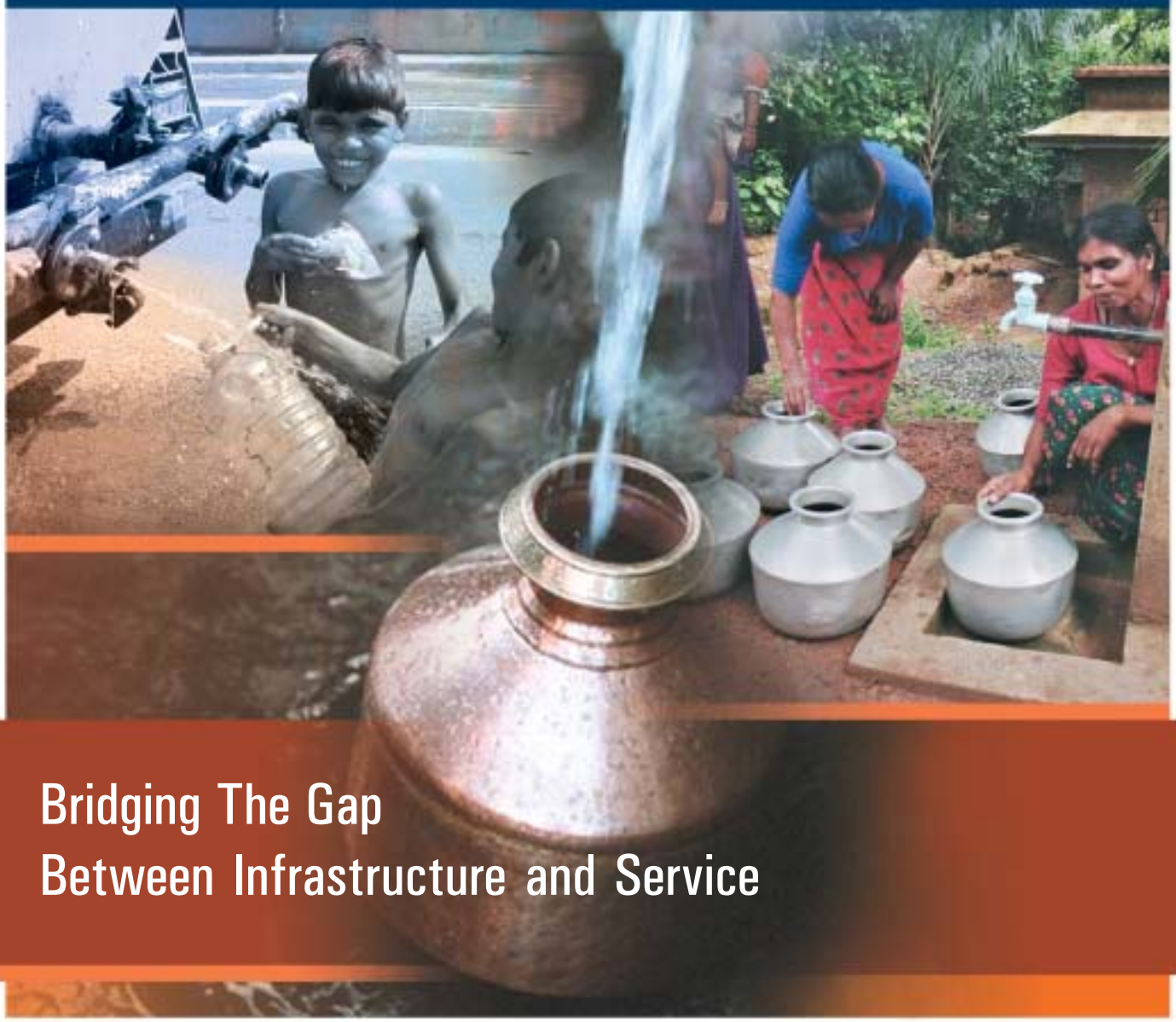
India

Water Supply And Sanitation



Bridging The Gap Between Infrastructure and Service

January 2006

THE WORLD BANK

India Country Team
Energy and Infrastructure Department
South Asia Region, World Bank

INDIA

Water Supply and Sanitation

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World Bank Report

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This report has been prepared by a World Bank team led by Alain R. Locussol (Lead Water Supply and Sanitation Specialist, South Asia Region) and including Smita Misra (Senior Economist, South Asia Region), Midori Makino (Senior Financial Analyst, South Asia Region), Catherine Hunt (Junior Professional Associate, Infrastructure Economics and Finance), and Vahid Alavian (Lead Water Resources Specialist, World Bank Institute. Data were collected and analyzed by Consultants Indicus Analytics, Delhi, partly financed by the Water and Sanitation Program – South Asia (WSP-SA). The team gratefully acknowledges inputs from Ministry of Urban Development; Department of Drinking Water Supply, Ministry of Rural Development; Planning Commission; UNICEF; WHO; DFID & WSP-SA.

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.

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Abbreviations and Acronyms

ARWSP	Accelerated Rural Water Supply Program
BIS	Bureau of Indian Standards
CPHEEO	Central Public Health and Environmental Engineering Organization
GoI	Government of India
GP	Gram Panchayat
HUDCO	Housing and Urban Development Corporation
lpcd	Liters per capita a day
LRMC	Long Run Marginal Cost
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MoUD	Ministry of Urban Development
NGO	Non Governmental Organization
NRW	Non Revenue Water
NSSO	National Sample Survey Organization
NURM	National Urban Renewal Mission
OBF	Output Based Financing
O&M	Operation and Maintenance
PHED	Public Health Engineering Department
PIP	Performance Improvement Plan
PSP	Private Sector Participation
PRI	Panchayati Raj Institution
TSC	Total Sanitation Campaign
ULB	Urban Local Bodies
VWSC	Village Water Supply Committee
WSS	Water Supply and Sanitation

डॉ. किरीट एस. परीख
Dr. Kirit S. Parikh

सदस्य
योजना आयोग
योजना भवन
नई दिल्ली – ११० ००१
MEMBER PLANNING
COMMISSION
YOJANA BHAWAN
NEW DELHI-110 001

Foreword

The Millenium Development Goal (MDG) require India to halve by 2015 the proportion of people who had no access to safe drinking water and basic sanitation. Are we on course to achieve this goal was the question this report initially wanted to answer. From the point of view of progress made so far, it appeared that India could achieve 100% access to infrastructure in the next decade or so, both in urban and rural areas, at the current level of funding. However a close look at the ground realities makes it obvious that mere access to infrastructure is only one side of the coin. Quality of service at levels comparable to atleast other developing countries merits equal, if not more, attention. The ultimate objective should be to achieve a service that is reliable and not restricted to a few hours of water supply in the day, financially sustainable and not surviving on large operating subsidies and grants, environmentally sustainable without aquifers getting depleted, supplying potable water instead of contaminated water due to inadequate treatment and last but not the least, affordable, in particular for the poor, instead of the consumer spending much more than they should for meeting their basic needs. Given the resource constraints, innovative financing arrangements will need to be evolved. 'Bridging the gap' between infrastructure and service is a challenging task and will require a serious adjustment, both by the Central and State governments, of policies, institutional arrangements and financial incentives. The report includes a series of recommendations that could help us to shape the design of our future programmes in the water and sanitation sector.

I am sure that the Central Ministries dealing with the water sector and the State governments will find the report most useful in preparing the road map for the sectors.

27.1.2006
(Kirit S. Parikh)

दूरभाष +91-11-23096568 टेलीफैक्स +91-11-23096569
Telephone: +91-11-23096568 Telefax: +91-11-23096569 e-mail: kirit.parikh@yojana.nic.in

Executive Summary

Access to Water Supply and Sanitation Infrastructure is increasing…

In urban areas, access to drinking water considered safe by the Government's standards rose from about 82% of the population in 1991 to 90% in 2001. This figure, which includes access to non-piped water, could rapidly reach 100%, consistent with the objective of the Ministry of Urban Development to achieve 100% coverage in 2007 (end of the 10th Plan). But in an urban environment non-piped water may not be considered a safe source. Thus progress toward Target 10 of the Millennium Development Goals (MDG) of halving by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation (in 1990) would need to be measured on the basis of access to piped water. This indicator, which was about 65% in 1990, would need to reach about 87% by the end of the 12th Five-Year Plan (2017) if India is to meet the MDG target. With access to piped water of about 74% in 2001 India appears to be on track to achieve the MDG. The urban population share with access to basic sanitation, which rose from 43% in 1990 to about 62% in 2001, is likely to improve to about 82% at the end of the 12th Plan, thus exceeding the theoretical MDG target of about 72%. Based on preliminary estimates, meeting the MDG target in urban areas would require investment of about Rs 695 billion and Rs 875 billion (US$16 billion and US$21 billion) for the 11th and 12th Plans[1].

In rural areas access to drinking water increased from about 65% of the population in 1990 to about 90% in 2001. Thus it appears likely that if India sustains investment at a level similar to that of the past decade, it could achieve 100% coverage of water supply infrastructure if not by 2007, as targeted by the Rajiv Gandhi National Drinking Water Mission, then probably by 2012. The rural population share with access to basic sanitation, which may have been as low as 5% in 1990, rose to about 20% in 2001 and is currently about 35%. If it is to reach about 55% at the end of the 12th Plan to meet the MDG target, India may currently be somewhat behind. Meeting the MDG target in rural areas would require investment of about Rs 240 billion (US$6 billion) for each of the 11th and 12th Plans.

…but access to reliable, sustainable, and affordable water supply and sanitation service is lagging behind.

Reliable? Whether in small towns, mega-cities, single-village or multi-village schemes piped water is usually distributed for no more than a few hours per day, regardless of the quantity available. In urban areas, raw sewage often overflows into open drains because sewers are blocked or pumping stations not functioning. In rural areas handpumps can remain out of order for months, while latrines too often are used for purposes other than that for which they were designed. Many rural habitations have slipped back to "not covered" or 'partially covered' status, mainly due to sources going dry, or systems working below capacity due to poor operation and maintenance.

