection as a proportion of income is about 1.5 percent on

**The average expenditure on non-essential items incurred by rural households in various states is commonly more than the estimated willingness to pay and affordability for a private connection**

average. The affordable payment level is about 1.7 percent on average. The expenditure on non-essential items as a proportion of total consumption expenditure (taken as a proxy for income) is about 2.6 percent on average (Figure 2). As regards standposts, the willingness to pay as a portion of income is about 0.5 percent and affordability is 0.7 percent, on average. The expenditure on non-essential items incurred by the bottom 30 percent households is 2.7 percent of their total consumption expenditure. Evidently, the estimates of willingness to pay and affordability are well within the amount that rural households spend on non-essential items.

# Conclusion

The main conclusion that may be drawn from the study is that affordability or willingness to pay is not an issue for improving rural water service delivery. Indeed, the charges being collected at present are generally much lower than what the households can afford and are willing to pay. The level of cost recovery can be substantially raised by improving the services and charging the households according to their willingness to pay. The analysis shows that an additional Rs 4 billion could be made available each year, if households are charged according to their willingness to pay. With these additional resources, the coverage can be increased by 14 percent.

Another conclusion that may be drawn is that it would not be right to insist on 100 percent O&M cost recovery in all demand-driven

The analysis shows that an additional Rs 4 billion could be made available each year, if households are charged according to their willingness to pay. With these resources, the coverage can be increased by 14 percent



schemes. In certain circumstances, the cost can be prohibitively high and 100 percent O&M cost recovery may be unaffordable.

In such cases, the beneficiary household could be asked to pay up to a 'ceiling' level, say, Rs 60–70 per month, and the cost beyond that level should be subsidized. For BPL households, the ceiling should be lower for capital and O&M cost contributions, based on the affordability criteria.

This Report has been prepared by Smita Misra (Sr. Economist, SASDU, World Bank), the Task Manager of this study.

The study was carried out under the overall guidance of Sonia Hammam, Sector Manager, Water and Urban, SASSD, World Bank. Data analysis has been undertaken by Professor B.N. Goldar and his research team at the Institute of Economic Growth, Delhi and the consumer survey was carried out by the ORG Centre for Social Research (a division of A.C. Nielsen ORG MARG Pvt Ltd). Comments and inputs at various stages of preparation from the following World Bank persons are gratefully acknowledged: Michael Carter, Rachid Benmessaoud, Clive G. Harris, Alain R. Locussol, Francis Ato Brown, Alexander E. Bakalian, Oscar E. Alvarado, G.V. Abhyankar, R.R. Mohan, S. Satish, N.V.V. Raghava, and Catherine J. Revels (WSP-SA). Special thanks are due to the Department of Economic Affairs, Ministry of Finance, the Department of Drinking Water Supply, Ministry of Rural Development, and the Rajiv Gandhi National Drinking Water Mission for their interest and collaboration in the study. Comments and data inputs during the preparation of the Report are gratefully acknowledged from R.P. Singh and M. Nagaraju (DEA), Bharat Lal and R.K. Sinha (RGNDWM) and their team, and the respective State Government officials.

The Report has been discussed with the Government of India but does not necessarily bear their approval for all its contents, especially where the Bank has stated its judgements/opinions/policy recommendations.

## Policy Papers

This is one of the six policy papers that have been prepared on the basis of the World Bank study on Review of Effectiveness of Rural Water Supply Schemes in India (June 2008). These policy papers, published along with the Report, are on the following themes:

**Paper 1:** Willingness of Households to Pay for Improved Services and Affordability

**Paper 2:** Inefficiency of Rural Water Supply Schemes in India

**Paper 3:** Multi Village Water Supply Schemes in India

**Paper 4:** Operation and Maintenance Expenditure and Cost Recovery

**Paper 5:** System of Monitoring and Evaluation

**Paper 6:** Norms for Rural Water Supply in India



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**Author and Task Manager:** Smita Misra  
(Sr. Economist, SASDU, World Bank)

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