

# URBAN WATER AND SANITATION IN INDIA

Multi-stakeholder Dialogues for Systemic Solutions

Rudresh Sugam and Arunabha Ghosh

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INDIA

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The views expressed in this report are those of the authors and do not necessarily reflect the views and policies of the Council on Energy, Environment and Water.

The Council on Energy, Environment and Water (CEEW) is an independent, not-for-profit, policy research institution. CEEW works to promote dialogue and common understanding on energy, environment and water issues in India, its region and the wider world, through high quality research, partnerships with public and private institutions, engagement with and outreach to the wider public. For more information, visit [www.ceew.in](http://www.ceew.in).

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# Foreword

Contemporary India faces a pressing developmental challenge, namely providing safe, affordable and efficient drinking water and sanitation services to a burgeoning urban population, the size of which is largely underestimated even by the official records of the census of India. Inadequate water supply and sanitation services impose a disproportionate financial and public health burden on the poor. It also results in unregulated and unsustainable groundwater pumping. Poor quality infrastructure, insufficient maintenance and non-standardised accounting practices undermine the effectiveness of water utilities and lead to unacceptably high levels of water loss. The urban water and sanitation services sector needs systemic responses to address these interconnected problems, which have huge ramifications for other development imperatives for India as well.

The analysis and recommendations in this report are the result of an approach which harnesses the collective wisdom of a diverse group of actors. Between December 2012 and July 2013, the Council on Energy, Environment and Water (CEEW) went beyond the usual “public versus private” discourse and convened five roundtable discussions to deliberate on the challenges facing the urban water and sanitation sector. Participants included water utility managers from different parts of the country, government representatives, private water companies, financing institutions, credit rating institutions, civil society organisations, think-tanks, senior academics, architects, planners, lawyers and government officials. I was a participant in one of these roundtables and I have followed their progress even when I could not attend personally.

The dialogues, undertaken with a spirit of continuity, focused on five themes: challenges in water utility management, roles of the private sector and civil society, role of water regulators, improving water data and metrics, and prospects for capacity building. The dialogues avoided having parallel discourses on PPP contracts, regulation and water utilities, on the one hand, and the demands for access to water for all and equitable pricing strategies, on the other. Instead, the deliberations focussed on innovations across the entire chain of consumers of urban water and sanitation services, from large establishments (public buildings, commercial places) to affluent households to lower income localities and shanty areas. And the discussions covered not only what the public sector could do or private companies wish, but also the role of civil society and communities in the delivery of services, in making regulation more effective, in collecting data and in building capacity at a local level.

This report summarises the overall diagnoses of the challenges in each of the five thematic areas as discussed by the participants and outlines broad recommendations. Each of the five key challenges have been analysed in detail through research issue briefs circulated by CEEW before each meeting as well as in the proceedings of the meetings. In addition, this report also includes short essays contributed by several participants in the dialogue. These personal reflections, together with the research briefs, proceedings and recommendations, offer diverse perspectives and yet suggest ways forward. That these perspectives and recommendations emerged from a mix of stakeholders is very reassuring, suggesting that it is possible to find common ground among those who are normally (and wrongly) perceived to be at odds with each other’s approaches. Even on issues where a consensus is yet to emerge, these deliberations help to widen an understanding of the challenges and should stimulate a healthy debate.

There are a lot of procedural, policy and technological innovations underway in India's urban services, not least in water and sanitation. My own writings have sought to capture these cases. Some are referred to here as well. But they neither always get due attention, nor do we learn from cases across the country and try to apply the lessons in other regions. I congratulate the researchers for preparing this report which, I am sure, will serve as an important reference document for different stakeholders in their endeavour towards providing an adequate and safe drinking water and proper sanitation facility for the urban population in India.

Urban water and sanitation lie at the core of healthy, vibrant and resilient cities. We need more such initiatives to convene, on a neutral platform, the different parties interested in solving problems rather than simply finding fault with others. The network of concerned stakeholders that has emerged as a result of these dialogues should continue its engagements, include even more stakeholders and, in turn, must spur implementation of ideas and innovations.

**Dr Isher Judge Ahluwalia**

*Board Chairperson, ICRIER ( Indian Council for Research on International Economic Relations);*

*Honorary Leader, Research and Capacity Building Project on Urbanisation, ICRIER; and*

*Chair of High Powered Expert Committee (HPEC) of the Government of India, which submitted as its report to the Ministry of Urban Development in March 2011*



# About CEEW

The Council on Energy, Environment and Water ([www.ceew.in](http://www.ceew.in)) is an independent, not-for-profit policy research institution. CEEW addresses pressing global challenges through an integrated and internationally focused approach. It does so through high quality research, partnerships with public and private institutions, and engagement with and outreach to the wider public. In June 2013, the International Centre for Climate Governance **ranked CEEW 15th globally** in its first ranking of climate-related think-tanks and **number 1 in India**.

**In its first three years of operations**, CEEW engaged in 40 research projects, published 18 peer-reviewed policy reports and papers, was invited to advise governments around the world 44 times, engaged with industry dozens of times to encourage investments in clean technologies and improve efficiency in the use of resources, promoted bilateral and multilateral initiatives between governments on 16 occasions, helped state governments with water and irrigation reforms, and organised more than 40 seminars and conferences.

**Among its major completed projects**, CEEW has: published the 584-page National Water Resources Framework Study for India's 12th Five Year Plan; written India's first report on global governance, submitted to the National Security Adviser; undertaken the first independent assessment of India's 22 gigawatt solar mission; developed an innovation ecosystem framework for India; facilitated the \$125 million India-U.S. Joint Clean Energy R&D Center; worked on geoengineering governance (with UK's Royal Society and the IPCC); created the Maharashtra-Guangdong partnership on sustainability; published research on energy-trade-climate linkages (including on governing clean energy subsidies for Rio+20); produced comprehensive reports and briefed negotiators on climate finance; designed financial instruments for energy access for the World Bank; supported Bihar (one of India's poorest states) with minor irrigation reform and for water-climate adaptation frameworks; published a business case for phasing down HFCs in Indian industry; and evaluated storage technologies for off-grid energy services.

Among other initiatives, CEEW's **current projects include**: developing a countrywide network of hundreds of firms and stakeholders for energy access (an idea endorsed by Prime Minister Singh and President Obama in September 2013); modelling India's long-term energy scenarios; supporting the Ministry of Water Resources with India's National Water Mission; advising India's national security establishment on the food-energy-water-climate nexus; developing a framework for strategic industries and technologies for India; developing the business case for greater energy efficiency and emissions reductions in the cement industry; in addition to this project on a multi-stakeholder initiative to target challenges of urban water management.

CEEW's **work covers all levels of governance**: at the global/regional level, these include sustainability finance, energy-trade-climate linkages, technology horizons, and bilateral collaborations with China, Israel, Pakistan, and the United States; at the national level, it covers resource efficiency and security, water resources, and renewable energy; and at the state/local level, CEEW develops integrated energy, environment and water plans, and facilitates industry action to reduce emissions or increase R&D investments in clean technologies.