Financially Sustainable? A few mega-cities recover from user charges the full cost of water supply and sanitation service, including operation and maintenance and capital costs. But most urban operations and all rural schemes still survive on large operating subsidies and/or capital grants provided by the States.

[1] *All figures are in 2001 rupees. The exchange rate used is US$1.00 = Rs 42.5.*

Environmentally Sustainable? Most cities must compete with the agricultural sector to secure surface water rights and tend to deplete local aquifers that they use as substitute sources; very few cities contribute to the abatement of pollution in receiving bodies. Villages relying on groundwater also suffer from the rapid depletion of aquifers, whose mining for irrigation purposes is encouraged by highly subsidized power rates.

Affordable? Most households, forced to cope with poor quality water supply and sanitation service, spend time and money on expensive and unsafe substitutes and on treatment for waterborne diseases. User charges are low by international standards, but the cost of the alternatives on which users must rely far exceeds the full cost of providing good quality service. And while the poor may be the intended beneficiaries of the low user charges, they suffer most from the resulting poor quality of service. Due to inadequate O&M and increasing numbers of partially functioning or defunct schemes, the rural communities revert to conventional substitutes that are often unsafe.

So the true challenge is not to increase access to infrastructure to almost 100% of the population, but to increase access to reliable, sustainable, and affordable service. India is unlikely to be able to meet this objective unless it adjusts policies, institutional arrangements, and financial incentives to help improve service delivery…

Improving Reliability. Improving the reliability of service would require clarifying the roles of the actors in the sector (policymakers, regulators, financiers, asset owners, and service operators) and establishing enforceable contractual relationships between them so as to increase transparency in decision making and accountability to end users. In addition, full responsibility for service provision would need to be devolved to the lowest appropriate level of government. As part of this, the function of "promoter of infrastructure", now the responsibility of State engineering agencies, such as Public Health Engineering Departments or State Water Boards, would need to be consolidated with that of "provider of service," to ensure that water supply and sanitation projects are implemented at low cost and correspond to what service providers can operate. The revenues and expenses of water supply and sanitation operations would need to be separated from those of the local government and "ring-fenced"; clarifying the financial situation of service providers is deemed to be essential to design appropriate financial recovery programs. To further increase accountability, the "beneficiaries" of a nearly free (but very poor-quality) service would need to be transformed into "paying customers" with the right to express concerns and preferences. Finally, the scope for private sector participation needs to be given careful consideration, with emphasis on "service" and "management" contracts, since the main issue is increasing the efficiency of day-to-day operations rather than raising commercial financing for extending infrastructure. Especially in the rural water supply and sanitation sector, it is important that demand responsive approaches are adopted. Communities need to be involved in the decision making process, regarding the choice of scheme, planning, design, implementation, control of finances and management arrangements. Monitoring and evaluation indicators need to be specially developed to provide a comprehensive coverage of inputs, processes, outputs and outcomes, related to various interventions for improving service performance, including periodic feedback from the beneficiary communities.

Achieving Financial Sustainability. Achieving financial sustainability would require establishing sound principles for pricing water supply and sanitation service so as to meet financial, economic, equity and simplicity objectives. Aiming at full recovery of operation and maintenance costs from user charges by the end of the 11th Plan (2012) is probably feasible for both urban and rural service. Going beyond and contributing to capital costs could be envisaged in a second phase; preliminary estimates show that it is likely that user charges needed to cover operation, maintenance and capital costs would, as an average, be lower than those in countries with water and sanitation sectors comparable to that of India. The transition from today's highly subsidized sector to a much less dependent one would need to be financed in a transparent and targeted manner, with any operating subsidies still provided by the States linked to actual improvement in the performance of service providers. Cost reduction programs have to be implemented: (i) to reduce operation and maintenance costs: efforts would need to focus on creating appropriate financial

incentives, and the private sector may have an increased role to play; (ii) to reduce capital costs: the dimensioning of sector infrastructure should be limited to what is strictly needed and the quality of construction should be improved to extend useful life of assets; and (iii) to reduce financing costs: financing conditions should be adapted to the sector's debt servicing capacity. State financing programs would need to be designed to support the recovery of the urban water supply and sanitation sector, not merely to fill gaps in infrastructure. The role of the Government of India in supporting the reform should be extended: a financing mechanism similar to the rural sector's Swajaldhara can be created for the urban sector, under the National Urban Renewal Mission. Finally, external financing needs would have to be harnessed primarily to support implementation of new policies, institutional arrangements, and fiscal incentives, not just to rehabilitate and extend infrastructure. In the rural water supply and sanitation sector, it is important to shift the O&M responsibility of handpumps, single village schemes, and intra-village network (multi-village schemes) to the VWSCs (under the aegis of the Gram Panchayat) to improve O&M cost recovery and collection efficiency.

Achieving Environmental Sustainability. To achieve environmental sustainability, bulk water would need to be priced according to sound economic principles, to give consumers the right signals about the actual cost of this increasingly scarce commodity. Water rights would need to be strengthened and water rights markets developed to allow water-starved cities an official access to water resources that are now used, often inefficiently, by agriculture, and to ensure proper compensation of farmers. Depletion of groundwater, still the main source of water for rural schemes, would need to be limited by pricing the electricity delivered to farmers according to sound principles and ensuring that power bills are actually paid. Groundwater recharge activities are required to address the "source sustainability" issues in "over-exploited" or "critical" aquifers. Given the conflicting groundwater demand from irrigation, industry and drinking water, there is an urgent need for State level regulatory agencies with specific mandates for water resource management and regulation of exploitation of groundwater. Water quality would need to be protected by paying as much attention to proper waste water collection as to waste water treatment; a large share of the waste water now generated never reaches treatment facilities. Infrastructure would need to be planned to achieve realistic environmental objectives: waste water treatment to the highest level often fails to improve the water quality in the receiving bodies enough to be economically justified. For rural water supply, an effective water quality monitoring and surveillance program needs to be institutionalized. Finally, efforts to support "collective" behavioral change toward better sanitation practices should be continued, particularly those aimed at eliminating open defecation.

Improving Affordability. Improving the affordability of service would require reducing costs, as already mentioned above. Cost recovery strategies would need to include transparent, well-targeted subsidies for the poor, both to help obtain connections to service and to encourage the consumption of a minimum quantity of water. It is important that rural communities and Panchayati Raj Institutions have a complete understanding of the various technology options. The selection of water supply technology should be determined by a number of factors, such as technical feasibility, user preferences and requirements, combined with willingness to contribute towards capital and O&M cost.

…and build the capacity now lacking.

In the urban water supply and sanitation sector an important step toward building capacity would be to create an identity for the "Urban Water Supply and Sanitation industry." A professional association of service providers could play a key role in disseminating best practices, implementing full scale benchmarking, and providing training and certification for sector professionals. Training institutions would need to adapt their programs, currently focused mainly on technical design issues, to the new needs of the urban sector. And special information programs would need to be developed for key stakeholders, i.e., local politicians, consumer associations, and the many non-governmental organizations with a special interest in water supply and sanitation. In the rural sector special training programs would also need to be developed to build the capacity of local governments (Panchayati Raj Institutions) and the village water supply committees.

Chapter 1

Assessing Progress in Extending Access to Infrastructure and Service

India is making good progress in increasing access to Water Supply and Sanitation (WSS) infrastructure in both urban and rural areas, but is lagging behind in expanding access to service that is reliable, sustainable and affordable. This report analyzes the main reasons for the gap between infrastructure and service and presents a series of recommendations for gradually improving the reliability, sustainability and affordability of the WSS service. The report draws on the findings and recommendations of two background papers on the urban and rural WSS sectors (World Bank 2005a, b) and takes into account the comments received from the Planning Commission, the Ministry of Urban Development (MoUD), the Rajiv Gandhi National Drinking Water Mission (RGNDWM) and several other agencies which participated in a workshop organized in Delhi in October 2005.

The exercise was prompted by a critical question: can India meet Target 10 of the Millennium Development Goals (MDG) of halving, by 2015, the proportion of people who had no sustainable access to safe drinking water and basic sanitation in 1990? The report concludes that access to WSS infrastructure is likely to increase regularly if India sustains its current level of investment. Nevertheless, India is unlikely to meet the MDG target of access to WSS service without changes in policies, institutional arrangements, and financial incentives. While most of the report's recommendations for such changes are well accepted in India, they have not yet been consistently implemented.

Growing Access to WSS Infrastructure

The Urban Sector

Some 5,161 of India's cities and towns, including 423 "class 1" cities with a population of 100,000 or more, have piped water systems, mostly designed according to standards set by the Bureau of Indian Standards (BIS)[2]. There are no global statistics on, for example, the number of connections served or the length of the distribution networks. Also, since metering is either non-existent or unreliable, the volumes of water produced and consumed cannot be accurately estimated. Piped water systems are known to be highly inefficient, with non revenue water (NRW)[3] typically averaging 40 to 50% of production. All "class 1" cities are equipped with a sewerage system, but the number of other cities and towns equipped is not known precisely; only about

[2] Per capita norms are as follows: (i) metro cities with sewerage system: 150 lpcd; (ii) towns and cities with sewerage system: 135 lpcd; (iii) towns and cities without sewerage system: 70 lpcd; (iv) population covered by public standpipes: 40 lpcd.

[3] NRW includes unbilled, metered consumption; unbilled, unmetered consumption; unauthorized consumption; metering inaccuracies; leaks in transmission mains; leaks and overflows in service reservoirs; and leaks in distribution mains and service connections up to the meter.

700 cities treat their effluent before disposal in the environment.