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Rudresh Kumar Sugam is a Programme Officer at the Council of Energy, Environment and Water (CEEW), India. He has recently conducted evidence-based research for the Minor Water Resources Department, Government of Bihar exploring institutional reforms that are required in minor irrigation to achieve agricultural growth targets set by the State. His four year experience in the water sector includes advising the Cola Cola Company on ways to adopt efficient measures for water resource management in their bottling plants under the Source Vulnerability Assessment and Source Water Protection Plan (SVA&SWPP) project. His interest areas include water use efficiency, water resources optimisation, impact of climate change on water resources, Integrated Watershed Management, and sustainable development.

His educational qualifications include a Post Graduate degree in Water Resources Management from The Energy and Resources Institute (TERI) University, Delhi and a B.Sc. in Botany from Kirori Mal College, University of Delhi. His post-graduate dissertation was on storm water pond efficiency with the Yale School of Forestry and Environment Studies, Yale University, United States.

## Arunabha Ghosh

Arunabha Ghosh is CEO of the Council on Energy, Environment and Water (CEEW), an independent, policy research institution in India. In less than three years, Arunabha has conceptualised and led CEEW (<http://ceew.in>) to the number 1 ranking among climate and energy-related think-tanks in India and 15th globally. With experience in more than thirty countries, Arunabha has devoted his career to public policy. His work intersects international relations, global governance and human development, including climate, energy, water, trade and conflict. He advises governments, industry and civil society around the world on: energy and resources security; renewable energy policy; water governance and institutions; climate governance (financing, R&D, geoengineering); energy-trade-climate linkages; and international regime design. In March 2013, the World Economic Forum selected him as a Young Global Leader. Arunabha's latest initiative is to create a countrywide network of off-grid renewable energy companies to lower their operational costs, and thereby increase the scale of rural energy services.

Dr Ghosh is part of Track II dialogues on energy, water and climate change with the United States, Israel and Pakistan. He formulated the Maharashtra-Guangdong Partnership on Sustainability. Dr Ghosh is also associated with Oxford's Global Economic Governance Programme and its Smith School of Enterprise and the Environment. Previously Global Leaders Fellow at Princeton's Woodrow Wilson School and at Oxford's Department of Politics and International Relations, he was also Policy Specialist at the United Nations Development Programme (New York) and worked at the World Trade Organization (Geneva). He sits on the Governing Board of the International Centre for Trade and Sustainable Development, Geneva.

His publications include: *Understanding Complexity, Anticipating Change* (India's first ever report on global governance, submitted to the National Security Adviser); *National Water Resources Framework Study* (for India's Planning Commission); *India's Resource Nexus* (for the National Security Advisory Board); *Governing Clean Energy Subsidies* (for Rio+20); *Laying the Foundation of a Bright Future* (on India's national solar mission); *Institutional Reforms for Improved Service Delivery in Bihar* (on irrigation reform); *Harnessing the Power Shift* (on climate finance); *International Cooperation and the Governance of Geoengineering* (for the Intergovernmental Panel on Climate Change); and three UNDP Human Development Reports. He has led research on trade, intellectual property, financial crises, development assistance, indigenous people, extremism and conflict.

Dr Ghosh has presented to heads of state, India's Parliament, the European Parliament, Brazil's Senate, the Andhra Pradesh Legislative Assembly and other legislatures; trained ministers in Central Asia; and hosted a documentary on water set out of Africa, *Diary of Jay-Z: Water for Life*, honoured at the Webby Awards. His op-eds have appeared in the *Business Standard*, *Financial Express*, *India Today*, *Indian Express*, *Mint*, *Seminar*, *Tehelka*, and *The Hindu*. He has delivered public lectures in several countries, and commented on All India Radio, ABC (Australia), BBC, NDTV (India) and Voice of America, among other channels.

Arunabha has been consulted by the Asian Development Bank, DFID (UK), IDRC (Canada), International Energy Agency, International Finance Corporation, IPCC, Commonwealth Secretariat (London), Oxfam International, Transparency International, UK Ministry of Justice, USAID, and the World Bank. He co-chaired the international governance working group for the UK Royal Society's Solar Radiation Management Governance Initiative. He has been an Editor of the *Journal of Human Development and Capabilities*. In 2011, the Asia Society named him an Asia 21 Young Leader. He is also an Aspen India Leadership Initiative fellow.

Arunabha holds a doctorate and M.Phil. in international relations from Oxford (Clarendon Scholar and Marvin Bower Scholar); an M.A. (First Class) in Philosophy, Politics and Economics (Balliol College, Oxford; Radhakrishnan Scholar); and topped Economics from St. Stephen's College, Delhi University. He lives in Gurgaon, India, and speaks English, Hindi, Bengali and basic Spanish.



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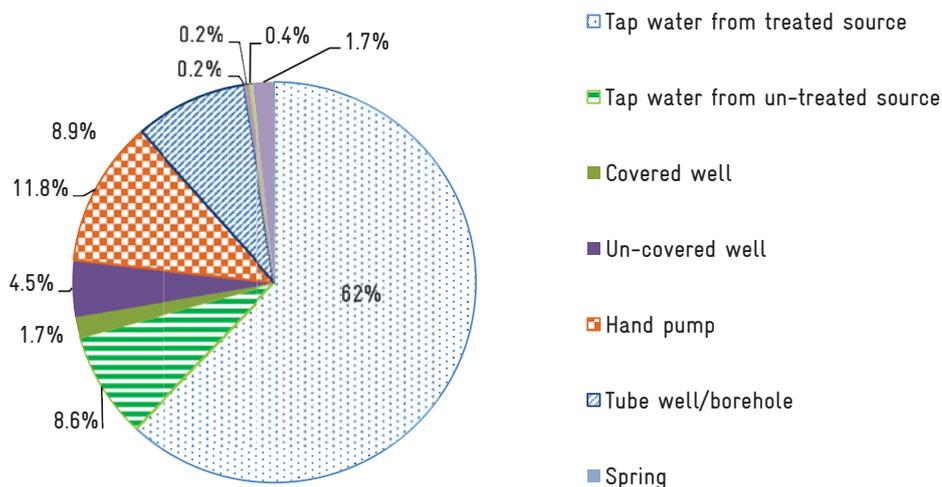
# The quest for water for all

Water is used by all sectors, agriculture, industry, commercial services and in the residential sector. Although these sectors compete with each other, access to water intended for personal and domestic use is a human right. Every human being has the right to water, which is sufficient, safe, acceptable, physically accessible and affordable.<sup>1</sup>

Honouring the human right to water in India's cities is going to be a growing challenge thanks to rapid urbanisation as well as citizens' impatience with the quality of one of the

among urban residents, the Ministry of Urban Development assesses that only 72% have water within their premises.<sup>3</sup> Of course, having a water source within or near one's home is no guarantee of good quality or even adequate water (**figure 1**). Only 32% of India's population receives treated water.<sup>4</sup> The status of sanitation is worse: 18.6% of urban households do not have access to any form of sanitation facilities at home (**figure 2**).<sup>5</sup>