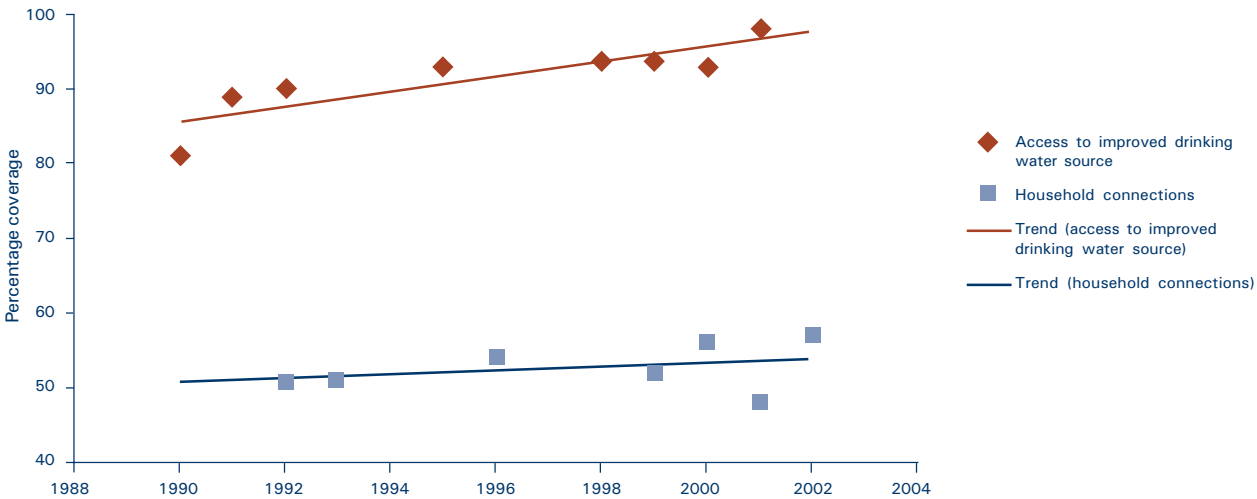
There are no statistics on the size of the staff employed by the urban WSS sector and the State engineering agencies that design and implement urban WSS projects, but most large WSS service providers employ more than 10 staff per 1,000 water connections (and sometimes significantly more), way above international best practice of 2 to 4. The training provided in the sector is traditionally oriented toward technical design issues.

Urban WSS is the responsibility of the States, which provide most of the funds for developing infrastructure; programs sponsored by the Government of India (GoI) contribute only limited financing. Revenues fall far short of costs: average operating costs are estimated at around Rs 6.5 per cubic meter (US$0.15/$m^3$), and average revenue from user charges at only about Rs 2.5 per cubic meter (US$0.06/$m^3$). Thus, the urban WSS sector survives on large operating subsidies and capital grants from the States. States also guarantee loans made by the Housing and Urban Development Corporation (HUDCO) to develop new WSS infrastructure; this agency has so far lent about Rs 150 billion (US$3.5 billion) to the sector. No consolidated data is available on the outstanding debt of the urban WSS sector.

A recent attempt to benchmark the performance of selected WSS service providers has highlighted the paucity of data available, beyond data on infrastructure capacity, to help efficiently monitor progress toward reliability, sustainability, and affordability of the WSS service.

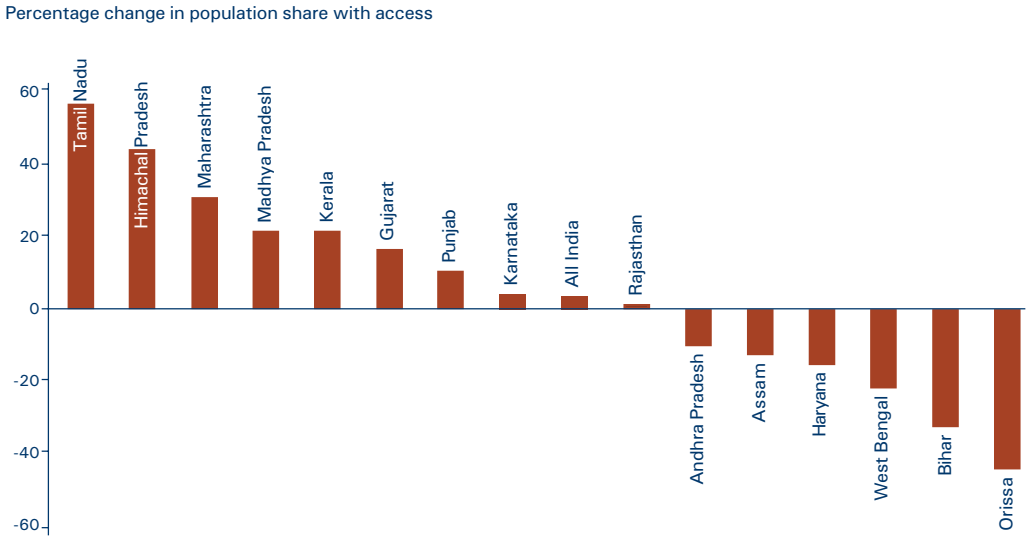
Current Access to Infrastructure. According to the 2001 census, about 90% of India's urban population (252 million of the total 280 million) had access to a source of drinking water considered "safe" by GoI standards, up from about 82% (177 million of 217 million) in 1991. About 50% of the urban population (140 million) had direct connections to distribution networks, up from about 42% (92 million) in 1991 and another 24% (67 million) access to public standpipes. About 16% (46 million) had access to other "improved" sources, such as wells or boreholes equipped with hand or motorized pumps (Figure 1). Also in 2001, about 62% of the urban population (182 million of the 280 million) had access to adequate sanitation, up from 43% (95 million) in

Figure 1 : Steady Growth in Urban Population with Access to Improved Drinking Water Sources



Source: For 1991, Census of India; for 1993, Demographic and Health Survey 1992/93 and National Sample Survey Organization (NSSO); for 1996, NSSO; for 1999, National Family Health Survey 1998/99; for 2000, Multi-Indicator Cluster Survey.

Figure 2 : Progress and Slippage: Change in Access to Piped Water in Urban Areas Between 1991 and 2001



Note: Piped access includes pipes both within and away from the premises.
Source: Census of India 1991 and 2001.

1991, with an estimated 36% (100 million) having access to sewers and an estimated 29% (82 million) to septic tanks. Out of the remaining 98 million, about half had access to pit latrines and community toilets and about half had no access to sanitation.

Future Access to WSS Infrastructure. India has made good progress since the early 1990s in developing WSS infrastructure in urban areas. But whether it is on track to meet the MDG target depends on whether non-piped water can be considered a "safe" source of drinking water in an urban environment. If so, the share of the urban population with access to safe water, which rose from about 82% in 1991 to 90% in 2001, could possibly reach 100% in the next 10 years or so, consistent with MoUD objective of achieving 100% coverage in 2007. But if, as this report recommends, non-piped water is *not* considered a "safe" source, progress needs to be measured on the basis of access to piped water. Access to piped water would need to increase from slightly less than 65% in 1990 to about 87% at the end of the 12th Plan, or 2017. With the 2001 census showing an estimated 74% of the urban population having access to piped water, India seems to be on track to achieving the MDG target; however there is evidence that piped water coverage has slipped in several States between the early 1990s and the early 2000s (Figure 2). Access to basic sanitation increased from about 43% in 1990 to about 62% in 2001; it is likely that the theoretical MDG target of 71% for the end of the 12th Plan would be exceeded and that coverage would reach about 82%. It is estimated that access to sewers would evolve from about 36% in 2002 to about 52% in 2017. Table 1 summarizes assumptions made with regards to future access to various sources of water and type of sanitation.

The Rural Sector

Rural WSS is also a State responsibility. But the GoI, through Swajaldhara, a program that advocates for decentralized service delivery and community participation in the project cycle, contributes about 10% of the overall investment program. Although service provision is supposed to be decentralized to local governments, most of the work of designing, implementing, and operating WSS schemes is still carried out by State engineering agencies such as Public Health Engineering Departments (PHED) and State Water Boards. States provide substantial operating subsidies, as cost recovery is limited, in addition to large development grants. The monitoring and evaluation (M&E) mechanism in place captures

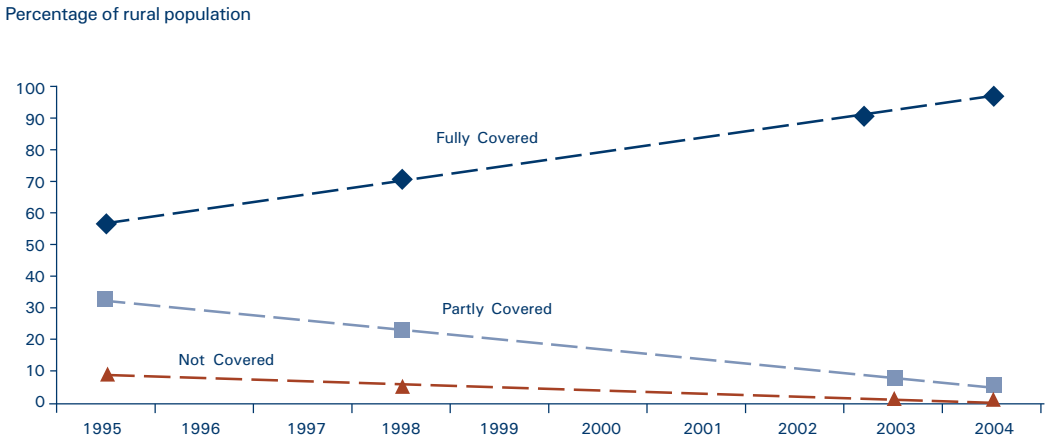
primarily progress in construction and the disbursement of funds at the State and central levels; it does not assess the functionality of the schemes and performance of the service. An exception is the Total Sanitation Campaign (TSC), which evaluates sanitation schemes by looking at their outcome indicators.

Current Access to Infrastructure. Coverage of the rural population by water supply infrastructure has increased steadily in recent years (Figure 3). According to census data, about 90% of the rural population (665 million out of the total 740 million) had access to a safe source of drinking water in 2001, much higher than the 65% (425 million out of 642 million) in 1991. In 2001 about 43% of the rural population (about 320 million out of 740 million) was served by 3.5 million community handpumps, and several million household handpumps were still used in areas with high water tables. In addition, 6% had access to tubewells and mini water supplies, and 24% to single-village or multi-village schemes. Systems are generally designed to provide an average of 40 liters per capita per day[4]. On the sanitation front, the 2001 census shows 20% of the rural population (135 million) with access to adequate wastewater and excreta disposal facilities.

Future Access to Infrastructure. The RGNDWM sets an objective of extending access to water supply infrastructure to 100% of the rural population by 2007. The expansion of coverage from about 65% of the rural population in 1990 to about 90% in 2001 suggests that this objective can clearly be achieved, if not in 2007 probably in 2012, if an investment level similar to that of the past decade is sustained. For sanitation, where only 5% of the rural population had access to infrastructure in 1990, a reasonable objective would be to reach 55% at the end of the 12th, or 2017. This implies that the coverage ratio should have been in the range of 27% in 2001. According to the 2001 census, the actual coverage ratio was 20%, indicating that India may be somewhat behind.

Future Capital Expenditure Requirements. Table 1 compares targeted access rates under the MDG (for 2017) and stated objectives of GoI agencies in charge of the WSS sector for 2007. Table 2 gives an

Figure 3 : Growing Access to Rural Water Supply Infrastructure



Source: Ministry of Rural Development 1996; Planning Commission, Annual Plan 2002; *and Rajiv Gandhi National Drinking Water Mission, 2003 and 2004 Habitation Surveys.*

[4] Access to rural water supply infrastructure is defined as access to an average of 40 liters per capita a day within a distance of 1.6 kilometers or, in hilly areas, within an elevation of 100 meters.

Table 1 : Actual and Targeted Access to Water Supply and Sanitation Infrastructure at the End of Five-Year Plan Periods

		1992	1997	2002	2007	2012	2017
Total population	**million**	**850**	**940**	**1,030**	**1,110**	**1,200**	**1,300**
Urban Sector Population	**million**	**210**	**250**	**290**	**350**	**420**	**500**
Access to "safe" water	million	173	213	264	334	420	500
Access to "piped" water	million	136	171	218	277	349	435
Individual connections	million	90	115	148	200	265	345
Public standpipes	million	46	56	70	77	84	90
Access to "improved" sanitation	million	152	189	238	306	386	486
Access to sewers	million	53	76	104	144	193	260
Access to septic tanks	million	44	58	79	102	126	148
Access to latrines	million	55	55	55	60	67	78
Rural Sector Population	**million**	**640**	**700**	**740**	**760**	**780**	**800**
Access to "safe" water	**million**	**420**	**542**	**684**	**726**	**764**	**800**
Access to "improved" sanitation	**million**	**37**	**68**	**150**	**234**	**335**	**425**

Source: For 1992 and 2002 estimates from the 1991 and 2001 Census of India; for targets, World Bank staff forecasts.

estimate of the capital expenditures be required to meet the MDG target based standard unit costs consistent with that suggested by the Central Public Health and Environmental Engineering Organization (CPHEEO). According to this calculation, India would have to invest about Rs 935 billion (US$22 billion, or an average US$4.4 billion/year) and Rs 1,115 billion (US$26.25 billion, or US$5.25 billion/year) respectively during the 11th (2007-2012) and 12th Plans (2012-2017). This would represent an average 0.55% of India's GDP during the ten-year period extending from 2007 to 2017. These percentages are higher than that estimated for the 8th and 9th Plans (0.32% and 0.34% respectively) but lower than that of the 10th Plan (0.64%)[5]. If only 40% of operation and maintenance (O&M) costs are recovered from user charges, as is the case today, India would have to devote another 0.25% of its GDP to supporting its WSS sector.

Lagging Access to Reliable, Sustainable and Affordable Service

The MDG Target 10 refers to "sustainable access to safe drinking water and basic sanitation," not simply access to WSS infrastructure. The quality of the current WSS service in India is assessed against four key criteria: reliability, financial sustainability, environmental sustainability and affordability.

Reliability refers mostly to the permanence of the water supply and the safe removal of wastewater and excreta from the immediate environment. In India, whether in

[5] Estimates using a different methodology suggest that, in order to sustain a growth rate of its GDP of about 7.5% between 2006 and 2010, India should spend about 8% of its GDP for developing infrastructure, of which 1% for WSS. About half of the future investment for WSS would have to be devoted to replacing existing assets. For the purpose of discussing cost recovery strategies this paper uses the estimates given in Table 2.

Table 2 : Expenditures Required to Meet MDG Target

	Actual and Projected Spending Requirements (2001 Rs billions, unless otherwise specified)[a]				
	1992–97	1997–02	2002–07	2007–12	2012–17
Urban areas					
Capital expenditure					
Water supply	–	–	310	385	470
Sanitation	–	–	230	310	405
Total	60	117	**540**	**695**	**875**
O&M costs	–	–	295	415	575
Rural areas					
Capital expenditure					
Water supply	**100**	**198**	**225**	**195**	**195**
Sanitation	**7**	**12**	**50**	**45**	**45**
Total	**107**	**210**	**275**	**240**	**240**
O&M costs	–	–	**255**	**270**	**280**
Total					
Capital expenditure	167	327	**815**	**935**	**1,115**
O&M costs			550	685	855
Capital expenditure (US$ billion)			19.2	22.0	26.2
GDP	**52,000**	**95,000**	**127,500**	**170,000**	**210,000**
Capital expenditure as % of GDP	**0.32**	**0.34**	**0.64**	**0.55**	**0.53**

– Not available.

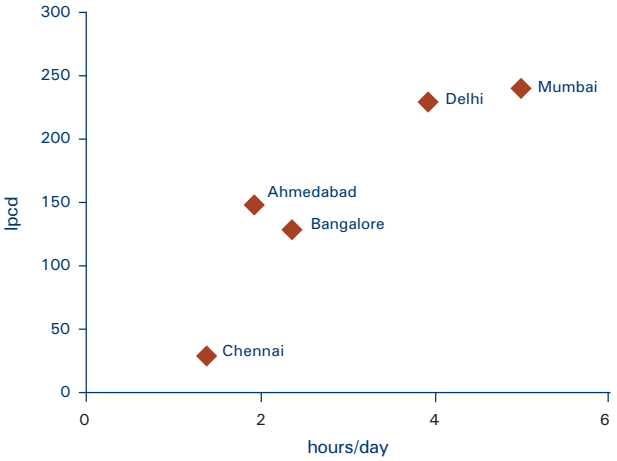
[a] All rupee values are shown in 2001 rupees. All dollar values are converted at the exchange rate US$1 = Rs 42.5.

The projected investment figures are based on available information and maybe on the lower side as future GoI programs develop. The rural water supply and sanitation is a dynamic sector with periodic changes due to groundwater depletion, floods, droughts etc., and keeping these in view the GoI has increased investment in the rural water supply sector by 40% over the last year, raising it from Rs 29 billion to Rs 40 billion in 2005-06. Further, under Bharat Nirman the aim is to cover 'uncovered' habitations, 'slipped back' habitations and habitations affected by 'poor water quality'. GoI is moving forward to address reliability and sustainability issues by addressing groundwater depletion through water recharge & watershed programs, as well as conjunctive use of surface and groundwater. The affordability issues are being tackled by increasing community participation in the selection and design of schemes. GoI is targeting 100% sanitation infrastructure coverage by 2012 and has increased allocation by 75% over the past year from Rs 4 billion in 2004-05 to Rs 7 billion in 2005-06. GoI is taking up awareness campaigns for changing mind-sets, along with a major role for panchayats and local institutions for social mobilization.

urban or rural areas, the WSS service provided today fails the reliability test. Indeed, there is even evidence that the quality of service is deteriorating. In many cities, for example, the number of hours during which water is available has recently decreased. Regardless of the quantity of water available, piped water is never distributed for more than a few hours a day, whether in small towns, in multi-village schemes, or even in class 1 cities and mega-cities (Figure 4)[6]. Handpumps, which still serve half the rural population, can remain out of order for months before being repaired by state agencies. In urban areas raw sewage often overflows into open drains because sewers are

[6] Limiting the hours of water distribution has adverse effects: it creates high risks of contamination of the water distributed; forces customers to cope with the intermittent service by installing booster pumps, storage reservoirs, and purification equipment or by developing their own water source (backyard well or borehole); and leads to significant waste because customers usually leave their tap open waiting for the water to come.

Figure 4 : Availability of Water (hours/day)



Source: Water and Sanitation Program South Asia, Benchmarking Project

blocked or because pumping stations are not functioning as a result of unreliable power supply. Rural latrines are too often used for purposes (such as storage) other than that for which they are intended, and open defecation is still widespread. Those who suffer most from all this are the poor, unable to afford the coping mechanisms often adopted to compensate for deficient public service[7].

Financial Sustainability means the recovery of O&M as well as capital costs from user charges rather than general taxes. A few mega-cities, such as Mumbai and Chennai, recover the full cost of service from user charges, but most urban operations and rural schemes, including those relying on handpumps, still survive on operating subsidies, estimated to be of the same order of magnitude as capital expenditure. A WSS service that relies on permanent operating subsidies cannot be considered financially sustainable. Subsidies are neither transparent nor targeted and, thus, tend to benefit better-off customers rather than the poorest who often lack access to public WSS.