**Figure 1: Main sources of drinking water in urban areas**



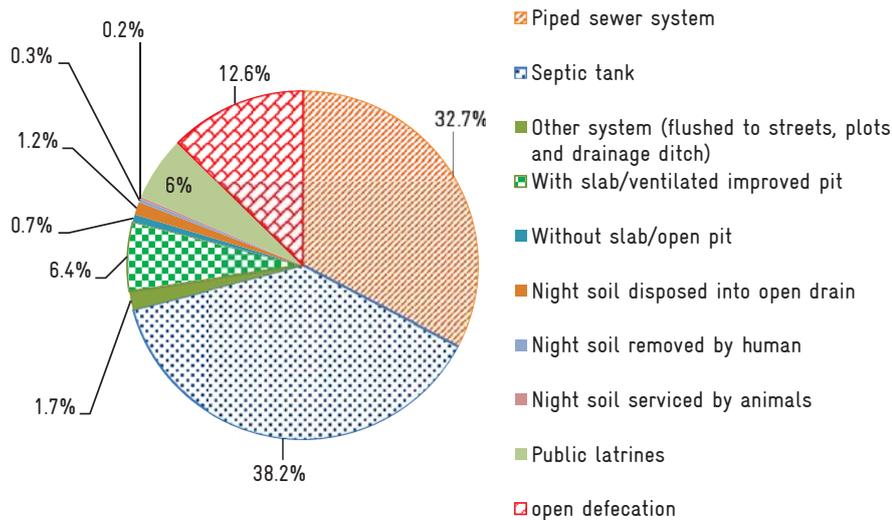
Source: CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

most basic services. Only 43.5% of the households in India use tap water as the major source of drinking water.<sup>2</sup> Even

<sup>3</sup> CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012  
<sup>4</sup> <http://www.censusindia.gov.in/2011census/hlo/Data%20sheet/Drinking%20Water.pdf>  
<sup>5</sup> <http://www.censusindia.gov.in/2011census/hlo/Data%20sheet/Latrine.pdf>

<sup>1</sup> United Nations Committee on Economic, Social and Cultural Rights  
<sup>2</sup> <http://www.censusindia.gov.in/2011census/hlo/Data%20sheet/Drinking%20Water.pdf>

Figure 2: Availability of latrine facility in urban households



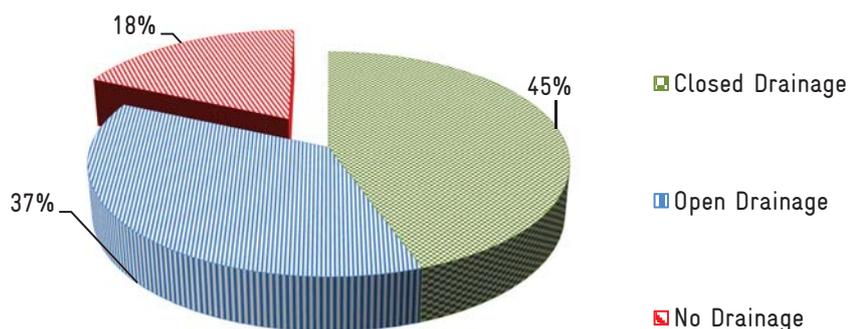
Source: CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

Moreover, the pressures of urbanisation continue to increase. India's urban population, already estimated to be 377 million (31% of the total population),<sup>6</sup> is expected to rise to 600 million by 2031.<sup>7</sup> The urban population grew by 31.8% in the last decade, compared with the national average of 17.64% and rural growth of 12.18%.<sup>8</sup> Further, India has 7935 towns (including 3894 census towns, which are often not counted in measurements of urban services). Many peri-urban areas are emerging out of once rural areas, creating pressures on

governance systems and public services. Moreover, about a quarter of the urban population lives in slums, people who are often not counted or under-counted in estimating the reach of basic services such as housing, water, sanitation and sewerage (see figure 3 for sewerage in urban households). In other words, it is likely that our current estimates overstate the extent of water supply and sanitation coverage.

Inadequate water supply and sanitation services in cities lead

Figure 3: Majority of urban household have no wastewater outlets to closed drainage systems



Source: CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

6 [http://www.censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/Rural-UrbanDataSheets\\_paper2.pdf](http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural-UrbanDataSheets_paper2.pdf)

7 NIUA (2011), *India's urban demographic transition*, JNNURM Directorate, Ministry of Urban Development and National Institute of Urban Affairs (NIUA) New Delhi, December 2011; Available at <http://indiagovernance.gov.in/files/urbandemographictransition.pdf> accessed on 11 November 2013

8 [http://www.censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/Rural-UrbanDataSheets\\_paper2.pdf](http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural-UrbanDataSheets_paper2.pdf)

to overcharging and exploitation of the poor. The urban poor end up paying more than the rich per unit of water because of (a) their inability in getting supply connections, (b) labour and time required to collect water from distant places, and (c) because water is sold at higher rates by private/informal vendors.

The pressure on resources available in urban areas is, therefore, increasing tremendously. The infrastructure and maintenance of the pipelines is also very poor. The average value for non-revenue water i.e. water loss due to leakage, theft, illegal connections and improper/incorrect metering was found to be 39% in a pilot study conducted in 28 cities of India in 2008-09.<sup>9</sup>As a result, the supply gaps are being increasingly met through unregulated and unsustainable groundwater pumping. Unaccounted water loss and wastage are adding to already stressed resources. Measurement devices need to be installed and regular auditing is required to control the mismanagement of resources. A strong database and information system for water resources management is critical for India. Skill and technology gaps also have to be identified and worked upon. In short, a systemic response is needed on multiple fronts: institutional arrangements for urban local bodies, financing options along with pricing and

cost recovery, and tackling data and capacity limitations (see **Essay 1**).

As one participant proposes, there is a need for “water-oriented development”, emphasising the convergence of blue and green networks: natural drainage, water channels, canals, flood zones and protecting them through green areas. Watershed management, water conservation, aquifer recharge and reduction of non-revenue water are among the key elements of such an approach (see **Essay 2** and **Box 1**). Taking into account the pressure on groundwater resources, the emphasis must shift from supply side approaches to demand side management and efficiency in water use (see **Essay 3**) on how a revised water policy for Delhi could focus on unconventional approaches to increase efficiency and service delivery).

### BOX 1

#### Delhi water supply: Discovering the unexploited opportunities

Water stress is a growing problem in Delhi, particularly due to excessive water consumption and population growth. The Master Plan for Delhi-2021 (MPD-2021), which was notified in 2007, gave a close look to the issue of water supply and discovered that there are numerous unexploited opportunities for saving and augmenting water supply. The MPD 2021 emphasises that it is imperative to not only to initiate new projects and upgrade present infrastructure, but also to promote water conservation through an integrated and a community driven model, comprising of complimentary short term and long term measures, as given below:

- (a) Recycling of treated wastewater with separate lines for potable water and recycled water. For this, dual pipe supply system shall be introduced in a phased manner in all the areas.
- (b) Ground water recharging through rain water harvesting, conserving water bodies and controlling groundwater extraction. Groundwater extraction is to be controlled through registering boreholes and recharging according to test yields.
- (c) To prepare and implement mandatory rain water harvesting schemes with the aim of optimizing water use and ground water recharge. For this suitable mandatory provision be made for planning and construction of various schemes.
- (d) Dovetail watershed management and arrest the run-off to ensure the conservation of natural valleys, water bodies and aquifers. The concept of ‘zero run-off drainage’ with retention ponds, sediments traps and balancing lakes should be adopted, with a segregated wastewater disposal system. A green network overlapping the blue network would protect the ecology of aquifers, and also provide a pleasant environment. Simple methods of site planning, which incorporate porous/semi permeable paving, drop inlet/down pipe, sediment trap, retention ponds, etc. will contribute in maintaining ground water table.
- (e) Pollution control of rivers, major drains and canals, with indiscriminate dumping of wastes, have become polluted and foul. These need strict pollution control measures and eco-sensitive land use controls. Water flow needs to be controlled and stabilized and marked at each kilometer station. The valleys should be zoned as water portals, so that these are flanked with greenery, farmlands and forests. Where the hazard of pollution exists, the minimum charge for operating permits should cover the expenses of adequate policing and controls/ mandatory performance bonds and liability insurance.
- (f) To improve the quality of river-water secure its continuous flow and encourage the return of aquatic life. This needs improvement of drainage, waste water treatment and pollution abatement by sewerage improvement. The surplus water during the monsoons should be retained in balancing ponds along the riverbed rather than allowing it to the downstream areas.
- (g) Landscaping of the drains and waterfront can be taken up in the form of interconnected parkways. There is no need for elaborate gardening of the greenways, but wild, simple and natural stretch by itself would be ecologically important. Such trails could be one of the cheapest forms of drainage and recreation. The drainage basins shall be made self-sustainable in water management by integrating water-sewerage-drainage systems.
- (h) Water supply in new areas should incorporate separate lines – one for washing, W/C flushing, water coolers and garden taps, the second for supplying potable water. All non-residential buildings having a discharge of over 10,000 litres day should incorporate a wastewater recycling.

- (i) Efficient methods of water conservation, use and recycling need to incorporate the mandatory stipulation of water saving appliances and waterless flushing system in the Building Byelaws.
- (j) Controlling leakages and UFW: All measures be taken to reduce unaccounted flow of water (UFW), production losses at existing plants.

About half of the water that is treated and distributed at public expense is non-revenue water. This is due to unrecorded usage or illegal taps and water connections. Reducing water losses is cheaper than augmenting water capacity for such losses.

Source: A.K. Jain

Although a few successful cases of sustainable water resources management exist, their success is localised and more information and experience is needed to scale up the interventions. Meanwhile, private sector participation in the provision of water resources and services is one potential solution to mounting water constraints. But many uncertainties remain, such as the role of the private sector in

investments in water infrastructure, accountability of service delivery, tariffs and inequality of access, opposition to the “privatisation” of resources, and so forth. These uncertainties, either in government policy or public discourse, need to be addressed if an appropriate role of public and private sectors in water utility management can be defined.

# Public or private or service delivery?

The ultimate responsibility for the provision of water for human needs is that of the state. It can make laws, install regulators, establish agencies to execute policy, leverage its financial resources, and enforce rights and responsibilities through the judiciary.

However, the responsibility of the State does not necessarily translate into the State becoming a service provider. Much public debate, for more than a decade in India and longer elsewhere, has been focused on whether public or private utilities deliver better service. For those advocating private service providers, the argument hinged on improved efficiency, accountability, lower costs and better customer experience. For those concerned about private interests dominating the urban water sector, the emphasis on public

utilities rested on the assumption that public agencies were directly accountable to people, and therefore would be forced to ensure access to water for all and keep prices low or close to zero.

Experience, as with many other things, suggests that the answer is a mixed one. As **table 1** shows, even among state agencies, a number of responsibilities overlap across several institutions and levels of governance.

Further, although much of the responsibilities relating to urban water and sanitation lie within state governments and urban local bodies, the institutional structure varies from state to state (see **table 2**).

**Table 1: Overlapping responsibilities for water service provision**

Function	Gol	SG	SPCB	UDA	SSA	PHED	ULB
Policy	√	√					
Planning	√	√			√	√	
Funding	√	√		√	√		
Asset Ownership							√
Resource Regulation		√					
Discharge Regulation			√				
Economic Regulation		√					√
Capital Expansion				√	√	√	
O&M					√	√	√

**Notes:**

Gol: Government of India; SG: State Government; SPCB: State Pollution Control Board; UDA: Urban Development Authority; SSA: State Level Specialist Agency; PHED: Public Health Engineering Department; ULB: Urban Local Body

**Source:** Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) National Water Resources Framework Study, Research Report Submitted to the Planning Commission for the 12th Five Year Plan, September, New Delhi: Council on Energy, Environment and Water and 2030 Water Resources Group, September, p. 435

**Table 2: Institutional structures vary in urban water service provision**

Agency type	Jurisdiction	Responsibilities		Examples
		O&M	Capital Works	
State level Specialist Agency (SSA)	Entire state	SSA	SSA	Kerala
	Large cities	City level agency	SSA	Uttar Pradesh
	Small Cities	Local Government	SSA	Karnataka, Maharashtra, Tamil Nadu
Public Health Engineering Department (PHED)	Entire State	PHED	PHED	Orissa, Rajasthan
Metropolitan Water Board (MWB)	Metropolitan Cities	MWB	MWB	Bangalore, Hyderabad, Chennai, Delhi
Ring Fenced Municipal Department (RMD)	Large cities	RMD	RMD	Mumbai, Pune
Municipal Water Departments (MWD) with ULB Staff	Municipalities	MWD	MWD	Gujarat
Municipal Water Departments (MWD) with PHED Staff	Municipalities	MWD	PHED	Andhra Pradesh, Madhya Pradesh

**Source:** Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) *National Water Resources Framework Study*, Research Report Submitted to the Planning Commission for the 12th Five Year Plan, September, New Delhi: Council on Energy, Environment and Water and 2030 Water Resources Group, September, p. 434

Other municipalities have selectively outsourced water service tasks through management contracts (**table 3**). This could happen either because the utilities do not have adequate capacity in-house or because of the urgency of dealing with specific operational needs have made it difficult to recruit skilled personnel. Although many tasks are already outsourced to private service providers, the multiplicity of contracts is time-intensive and reduces oversight and accountability.

Since the mid-1990s there have been gradual reforms in the urban water sector in India. Some of them have been initiated by urban local bodies, others by the Government of India through programmes such as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT). Until 2003, out of 42 attempts to contract work to private service providers, only two (Tirupur and Alandur) had been awarded. Between 2003 and 2010, another 11 contracts (out of 15 attempts) were awarded in the

**Table 3: Selective outsourcing in water utility management**

Planning	Consultants	Private
Design	Consultants	Private
Detail Engineering	Consultants	Private
Funding	Government/Multilaterals	Public/Private
Procurement	Consultants	Private
Construction	Contractors	Private
Supervision	Consultants	Private
Treatment Plant Operations	Contractors	Private
Annual Maintenance	Contractors	Private
Connections	Licentiate Plumbers	Private
Leak repair	Contractors	Private
Valve Operations	Own Staff	Public
Meter reading	Own Staff	Public
Billing	IT Company	Private
Cash collection	Banks	Private
Contract Payments	Own Staff	Public

**Source:** Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) *National Water Resources Framework Study*, Research Report Submitted to the Planning Commission for the 12th Five Year Plan, September, New Delhi: Council on Energy, Environment and Water and 2030 Water Resources Group, September, p. 439

country. The geographical concentration of the projects has also spread, starting initially in the southern states (Andhra Pradesh, Karnataka and Tamil Nadu) but gradually covering the northern and western states as well.