Environmental Sustainability means proper recharge of aquifers and reservoirs, robust water rights, and the capacity to protect water quality against increasing domestic, agricultural, and industrial pollution. In India the WSS service seldom meets this criteria. Most cities must compete with the agricultural sector to secure water rights and insufficient allocation of surface water often leads to over-exploitation of local aquifers. Very few cities are able to contribute to the abatement of pollution in receiving bodies. Villages relying on groundwater suffer from the rapid depletion of aquifers, whose mining for irrigation purposes is encouraged by highly subsidized power rates; as a result many villages are now forced to develop much more expensive multi-village schemes based on surface water.

Affordability is measured by comparing the combined cost of primary and substitute WSS services with the cost of public services that meet good quality standards and for which user charges cover the full (O&M and capital) costs. Most households, forced to cope with poor-quality service, spend time and money operating expensive substitutes, travel distances to collect water, and incur costs for the treatment of waterborne diseases. Alternative services are always costly, and household spending on water supply and sanitation can be 10 times the official water bill. Again, the poor suffer most from the poor quality of service, itself a direct result of the low user charges for which the poor are the intended beneficiaries.

The focus of the report is on "services" rather than "infrastructure" and hence the principles that apply to water supply also apply to the waste water services when "WSS" is mentioned. A separate analysis of waste water services has not been attempted.

[7] In Delhi the cost of "coping" has been estimated to average Rs 4,000 a year per household – for installing and operating substitute sources (storage tanks, booster pumps, purification equipment, backup borehole and motorized pump), excluding the opportunity cost of the time spent. Compare this figure.

Chapter 2

Bridging the Gap Between Infrastructure and Service

The overview in the previous chapter suggests that the true challenge of the MDG target is not to boost the share of population with access to WSS infrastructure from an already fairly high level to close to 100% before the end of the 12th Plan or earlier. Instead, the challenge is to increase the share of the population with access to reliable, sustainable, and affordable service from an extremely low level to, say, about 50%. This task is clearly much more difficult, since it requires adjusting policies, institutional arrangements, and fiscal incentives. If GoI continues with "business as usual," it is unlikely that the MDG target can be met.

What India Can Do to Meet the MDG Target

To support progress toward the MDG target, this report advocates the implementation of widely accepted principles such as the Dublin Principles, the Government of India's official policy for rural WSS (Swajaldhara), and the comments of the Planning Commission in the 10th Plan for urban WSS[8]. (For detailed proposals for the urban and rural sectors, see World Bank 2005a and b.)

Increase the Accountability of Institutions to Improve the Reliability of Service

Improving the reliability of the WSS service depends very much upon increasing the accountability of its providers. And achieving this objective depends on a few principles that apply to both the urban and the rural sector:

- Clarify the roles of the actors;
- Devolve the full responsibility for providing the service to the most appropriate level of government;
- "Ring-fence" WSS operations;
- Transform beneficiaries into paying customers; and
- Look for approaches that strengthen performance incentives, including an enhanced private sector role.

Clarify the Roles of the Actors. In urban WSS there is often an unhealthy overlap between policymaking, regulation, financing, ownership of infrastructure, and operation of service within State agencies responsible for the two sub-sectors. Essential steps to avoid

[8] Formulated in the early 1990s, the Dublin Principles articulate four main themes: the institutional principle, which advocates stakeholder participation, including a greater role for nongovernmental organizations, women, and the private sector; the subsidiarity principle, which calls for managing water supply and sanitation service at the lowest level of government deemed appropriate; the ecological principle, which suggests that water management be designed in a holistic manner to ensure that intersectoral needs are taken into account and environmental consequences properly mitigated; and the instrument principle, which encourages greater attention to the economic value of alternative uses of water resources and the use of economic instruments such as water rights and user charges.

conflicts of interest include unbundling these functions, establishing clear terms of reference, and building accountability mechanisms, preferably within the framework of enforceable contracts.

The rural sector faces a similar need to clarify roles. Efforts should focus on devolving finances, functions, and functionaries to Panchayati Raj Institutions (PRI) and progressively shifting the role of the State to facilitator, and the role of State engineering agencies from promoter of infrastructure and provider of service to provider of technical assistance.

Devolve Full Responsibility for Providing the Service to the Most Appropriate Levels of Government. Despite constitutional amendments that leave the States free to decide how they wish to transfer responsibility to local governments for providing WSS service, State engineering agencies are still very much the driving force behind the development of the WSS infrastructure. They design infrastructure, sometimes arrange financing for it, implement infrastructure projects, and transfer infrastructure to municipal corporations, urban local bodies, or PRI for operation and, if applicable, servicing debt. This arrangement provides little incentive for State engineering agencies to construct cost-effective infrastructure or for local governments to take it over, as evidenced by the predominance of expensive multi-village schemes in states where PRI are known to be weak.

In the urban sector, Urban Local Bodies (ULB) should create autonomous service providers and give them responsibility for selecting WSS projects that they can afford and can operate technically and commercially; this would require consolidating the roles of "promoter of infrastructure" and "provider of service" at the local level. Smaller ULB should be encouraged to join forces in "WSS syndicates" to achieve economies of scale and reduce the cost of service provision. State engineering agencies should still have a major part to play, in strengthening the capacity of these local service providers to make informed decisions, prepare financing requests, design and implement projects to rehabilitate and extend infrastructure, and operate the WSS service. But such agencies should not be allowed a monopoly, and local service providers should be free to employ private engineering consultants, selected through open competition, if they wish.

Similar principles should apply in the rural sector. Rural water supply infrastructure is currently provided in a supply driven mode by the State agencies which identify, design, finance, implement and maintain the schemes. The current emphasis on targets and norms encourages excessive investment, undermines efficiency, and deters the transfer of ownership to PRIs and communities which should be responsible for planning, implementing and maintaining the infrastructure. To bridge the water supply infrastructure/ service gap, it is essential to shift from the target-oriented supply driven approach to a demand driven approach which provides users with the services they want and are willing to pay for. The funds, functions and functionaries should be gradually devolved to the PRIs and the user communities. Decentralization should be accompanied by efforts, by State engineering agencies or private consultants and professional Non Governmental Organizations (NGO) to strengthen the role of user committees and PRI in the project cycle from identification to implementation and operation.

"Ring-fence" WSS Operations. In urban areas efforts to improve WSS service need to go well beyond closing the gap between the demand estimated according to GoI standards and the capacity of the existing infrastructure. Unless the WSS service is treated as a commercial operation, its quality, including that provided to the poor, is unlikely to improve. An essential step in this is to separate the accounts of the autonomous local service providers from those of the ULB to which they report. This step is critical even in rural areas, where international experience has shown that separating the accounts of the village water committee from those of the local government helps users develop a sense of ownership of the systems and improve their O&M.

Central and State government funds for capital expenditures should be preferably channeled toward such "ring-fenced" entities rather than ULB or State engineering agencies. When preparing financing applications for WSS infrastructure rehabilitation and extension projects, ring-fenced service providers would need to submit financial recovery programs as part of their Performance Improvement Plans (PIP) based on financial forecasts meeting minimum accounting standards. Financing applications would have to be independently appraised by State agencies responsible for financing urban WSS projects. As part of this, standard formats for financing applications need to be developed for autonomous service providers, along with standard appraisal procedures for State financing

agencies. Service efficiency and financial indicators would have to be closely monitored by independent regulatory mechanisms, most likely to be created at the State level. Tariffs would have to be proposed by service providers in accordance with policies to be defined by the States and submitted to independent regulatory agencies for review so as to limit political influence.

Transform Beneficiaries into Paying Customers. International experience shows that urban WSS sectors that are successful always recover their O&M and capital costs from user charges. Similarly, successful rural sectors always recover 100% of their O&M costs from user charges and often request contributions to capital costs (5 to 10%) in cash or in kind, mainly to create a sense of ownership: these principles are part of the GoI Swajaldhara program. In India, however, O&M of both urban and rural systems is deficient because revenues from user charges are inadequate and operating subsidies often not available in a timely manner.

Despite widespread "unwillingness to charge" among politicians, there is evidence of "willingness to pay" among users, at least when they feel that service providers are genuinely concerned about improving quality. Indeed, transforming "beneficiaries" of almost free but very poor-quality service into "paying customers" of reasonably good service should increase accountability: paying customers should, and even must, have the right to voice their concerns and preferences. In urban areas, they should be represented on the boards of the autonomous service providers so that they can participate in decision making.

A move toward cost recovery from user charges may have to be gradual and linked to improvement in the quality of service. Thus, operating subsidies may still be necessary but they should be transparent, targeted and eventually phased out.

Promote Private Sector Participation. Private sector participation (PSP) could be helpful to improve the efficiency of service and increase the accountability of service providers, qualities in short supply in both urban and rural areas today. (But attempts to develop schemes involving the private sector have so far focused mostly on raising commercial financing to develop new infrastructure and limited to operations in "enclave" projects).