Just as public ownership of water utilities has been plagued with inefficiency, lack of accountability and persisting inequities in access to water, awarding of contracts to private companies is not in itself a guarantee that the challenges of urban water and sanitation will be overcome. Given the status of water and sanitation infrastructure in the country, large capital investments will be needed either to repair or upgrade water systems or install new systems where none exist. Much of these investments will have to be paid upfront, whereas the benefits and revenues would accrue over several decades. Therefore, innovative financing models have to be developed and both public and private sectors have to complement each other to design the lowest cost investment strategies.

The focus has to be on households, especially poor households, which pay more for less water in India's cities. The debate on public versus private sector is an important one only when measured against a far more important objective: access to water for all. Viewed from the perspective of individuals or households, the ultimate units for measuring human development progress, the more important questions relate to the challenges that water utilities face, the specific roles of the public as well as the private sectors, the role of civil society, the functions of water regulators and watchdogs, the limitations of data, and the constraints of capacity. Unless these questions are discussed in more detail and solutions found for them, neither public agencies nor private companies alone would be able to fill the gaps and meet the demands for safe, accessible, acceptable, affordable and adequate water for all. What is needed is concerted effort by public and private parties, with specific responsibilities at the central government, state government and urban local body levels of governance (see **Essay 4**).



# Creating a multi-stakeholder dialogue

The Council on Energy, Environment and Water organised a series of roundtables on urban water management during December 2012 to July 2013. There were four motivations behind convening these dialogues. The first was to offer a forum for participants from different backgrounds to discuss the challenges facing the urban water and sanitation sector. Participants at the roundtables included water utility managers from different parts of the country, private water companies, financing institutions, credit rating institutions, civil society organisations, think-tanks, senior academics, architects, government officials, and others. In all, 46 persons participated in at least one dialogue with several coming together on numerous occasions (see Annexure 1 for the list of participants).

A second reason was to ensure that a spirit of continuity was instilled in the dialogue process. To be sure, this was certainly not the first time that dialogues on water had been organised. In fact, in 2010 CEEW had organised a series of India Water Dialogues across Delhi, Mumbai and Bangalore (those dialogues covered municipal, industrial and agricultural water use). However, there were few platforms, which offered the opportunity for continuing dialogue. The roundtables on urban water management were not conceptualised as a one-off meeting, but a series of conversations, in the hope that repeated interactions between the participants would allow for greater appreciation of each other's perspectives and deepen understanding of the challenges.

The third motivation was to broaden the discourse beyond formulations of “public versus private” water services. As discussed above, there was recognition among the participants that certain challenges were common to the UWSS sector in India, irrespective of whether the services

were provided by public utilities or private concessionaires. By focusing on those common challenges the dialogues could be more constructive in offering recommendations and roadmaps for improvements in service delivery. Thus, the dialogues were organised around five themes: challenges of water utility management, roles of the private sector and civil society, role of water regulators, improving water data and metrics, and prospects for capacity building.

A fourth motivation was to ensure that problems facing the poor were discussed in the same setting as discussions on PPPs or water regulators or capacity building. Too often, it was felt, there were parallel conversations about municipal water utilities and the contracts between the public and private sectors, on one hand, and a separate set of interventions implemented by civil society organisations in poorer neighbourhoods and slums. Instead, it was important to discuss innovations – in technologies, contractual models, financing strategies, investments, and community engagement – across the entire chain of consumers of urban water and sanitation services, from large establishments (public buildings, commercial places) to affluent households to lower income localities and shanty areas. As one participant has observed, both public and private service providers have to “unthink” their traditional approaches and reimagine the service architecture and ensure water availability, access and affordability for all (see **Essay 5**).

The following sections summarise the overall diagnoses of the challenges in each of the five thematic areas as discussed by the participants. They also outline the broad recommendations. More detailed analysis is available in each of the issue briefs appended at the end of this document along with the proceedings of each meeting. In addition, several

participants have contributed short essays on various aspects of the UWSS sector. The essays are personal reflections and not endorsed by the group as a whole or by the institutions to which the authors belong.

The combination of CEEW's research briefs, proceedings of the meetings, group-wide recommendations, and individual perspectives offer a far broader view of challenges and opportunities in the urban water and sanitation sector than

would have been possible through a purely research exercise or solely via dialogues among one set of stakeholders. This unique aspect of these roundtables on urban water management serves as the necessary first step for building and maintaining a community of practice on water supply and sanitation and, more importantly, a basis for building consensus or resolving tensions with regard to policy, implementation and quality of service delivery in future.



# Improved water utility management

Water supply and sanitation utilities in India have suffered from poor design, poor operation and maintenance practices, lack of accountability, poor data and transparency, and inadequate investments. While these were the symptoms, the group concluded that they arose due to certain fundamental deficiencies:

- The absence of an ethic and culture of service delivery within utilities;
- Limited capacity with limited training for managers or technicians; Lack of integrated planning with little consultation with utilities when large development projects are planned;
- Political instability and vested interests; and
- Limited private sector participation with no or few standardised policies, loan procurement processes, or willing financiers for the sector.

a utility should:

- be accountable for its services;
- be able to provide equitable service to all the sections of the society;
- have a well-managed, transparent distribution system;
- understand its stakeholders and ensure good communication with its consumers to understand their needs and inform them;
- have efficient billing and collection system;
- manage operations of its technical, commercial and planning units in an integrated manner; and
- have a robust system to ensure asset inventory and management practices.

In response, the group proposed interventions and reforms in the political, economic and social environments within which utilities operate.

As basic principles for water utilities, participants agreed that



CEEW-Veolia Water India First Roundtable gathered a range of stakeholders to discuss water utility management

*Political environment*

- Recognise water as a human right but create a narrative to minimise perceived conflicts between such a right and the objectives of managing utilities as corporations
- Political vision should be people-centric and should match the service-delivery
- Ensure that access to toilets and sanitation is not ignored
- Separate political will and leadership in support of water utility reforms from actual implementation, which should be left to professionals
- Maintain the sanctity of contracts

*Economic environment*

- Feasibility studies before projects are validated to cover all aspects: engineering, resources management, existing social and political environment, and profit
- Standardise the loan procurement process
- Increase water tariffs rationally, after a basic minimum of water had been supplied to all households
- Also focus on increasing the efficiency of the billing and collection system, without which higher tariffs would be ineffective or impose disproportionate burdens

*Social environment*

- Minimum amount of water required for supporting life should be available to all areas
- Equitable service provision being the primary concern, focus should shift to providing water to those who do not

have access to it while designing extension of network lines

- Stakeholders from different constituencies should be involved in decision making
- Seamless process of information exchange between consumers and service provider
- Spread public awareness about availability of water resources, challenges in service delivery, etc.