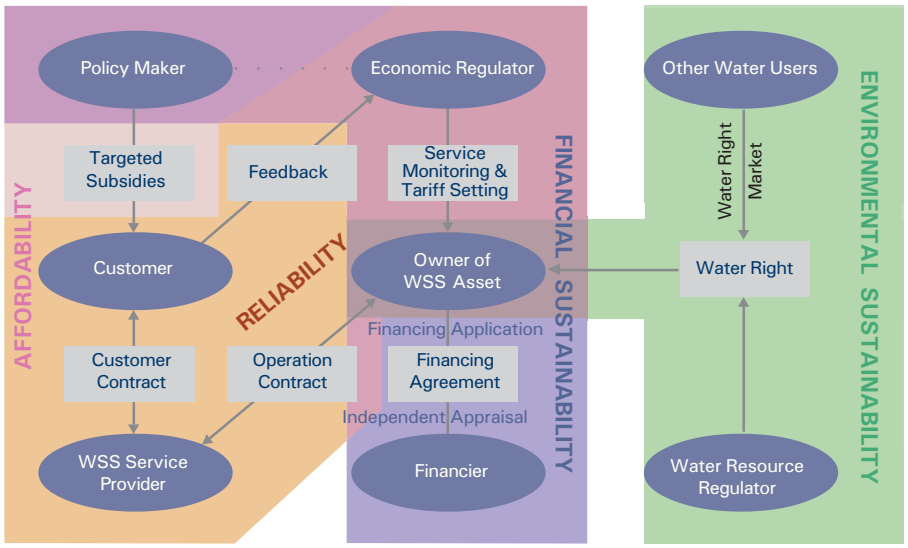
In the urban sector, experience in various countries has already shown that PSP could be helpful for mega-cities as well as for secondary cities and small towns, in a number of ways. Autonomous service providers could award service contracts of limited scope for such tasks as detecting and repairing leaks, operating and maintaining pumping stations, or billing and collection local private contractors. Similar contracts could be awarded for village piped water systems. Private operators could also take on more comprehensive tasks, such as the technical and commercial operations of a WSS service, under a medium-term "management" contract or a "lease" or "affermage" contract. Remuneration of operators should be linked to their performance. And the performance of the operators should be benchmarked to identify the good performers and the laggards. In the rural sector local retailers could supply parts, and private mechanics can be trained by state engineering agencies to maintain handpumps for village water committees, who would also finance their services.

Schemes to involve the private sector must not neglect stakeholders. International and recent Indian experience has shown that clearly communicating the rationale for PSP and consulting clients in the basic design of schemes are key to success. Also critical is managing expectations about the speed with which service quality can be improved: turning around a poorly performing WSS system takes time.

Figure 5 proposes an operational framework for improving accountability of the various actors and for improving reliability, financial sustainability, environmental sustainability and affordability of the urban WSS service. It identifies the various key actors, i.e. the policy maker, the economic regulator, the water resource regulator, the owner of the WSS assets, the other users of the water resources, the provider of the WSS service and the customers (in ovals) and shows the contractual relationship to be established among them (in rectangle).

When it comes to improved reliability of the WSS service, figure 5 shows that the key elements to be developed are the "operation contract" between the owner of the WSS assets and the provider of the WSS service; the "customer contract" between the provider of the WSS service and the customer; the "feedback" mechanism between the customer and the regulator;

Figure 5 : Operational Framework for Improving Accountability in the Urban WSS Sector



and the "service monitoring" mechanism between the regulator and the owner of the WSS assets. This arrangement can also be implemented when the asset ownership and service provision functions and when the policy making and regulatory functions are combined, but obviously much less efficiently.

Improve the Financial Sustainability of the Service

Efforts to improve the financial sustainability of urban and rural WSS service should center on several principles:

- Price the WSS service according to sound principles;
- Finance the transition toward full cost recovery in a transparent manner;
- Create financial incentives to reduce O&M, capital, and financing costs;
- Expand the role of programs sponsored by the GoI to support reform; and
- Encourage the use of other sources of financing to promote reform.

Referring to Figure 5, key elements of the accountability framework to achieve financial sustainability in the urban WSS sector include the definition of sound pricing policies by the policy maker, their enforcement by independent regulators and the independent appraisal of applications submitted together with the Performance Improvement Plan (PIP) by owners of WSS assets to autonomous financing agencies. Similar principles, including independent appraisal and approval would apply for multi-village schemes in the rural WSS sector. It is important to shift the O&M responsibility of handpumps, single village schemes, and intra village network (multi-village schemes) to the VWSCs (under the aegis of the GPs) to improve O&M cost recovery, collection efficiency and thereby achieve financial sustainability of the schemes in the rural WSS sector.

Price the Service According to Sound Principles. In the urban WSS sector, user charges are currently set by politicians with short-term objectives. They should instead be set by autonomous local service providers according to principles set by policy makers and reviewed by independent regulatory mechanisms to be established, in most cases at the State level.

Best practice suggests that WSS tariffs should meet four main principles. First, tariffs should meet financial

objectives: user charges should eventually cover O&M costs and yield a return on net fixed assets in operation sufficient to depreciate assets and cover financing costs. Some mega-cities already achieve this, but in most cases user charges do not even cover O&M costs. Second, the tariff structure should be simple. Multiplying blocks and rates should be avoided, since it is impossible to design tariffs that serve every social purpose. In addition, large cross-subsidies between industrial and commercial customers and domestic customers should be avoided: if businesses opt out of the WSS service, as is already happening in some cities, the service providers revenues could drop sharply. Third, tariffs should reflect the economic value of water, as reflected by its long-run marginal cost. Because of the strong competition for water sources, it is essential that customers receive the right signals about its economic value and adjust their consumption to what they can afford. When economic and financial pricing principles lead to conflicting results, financial objectives should be given priority. And fourth, tariffs should be equitable. Because the provision of drinking water has a strong element of a public good mostly in terms of better public health, it often makes sense to subsidize lifeline consumption for those who might otherwise be unable to afford it. The subsidies would need to be well targeted and phased out over an agreed period.

In rural WSS recovering 100% of O&M costs and requesting small contributions toward capital costs have been shown to lead to sustainable service in many countries. But in India, despite these principles being part of Swajaldhara, there is evidence that they are not implemented consistently. In particular, energy bills often are not covered from user charges. It is important that the GPs initiate a "payment culture" for recovering full O&M cost of handpump & simple single village schemes, as well as "affordable" contributions for high cost single and multi-village schemes. Transparent State subsidies (in excess of "affordable" household contributions) should be provided for high cost single / multi village schemes.

Finance the Transition Toward Full Cost Recovery in a Transparent Manner. In urban WSS a large gap persists between the costs to be covered and the revenues generated from user charges. As a result, if GoI carries on with "business as usual," it will have to provide operating subsidies of the same order of magnitude as capital grants (Figure 6 – "business as usual scenario"). A better practice scenario envisages (Figure 6) that operating costs (O&M, depreciation and financing costs) would be recovered from user charges by the end of the 11th Plan (2012) and that thereafter revenues would be sufficient to contribute about one third of the Capex from cash from operations. This scenario would eventually result in an average tariff of Rs 17 per cubic meter (US$0.40/$m^3$), still low by international standards, and lower than tariffs even in countries much poorer than India.

To support the transition toward full cost recovery, a transparent mechanism should be used to assist service providers willing to improve their financial situation. Support complementing revenues of these providers could be provided as part of "Output Based Financing" (OBF) schemes, with payments linked to performance. Service providers submitting financing applications would need to prepare detailed financial forecasts based on realistic assumptions, particularly with regard to reduction of non revenue water (NRW) as part of their PIP.

A similar principle could be applied in the rural sector for piped water schemes whose O&M costs initially exceed what the operators could reasonably be expected to recover from users. For handpump based schemes, still expected to serve an average of 250 million people during the coming decade, one possible route toward full recovery of O&M costs from users is to shift responsibility for the maintenance function from state agencies to local private artisans. Replacing handpumps that are out of order with pumps that can be operated and maintained at the village level could aid this devolution of responsibility.

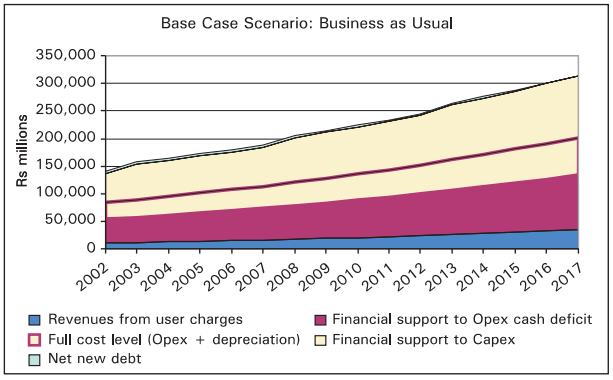
Create Financial Incentives to Reduce O&M, Capital, and Financing Costs. Increasing tariffs is not the only way to improve cost recovery. Most urban WSS operations could achieve significant efficiency gains by reducing O&M, capital, and financing costs and increasing sales. Besides reducing NRW, PIP should focus on increasing energy efficiency and reducing staffing ratios: energy and staff costs account for a significant share of O&M costs. Because private companies respond much better to financial incentives than public agencies do, properly designed contracts with private operators could greatly help in reducing O&M costs. To help reduce capital expenditures, design criteria should be revisited, to ensure that the dimensioning of new assets correspond to the least-

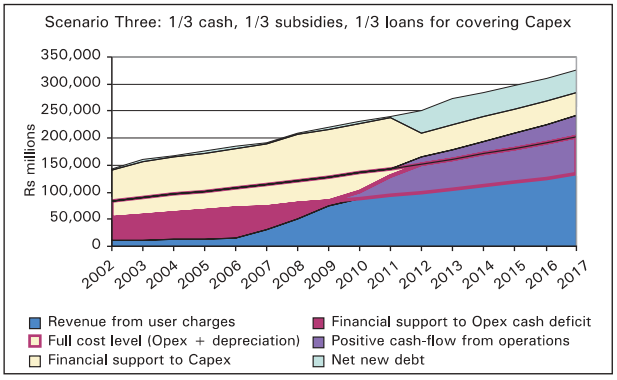
cost solution. In addition, the quality of construction should be improved to help extend the useful life of WSS assets. To help lower financing costs, most PIP would need to consider the possibility of transforming part of the current debt attached to (mostly bankrupt) WSS operations into State equity. And of course future borrowing should be considered only when revenues from user charges are sufficient to service the debt.