*Technical/human resources*

- Integrate urban infrastructure planning with urban water management
- Create a core group of experts nationally and in each state to advise on urban water supply and management
- Integrate technical, commercial and planning units in the process of decision-making
- Communicate with employees to imbibe role of the utility as a “deliverer of services”
- Capacity building and training workshops for staff at all levels
- Improve asset management by creating data inventories using a single template
- Strengthen independent monitoring and regulatory bodies
- Benchmark utilities and encourage competition between utilities
- Certification system in the UWSS sector on the lines of existing practices of *Navratnas*

# Role of the private sector

## *Counting the poor*

The participants of the roundtables discussed the role of the private sector within the larger context of the roles of other stakeholders, particularly government and civil society. The group discussed the compatibility between the private sector and services to the urban poor. What is the definition of water for all? There is a fundamental problem if access to water is linked to legality of land tenure. This would result in slum dwellers either not being counted or having little or no recourse to quality and affordable drinking water. If public utilities and the private sector are serious about ensuring water for all, they would first need to recognise customers.



Credit: CEEW

Mr G.S Basu, JUSCO chairing the second CEEW-Veolia Water India roundtable on private sector participation in urban water management

## *The government's ultimate responsibility*

Regardless of whether a private sector or a public sector entity is operating/managing the WSS system, the responsibility of service provision ultimately lies with the public sector. The public sector has the duty to ensure that equitable services are being provided to all consumers. The role of the government does not end after allocating a water PPP contract to a private partner.

## *PPPs important but not objectives in themselves*

The group also recognised that PPPs were not objectives in themselves. The end goal is improved water utility management and quality of services delivered. But PPP targets have to be realistic, unambiguous and set on the basis of verified data. Originally restricted to a few southern states, PPP projects have now spread throughout the country. Several models of PPP contracts, ranging from management contracts to build-operate-transfer (BOT) arrangements, are being developed. Such a shift in focus has probably been facilitated by the increased and changed nature of public funding support to water PPP projects in recent times. A shift from bulk water supply towards O&M of the distribution systems and less dependence on multilateral agencies for funding has been observed. The most promising development is that the number of private players, especially domestic players, thus showing signs of increasing competition in the WSS sector.

Successful PPP projects have benefited from a combination of public funding, specialised project expertise and ownership, support from diverse stakeholders, strong demand for the project, reduced revenue risk, and high degree of interest

among private operators for the project. By contrast, PPP projects have failed where there has been inconsistent support from stakeholders, weak financial capacity and tariff mechanisms, little awareness about the projects, and low capacity to deliver the projects.

*Recognising and managing risks*

Overall, there are numerous risks, which the public agency and the private service provider have to countenance, and for which appropriate mitigation strategies have to be developed. These risks range from the design and development stage to the construction stage (cost overruns, delays, failure to meet standards), to operational risks (costs, quality and quantity of water, regulatory approvals), to revenue risks (bulk water charges, changes in tariffs) and financial risks (exchange rates, interest rates), to force majeure and insurance risks, and finally political risks.

However, the most important risk was associated with lack of specificity in the contract or of shifting targets once contracts had been awarded. These risks can be clubbed as risks associated with improper feasibility studies prior to contract bidding (figure 4).

One of the most important steps in mitigating some of these risks is developing, deepening and managing a sound database. A proper database should be prepared by the public sector in consultation with technical experts. Experts should be tasked with detailed research in order to understand local conditions and existing assets. A detailed project report,

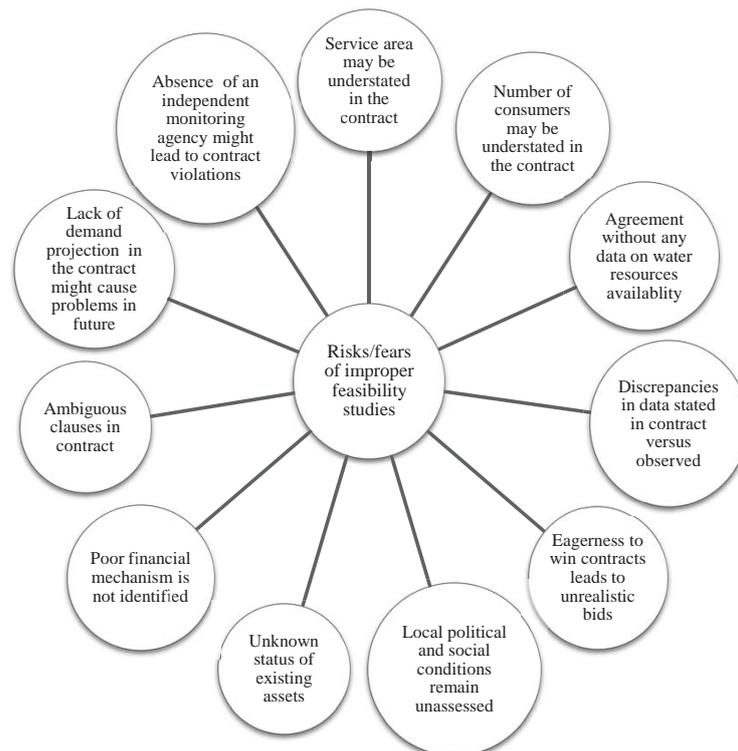
illustrating data for the service area, number of consumers, social mix, condition of assets, growth trends etc. should be prepared. This report should form the basis of the PPP contract. Further, private bidders for a contract should be allowed to carry out an internal evaluation study, so that the accuracy of data reported in the detailed project report can be verified. Well informed private partners would be then expected to make realistic bids.

*A more robust PPP*

Participants observed that there was a need to pay greater attention to the types of contracts that were being awarded in the UWSS sector. Traditional contracting mechanisms derived from public ownership of utilities and sub-contracting to private service providers for short-term service contracts, rate contracts for construction, EPC contracts on a lump sum basis for turnkey projects, and fixed fee management contracts. These contracts largely targeted tier I (water treatment) and tier II (water transmission) infrastructure. The potential for securing efficiencies in the water distribution system (tier III) had not been exploited in India, especially with a focus on accountability for the quality of service delivered (see Essay 6).

That said, if there had to be greater emphasis on service delivery, project preparation, quantified outputs and improved efficiency, there was also need for more confidence in the contracting process. Unless standardised principles inform urban water contracts, legal, political and operational risks would discourage private sector participation. By contrast,

**Figure 4: Risks/fears of improper feasibility studies**



standardised PPP provisions would help create a common understanding among all the parties about the technical, operational and financial risks to address in an urban water management PPP (see *Essay 7*).

In recognition of the concerns about access to water for the poor, the responsibilities of the government, and the risks perceived by the private sector, participants outlined key steps to develop more robust partnerships between public agencies and private service providers:

- **Designing unique contracts but adopting standardised principles:** No single contract document has the potential to fit in every situation. But a way to mitigate risks would be to standardise the core requirements of a PPP contract in the field of urban water supply in the form of a set of model contract clauses.
- **Understanding the problem:** a badly designed project cannot be executed by a good concession agreement.
- **Planning a proper time frame:** the public agencies should prepare an appropriate timeframe for carrying out the feasibility study as well as for achieving realistically framed targets, based on detailed databases of assets, consumer mix and growth scenarios. The private sector, in turn, should also understand the contract structure before determining its ability to deliver on the project.
- **Allocating contracts to experienced firms:** It is necessary to assign contracts to private partners, which have a proven track record. In their absence, a contract should first be provided on a pilot scale, allowing the concessionaire to demonstrate its capabilities.
- **Financial mechanisms** have to be analysed for assuring the operator a revenue stream based on services provided.
- **Demonstrating improved service delivery before tariffs are raised:** Pilot projects can be implemented while keeping investments from the private sector low even as consumers start gaining trust as they witness improved service delivery.
- **Delinking service quality from tariffs:** Water PPP contracts should strictly mention that the level/quality of services should be the same for all sections of society, even if a dual tariff system or a subsidised service delivery system for urban poor is offered. The public sector should ensure that the services first reach the neglected areas and this should explicitly be mentioned in the contract. The private sector should also understand its social obligation and can devise innovative/price differentiating mechanisms in association with CSOs/NGOs for low income areas.
- **Transparency:** A public relationship officer hired by the private operator could help establish regular interactions with consumers and provide detailed information to them.
- **Involving stakeholders** for gathering information and communicating decisions, as well as finding ways to engage in dialogue, harnessing the knowledge and creativity of end-users and other stakeholders, and involving them in decision making.
- **Working together:** The public partner and other government departments, political entities, stakeholders and CSOs/NGOs should work in close association with the private operator to ensure that the objective of water for all is achieved. CSOs/NGOs and the private sector should also look at areas where they could formulate a joint venture. For example, feasibility research, IEC programmes, policy research, pilot projects etc. could be performed by CSOs and the private sector together. A more holistic approach is required where all stakeholders have a role to play.



# Role of civil society

Efforts of civil society organisations in increasing awareness among the urban poor about water quality or their rights to good quality water services need recognition and support. Such efforts also need to be an integral part of so called public-private partnerships. The private sector, in association with NGOs, can reach out to traditionally marginalised groups, including poor households and people in informal settlements. Conducting Information, Education and Communication (IEC) programmes is essential to spread awareness regarding hygiene and sanitation. CSOs/NGOs could play a very important role in bringing all the three components of WSS sector (public sector, private sector and consumers) together on the same platform at a decentralised level and, thereby, ensure greater accountability.

The participants highlighted the following among the range of roles for CSOs in the UWSS sector.

- Community engagement is necessary for **social mobilisation** and for raising awareness. These would include mass mobilisation, campaigns through posters, leaflets, radio and television spots etc., use of broadcast media, school awareness programmes, and prizes such as the *Nirmal Gram Puraskar*.
- **Building capacity** within communities: In Delhi and Agra, the Centre for Urban and Regional Excellence (CURE India) has set up local water treatment plants with kiosks as business enterprises (see **Box 2**). Managed by women entrepreneur groups, these treatment plants provide doorstep supply at affordable rates in water-shadow areas. While the plants themselves are generating incomes for poor women, by making water safe, these have led to better health and productivity.
- Innovating for **alternative models of service delivery**. Several examples exist in this regard: the Cluster Septic

## BOX 2

### Innovations in service deliveries to the poor

Plumbing the slum areas will need some “unthinking”, especially if we connect needs of water with sanitation. In Delhi and Agra, the Centre for Urban and Regional Excellence (CURE) India has set up local water treatment plants with kiosks as business enterprises. Managed by women entrepreneur groups, these treatment plants provide doorstep supply at affordable rates in water-shadow areas. While the plants themselves are generating incomes for poor women, by making water safe, these have led to better health and productivity. CURE India has plans to also pipe this water to homes, depending upon community willingness. CURE India has also helped families build household toilets connected to individual or cluster septic tanks. The Cluster Septic Tank in Savda Ghevra, Delhi is helping 320 families to have their own toilets. By linking toilets to Decentralized Wastewater Treatment Systems (DEWATs), CURE India has helped generate water for recycling – housing construction, peri-urban agriculture and household use. More DEWATs on city's other drains are planned to clean up the storm water drainage system and reduce pollution in River Yamuna. In Agra, CURE India is also implementing a water conservation project that will recharge ground water and revive the city's traditional water wells, enabling them to serve as water reservoirs. A process of social cohesion is bringing communities together to harvest rainwater – making poor partners in the process of regenerating the water resource.

Source: Renu Khosla, CURE India



Credit: CURE India

CURE India and FEMS3 joint intervention for developing water treatment plant for Low Income Group people in Agra

Tank in Savda Ghevra, Delhi helps 320 families have their own toilets; social entrepreneurs experimenting with solar water disinfection; civil society participation in assessments and reviews of PPP projects; strengthening the supply chain in delivery of sanitation facilities; and initiatives such as citizen report cards.

- **Research and documentation** to influence policies and programme design for improved service delivery, whether through the public sector or via PPPs.
- **Strengthening the supply chain for improved sanitation:** The Centre for Environmental Education, in collaboration with the Zilla Panchayats, UNICEF and the Karnataka Rural Water Supply and Sanitation Agency, implemented educational programmes on water and sanitation in Gulbarga, Chitradurga, Chikmagalur, Mandya, Raichur, Mangalore and Bangalore Rural districts. Further, 400 masons were trained to build cost-effective toilets.

# Regulation of UWSS services for the poor

At the 6th meeting of the National Water Resources Council in December 2012, Prime Minister Manmohan Singh said, “One of the problems in achieving better management is that the current institutional and legal structures dealing with water in our country are inadequate, fragmented and need active reform.”<sup>10</sup> Realising the need for strengthening regulatory functions, the Ministry of Urban Development (MoUD) also issued an advisory note in 2012 for formulating a comprehensive sector development plan at the state and local body levels. The note mentioned regulatory functions that could cover service delivery standards for the service provider, monitoring of compliance, periodic resetting of tariffs, etc.<sup>11</sup>

## *Few rules for quality of urban water services*

In India, traditionally the focus had been to regulate water pollution, via the Water (Prevention and Control of Pollution) Act, 1974, and the Water (Prevention and Control of Pollution) Cess Act, 1977. The Central Pollution Control Board and the State Pollution Control Boards were created and derived their authority from the 1974 Act. There are few legislations to govern the quality of service for water supply in India. Almost every state policy advocates 24x7 water supply, but regulation of domestic water supply barely gets mention in state water policies. Only a few states –Andhra Pradesh, Arunachal Pradesh, Maharashtra, and Uttar Pradesh – have an independent regulator or a regulation committee of water.

There are centrally mandated water quality standards but they are not legally binding on water service providers.