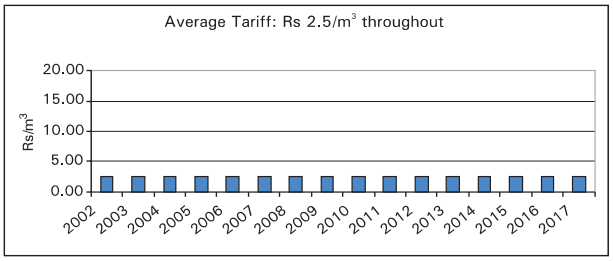
In the rural sector the key to better use of scarce public funds appears to be ensuring that true demand-driven approaches are implemented and that communities make informed choices on the basis of their financial contribution. Rural projects should be independently appraised by the financing agencies to ensure that they correspond to the least-cost solution and that proper arrangements for O&M have been designed. In particular, the justification for more expensive multi-village schemes, whose choice is sometimes driven purely by engineering concerns, needs to be assessed by independent technical auditors.

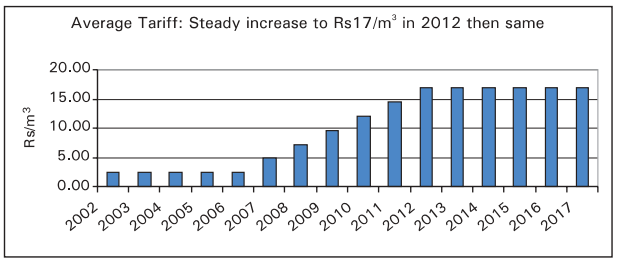
Expand the Role of Programs Sponsored by GoI to Support Reform. Programs sponsored by the GoI for urban WSS have been limited and have tended to allocate financial support on the basis of the gap between existing infrastructure capacity and future demand assessed according to BIS norms. Despite clear guidelines to the contrary, the release of funds has not always been linked to the performance of the service providers. Establishing reliable and sustainable service will depend on linking the provision of financial support to the successful implementation of the PIP. The National Urban Renewal Mission (NURM) is designed to provide grants to reforming States and local governments, indeed aims at addressing many of the shortcomings listed above. To qualify for grants, local governments would have to implement basic reforms such as double entry accounting, improved

Figure 6 : Two Cost Recovery Strategies for Urban WSS. Implications for Tariff Support



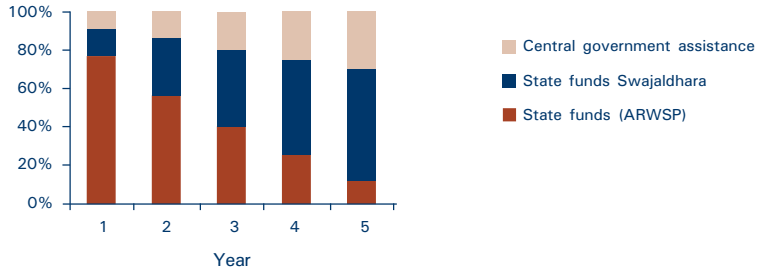






Opex : Operation and maintenance expenditures
Capex : Capital expenditures
Rs/m³ : Rupees per cubic meter

Figure 7 : Changing Allocation of Reform-linked Incentive Funds for Rural Water Supply and Sanitation



ARWSP: Accelerated Rural Water Supply Program

cost recovery, increased efficiency, pro-poor WSS tariff structure, "professionalize" service providers and seek public private partnerships. Urban WSS, unlike most other municipal functions, is a commercial activity; many countries that have developed a well-performing urban WSS sector have done so by supporting a specific WSS program. The GoI could consider a special financing window under NURM to provide grants to qualifying WSS service providers as part of a national "Urban WSS Recovery Program".

In the rural sector, Swajaldhara is a "reform-based fund," and its share of financing should increase significantly as the traditional supply-driven ("gap based") funds of the Accelerated Rural Water Supply Program (ARWSP) are phased out (Figure 7). To provide further support for reform, special financial incentives could be provided to States for taking up Swajaldhara schemes and scaling up reforms.

Use other Sources of Financing to Complement the Support for Reform. The discontinuation by the GoI of equity investment in HUDCO shares and the reduction by many States of guarantee ceilings on HUDCO loans can only be beneficial, as these changes will compel the main provider of debt to the urban WSS sector to enforce stricter appraisal procedures and to scrutinize more closely the PIP submitted by service providers with their financing applications. Financing from international financial institutions for the urban sector, which has been minimal recently, should be used primarily as a catalyst for policy, institutional, pricing, and incentive reforms. Capital markets should be tapped by the few creditworthy WSS operations, mostly in mega-cities and large cities. Bonds should be secured by revenues generated from user charges rather than general municipal revenues (such as tax and octrois), which are not linked to the investment for which the bonds are issued.

Improve the Environmental Sustainability of Service

The environmental sustainability of the WSS service could be improved by applying a few key principles in both the urban and the rural sectors:

- Price water according to sound economic principles;
- Strengthen water rights and develop water markets;
- Limit depletion of groundwater;
- Protect water quality;
- Plan infrastructure to achieve realistic environmental objectives; and
- Support behavioral change toward better sanitation practices.

Price Water According to Sound Economic Principles. Protecting a scarce resource increasingly subject to competing demands requires giving consumers the right signals about its actual cost. For urban WSS, this usually means using long-run marginal cost (LRMC) pricing. Estimates of LRMC should include the cost of addressing environmental externalities, such as the

proper collection and disposal of wastewater. But they should exclude operational inefficiencies, such as high levels of NRW and O&M costs, and capital inefficiencies, such as investments in wastewater infrastructure that are not subjected to the least-cost test. These inefficiencies should not be passed on to consumers.

Seeking the least cost option is essential for achieving economic and environmental sustainability of WSS systems. But in India this type of analysis is seldom done when planning systems, even in mega-cities. Figure 8 illustrates this problem using the example of Chennai, a city of six millions people that had suffered from recurrent droughts lately.

Strengthen Water Rights and Develop Water Markets. Many urban WSS systems rely on surface water sources that affect several States, but lack of clear rules for allocating such water sources among States have led to growing conflicts; cities are the first to suffer. Many States pay more attention to laying claims to future water rights than to using present allocations efficiently: this applies in particular to "surplus" States that may doubt that they will be properly compensated by States "taking" their water.

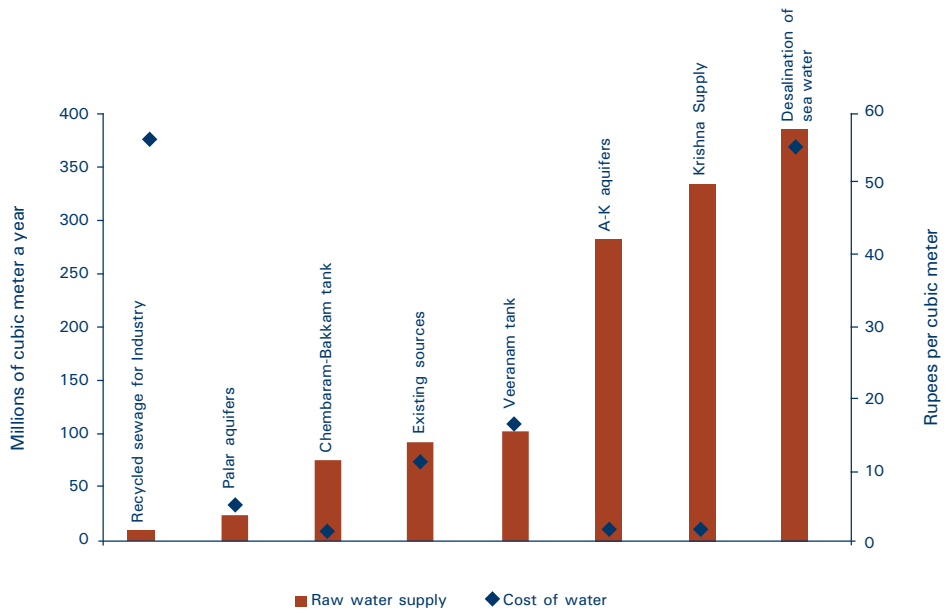
These conflicts about water rights are mirrored by similar conflicts among user groups within States. Sensible trades offer the potential for enormous gains, but most States have yet to develop mechanisms for making informed decisions about proper allocation of water sources. Drinking water is in theory given first priority, but farmers, often believing that they will not be properly compensated, are usually reluctant to give up their rights.

Developing markets for water rights is probably the only option that would enable most cities and towns to establish environmentally sustainable WSS service. Coping strategies, such has heavy reliance on local aquifers, obviously have physical limits as well as high financial, economic, and environmental costs.

Limit Depletion of Groundwater. In urban areas depletion and contamination of aquifers has become the norm. Because groundwater abstraction is chiefly a mechanism to cope with deficient public piped water service, however, improving the performance of WSS utilities could help rejuvenate urban aquifers.

In rural areas, highly subsidized power rates for farmers have encouraged the proliferation of motorized

Figure 8 : Potential Sources of Water for Chennai



Source: Briscoe 1996.

pumps, leading to over-exploitation of aquifers for irrigation and sometimes to their depletion. Where aquifers are over-exploited wells and boreholes for drinking water have to be deepened and sometimes abandoned and to be replaced by more expensive piped schemes relying on surface water. Most States are addressing the depletion issue by taking up groundwater recharge initiatives, but these programs may not increase the supply of drinking water unless groundwater management activities are simultaneously undertaken for overexploited aquifers. Also critical is to implement a more transparent and targeted power subsidy mechanism for agriculture in compliance with the recently passed Electricity Act, which mandates the metering of electricity supplied to farmers within two years. In addition, assessments of the availability of groundwater by the water resources departments should be shared with PRI so that they can ensure that local agricultural practices are adapted to sustainable water use. A few States have enacted groundwater acts, but enforcement has been problematic and independent regulators need to be established to help resolve disputes.

Protect Water Quality. Water quality has deteriorated in many receiving bodies as a result of uncontrolled discharges of raw domestic or industrial wastewater as well as agricultural runoff. In urban areas, the solution too often has been to build more wastewater treatment infrastructure rather than to improve the collection of wastewater. In many cities, only a fraction of the wastewater generated and discharged into sewers actually reaches the treatment facilities, because sewers are silted up as a result of poor maintenance and because the operation of pumping stations is hampered by unreliable power supply. Thus the solution of building more treatment capacity has seldom been successful. River basin agencies, the proper mechanism for addressing comprehensive improvement of water quality, have been created on paper but do not yet exist in reality.

In rural areas, despite the launching of a Water Quality Monitoring and Surveillance Program, State-level agencies rarely have a well-defined mandate, or sufficient budget and qualified staff, for routine monitoring of water quality. As a result, WSS departments must rely on sporadic information collected by health departments. To ensure safe water in communities, States need to institutionalize an effective program for monitoring water quality, perhaps by outsourcing this function to private laboratories.

Plan Infrastructure to Achieve Realistic Environmental Objectives. Despite substantial investments in wastewater collection, treatment, and disposal throughout India, the environmental condition of water bodies in and near urban areas remains very poor. The reasons commonly cited include explosive urban growth and financial constraints that limit both new investment in wastewater infrastructure and adequate operation and maintenance of existing systems. Yet there is growing recognition that the primary reason is a chronic lack of strategic sanitation planning. Investments are typically made in an ad-hoc way and often at high cost to meet effluent standards. Little attention is paid to ensuring cost-effectiveness in achieving environmental objectives, which tend to be vague and unrealistic, nor to comparing the cost of improving pollution control infrastructure with the expected environmental benefits.

To address these planning weaknesses, objective methods should be developed for analyzing wastewater schemes and comparing the benefits of different options at the catchment or river basin level. To aid decision makers, possible schemes should be ranked on the basis of their environmental benefits relative to their financial costs.

Another environmental issue often overlooked in sector planning is the disposal of sludge. Strategic sludge management plans, considering both utilization and disposal of sludge, should be developed as part of any water supply and sanitation scheme.

Support Behavioral Change Toward Better Sanitation Practices. To improve sanitation coverage and practices in rural areas, the Total Sanitation Campaign (TSC) promotes sanitation facilities and works to eradicate open defecation. The TSC has just started, however, and effective implementation and scaling up will be required to realize its full potential. The campaign focuses on the provision of low-cost sanitation options (household latrines, community sanitary complexes, Anganwadi toilets) and the use of information, education, and communication materials to trigger behavioral change. It also provides rural sanitary marts and production centers of latrine slabs, to be operated on a commercial basis by NGOs or PRI. In another effort, the GoI has launched the Nirmal Gram Puruskar

(Incentive Cash Reward) to recognize efforts by individuals and PRI and other institutions that have contributed significantly to full sanitation coverage.

Improve the Affordability of Service

A few common principles, applied to both the urban and the rural WSS sector, could improve the affordability of service, allowing consumers to abandon costly and unsafe substitutes:

- Reduce costs by adapting design criteria and technology;
- Reduce costs by adapting operation and maintenance arrangements; and
- Implement a cost recovery strategy adapted to the poor.

Going back to Figure 5, key elements of the accountability framework to achieve affordability in the urban WSS sector include the pricing and subsidy policy to be defined by the policy maker, its enforcement by the independent regulator, the operation contract between the owner of the WSS assets and the provider of the WSS service aimed at improving efficiency and reducing O&M costs, and the feedback mechanism between the customers and the regulator.

Reduce Costs by Adapting Design Criteria and Technology. In the urban sector, design criteria for water production and distribution systems as well as wastewater collection and disposal facilities should be revisited. Least-cost options for all assets, but particularly for wastewater treatment facilities, need to be identified by comparing discounted values of investment and operation and maintenance costs. There is a clear need to develop a systematic metering program to monitor water production and consumption, and to assess the elasticity of demand to pricing, since highly subsidized user charges encourage high consumption and waste. There is also a need to assess the costs of intermittent water supply: (i) the technical cost, particularly when water production is sufficient: distributing 250 lpcd in four hours clearly requires larger pipes, pumping equipment and storage capacity than distributing the same amount in 24 hours; (ii) the direct coping costs for customers; and (iii) the indirect costs, such at those related to the depletion of aquifers and public health. This assessment should support a more aggressive move toward internationally accepted water distribution standards; piped water can be safely distributed only if provided 24 hours a day, seven days a week.

In the rural sector an independent exercise could investigate technology and O&M options for handpump-based schemes, again by thoroughly comparing investment and O&M costs. Multi-village schemes should be implemented only when independent technical audits have proved that more affordable single-village schemes are not possible.

Reduce Costs by Adapting O&M Arrangements. Fighting inefficiencies built into systems by perverse incentives is essential to achieve sustainability. In urban WSS, this calls for preparing programs to reduce NRW, increase energy efficiency, and adjust staffing as part of PIP, and supporting these programs through OBF schemes to be provided by the States. For most service providers, a key element of financial recovery is likely to be improving metering, billing, and collection and regularizing illegal connections, all activities in which the private sector could be helpful. All this should be facilitated by consolidating the role of "promoter of infrastructure" with that of "provider of service" and decentralizing these responsibilities to the lowest appropriate level of government.

Similarly in rural WSS, adopting demand-driven approaches and transferring O&M responsibilities to PRI and village water committees should result in significant savings. This is particularly true for large multi-village schemes, which should be designed and managed more as "simplified urban water supply schemes" than as "upgraded rural water supply schemes."

Implement a Cost Recovery Strategy Adapted to the Poor. The poor suffer most from current pricing practices that are portrayed as specifically aimed at benefiting them. In urban WSS these pricing practices involve implicit and untargeted subsidies that not only are inefficient but also benefit mostly better-off customers able and willing to pay for service. Moreover, the subsidized prices seldom support improvement in sector performance.

Tariffs should be designed to ensure that the poor have access to a minimum amount of service through connection to a piped water supply. Because of health externalities, subsidizing minimum consumption of water through targeted subsidies may be economically efficient[9]. The tariff for low-income customers should be based on a detailed assessment of willingness to pay, and the lifeline tariff should be set at a level comparable to O&M costs to avoid creating a financial disincentive to providing service. Since a direct connection to piped water is strongly correlated with household income, reducing the initial connection fee is an efficient way to promote consumption of piped water.

"Good" subsidies are transparent, targeted, linked to performance, and time limited, objectives easier to achieve through output- rather than input-based financing. Since the issue at stake in India is provision of service rather than of infrastructure, linking OBF to water actually delivered to poor customers is likely to be more productive than linking it to, say, the number of connections made available to them. OBF is even more efficient if subject to competition and associated with bidding for contracts by private operators.

Build the Capacity of the WSS Sector

The WSS sector faces formidable challenges, as outlined above. To build the sector's capacity to address those challenges, the following actions are recommended:

- Build an identity for the urban WSS "industry";
- Adapt training programs to the new needs of the urban WSS sector;
- Develop special information programs for key stakeholders; and
- Build the capacity of PRI.

Build an Identity for the "Urban WSS Industry". This report argues that the provision of reliable, sustainable, and affordable urban WSS service can be achieved only by creating autonomous, ring-fenced service providers at the most appropriate level of government. The urban WSS "industry" needs not only adequate policies but also well-trained human resources. The recruitment freeze in effect since the mid-1990s has prevented the injection of new skills to add to those (mostly engineering) typically available in Indian WSS service providers. Even if the sector were able to recruit, it would have to compete with other sectors to attract good professionals with the skills now missing, such as in accounting, customer relations, commercial management, and information technology. PSP may well be the only option now available to address this issue.

A professional association of service providers could work to help improve the image of the urban WSS industry so as to help attract skilled professionals. The association could also do important work by disseminating best practices in O&M , initiating full-scale performance benchmarking, and organizing training and certification of utility managers and key professionals. The Indian Water Works Association could play a role in the creation of such an association.

Adapt Training Programs to the New Needs of the Urban WSS Sector. The training programs now provided by specialized institutions need major revision and updating, to broaden their content and their target audiences. In addition, as service providers progressively engage in reform, the training rate must be greatly accelerated to meet demand. With the global WSS community possessing a great deal of learning and capacity building material, one way to update curricula and scale up delivery would be to establish partnerships with training institutions in other countries. As India's training institutions expand their programs, their capacity to assess stakeholder needs and provide the full range of capacity building services required will need to be evaluated and strengthened. Courses should be developed on general industry topics, such as regulation, institutional options, PSP , and monitoring and evaluation, as well as more utility-specific ones, such as marketing, benchmarking, creditworthiness, water audit, tariff structures, asset management, and NRW reduction. Capacity building programs should also be developed for large WSS boards that may face the challenge of securing bulk water in such areas as public awareness of water scarcity, interstate water transfer and negotiations, and water trading and swaps with other sectors.

[9] Say, up to 6 cubic meters a month, corresponding to about 40 liters per capita a day for a household of five.

Develop Special Information Programs for Key Stakeholders. Also essential is to build the capacity of all stakeholders to understand and support the proposed sector reforms. Attention should be focused on such key stakeholders as the media, consumer associations, local and state-level politicians, NGO advocating improved service for the poor, and NGOs opposed to any form of private sector participation. Messages and delivery mechanisms would need to be tailored to each audience. In addition, training institutions should design targeted programs that include training of trainers, to expand the reach of information programs to such stakeholders as consumers, consulting firms, and the community of water supply and sanitation professionals. Special attention also should be paid to small-scale local private service providers, which could play a key role in the delivery of services in small towns.

Build the Capacity of PRI. State governments need to organize special training programs to build the capacity of PRI to plan, implement, and operate rural schemes. The training programs should cover simple water quality testing, promotion of sanitation and hygiene, monitoring and evaluation of schemes, and financial, accounting, and disbursement systems.

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The World Bank
70, Lodi Estate
New Delhi - 110003
Tel: (91-11) 2461-7241
Fax: (91-11) 2461-9393
Website: http://www.worldbank.org

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