There was consensus within the group that a few important processes in the urban water domain needed the intervention of a regulator. These were:

- Reporting and data collection;
- Ensuring equitable service quality (especially in low income areas);
- PPP projects (not only for project selection but for implementation and performance benchmarks as well);
- Slum census (to ensure that target populations are correctly counted to estimate deficits in water and sanitation services);
- Setting water tariffs (either via an independent regulator or in designing the pricing mechanism);



Dr Isher Judge Ahluwalia, Chairperson, ICRIER; and Ms Debashree Mukherjee, CEO, Delhi Jal Board discuss regulatory frameworks at the third CEEW-Veolia Water India roundtable

10 Singh, Manmohan (2012) “The National Water Resources Council” *Opening statement at 6<sup>th</sup> meeting*, 28 December.

11 MoUD (2012)“Advisory Note on “Improving Urban Water Supply & Sanitation Service”, Ministry of Urban Development, Government of India.

- Monitoring progress in water sector reforms (such as performance measurements at the level of ULBs under Maharashtra's *Sujal Nirmal Abhiyaan* or Karnataka's *Tulna* process for comparing performance);
- Setting performance benchmarks for reducing wastage, inefficiency and non-revenue water;
- Overseeing transfer of public funds to service contractors;
- Groundwater abstraction within urban areas;
- Resource conservation and pollution control.

But, as with water utilities, the experience with regulators has also been mixed. Regulators and public auditors have limited capacity, limited legal powers, and limited scope to monitor and regulate parastatal agencies delivering water services.

#### *Gradual evolution of regulatory roles*

Participants believed that the role of regulators would evolve as the sector developed, as new entities and stakeholders got involved in delivering services, and as consumer demands and expectations of levels of service increased. That said, the group recognised that certain reforms could be initiated with priority. These included: collecting data, which could increase confidence in contracts; categorising cities to design appropriate pilot projects; training of regulators and interactions with stakeholders; stronger legal frameworks to enforce performance benchmarks; integrated regulation of drinking water, wastewater treatment, sanitation facilities; and a phased approach with the possibility of "opt-in" clauses for service providers to graduate to higher levels of service delivery.

#### *Maintaining flexibility over pricing structures*

The Indian urban water supply system lacks adequate point-of-use metering. In some cities – Amritsar, Bengaluru, Bhopal, Chandigarh, Chennai, Coimbatore, Dehradun, Delhi, among others – a hybrid structure of fixed and volumetric tariffs for water supply is being used for non-metered and metered areas, respectively. In some of the metropolitan cities, such as Bengaluru, Chennai, and Delhi, increasing block tariffs are common. Households with metered connections tend to pay less, but they pay for what they use, whereas fixed charges result in wastage as consumers have few incentives to reduce water use. The World Bank found that, in 19 Indian cities, fixed charges were neither cost efficient nor did they promote conservation of water resources.<sup>12</sup> Another study of 20 WSS utilities in India found that for most of the utilities the operating ratio (annual O&M cost as a proportion of

annual revenue) was greater than 1, implying that utilities were unable to recover running costs let alone capital investments.<sup>13</sup>

While there is the case for increasing revenue for water services, there was still the need for flexibility in choosing water pricing mechanisms, such as linking to electricity tariffs, indexing tariffs to inflation, differentiated tariffs for residential, commercial or industrial users, subsidies for poorer households, spreading payments for connection charges over time, and separating O&M accounts to cover full maintenance costs.

#### *Regulating services for the poor*

Even as regulators evolved in their capacity, participants emphasised the need for improved regulation of water and sanitation services for the poor.

- **Tariffs and willingness to pay:** The group was of the opinion that, although there was willingness to pay for improved water services, the quality of service had to demonstrably improve *before* tariffs were raised.
- **Regulating connection charges:** Poor consumers were burdened by high connection charges, which had to be regulated or subsidised in order to increase access to improved water services.
- **Informal water vendors** had to be brought within the scope of regulation. Vendors in Delhi, for example, charge by connection rather than the amount of water supplied, resulting in high per unit costs. Regulators need to work with Resident Welfare Associations to ensure that their concerns regarding informal vendors are addressed.
- Regulators across states should **share their learning and experience**, so that appropriate services could be offered to the poor. These learnings would offer insights into variations in willingness to pay (in Hubli, women more found to be more keen than men to pay for water), community involvement (say, in managing toilets in Tiruchirappalli), collective decision-making on tariffs in slums, etc. The informal sector did not mean it was irrational but needed appropriate interventions.

12 Gupta, Anjali Sen.(2011) "Cost recovery in urban water services: select experiences in Indian cities" *Water and sanitation program*, World Bank , Technical paper: 12; - available at <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Cost-Recovery-Urban-Water-Services.pdf>; accessed 14 March 2012

13 ADB (2007) *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

# Suggestions for improving water data in the UWSS sector

The challenges currently facing the UWSS sector in India will pale against the pressures of urbanisation in future. As one of the participants has argued, the greatest human migration is underway, namely urbanisation (see **Essay 8**). The development of “smart cities” would be halted or get interrupted unless the quantity, quality and analysis of data on delivery of essential services are improved. Technology will be an essential driver, but human resources within utilities have to be also sensitised and trained in collecting, analysing and using data for improving services (see **Box 3**).

## *Water data depend on utilities' roles*

Good quality water-related data and information are necessary for accurately measuring use and promoting efficiency, for designing investment strategies for infrastructure, for fair

pricing and equitable use of scarce resources, for developing water markets, and for ensuring that environmental sustainability of water sources is maintained. In the urban water and sanitation context, the nature of water data requirements depends on how water utilities view their role.

- **Utilities as water suppliers:** In this basic role, utilities would need data on water availability, consumer demand, and treatment capacity.
- **Utilities focused on service delivery,** concerned about the quality of services and efficiency of the system, would need additional information on the adequacy of the water resource, quality of infrastructure, the mix of consumers and stakeholders, water quality, consumer feedback, skills and training needs of staff, investments and revenues, efficiency in water conveyance, use, treatment and reuse,



Participants deliberate on improving data on urban water at the fourth CEEW-Veolia Water India roundtable

and systemic risks and vulnerabilities.

- **Utilities viewing their role as managers of an integrated urban water system** would need even more information, including data on surface and ground water, land use and changes in land cover, and ecological and climatic data.

#### *Challenges with quality of data*

Among the wide ranging data requirements listed above, the roundtable participants noted five key challenges with quality of data in the UWSS sector.

- **No institutionalised reporting**, which would make the supplier accountable to report the data on water supply, consumption, etc.
- **Limited information on the mix of consumers**: While consumers might prefer 24x7 water, their ability to afford to pay for water varies. Moreover, payment patterns vary depending on the periodicity of household income cashflows.
- **Lack of data on water consumption**: Although utilities have data on water supplied, there is little information available on final consumption. Utilities often work on assumptions about the volume of water that finally reaches consumers, with unaccounted flow water reaching as high as 50%-60% in some areas.
- **Poor data on groundwater**: To the extent that data from the Central Ground Water Board is reliable, it is of low resolution and cannot be used to understand groundwater withdrawals and use in small scale urban localities.

Practices, such as the licencing system for groundwater introduced in Dhaka, could be adopted to build a more robust information base and prevent misuse.

- **Poor data on distributed water supply**: In slums and elsewhere, even households connected to the water mains might have to rely on informal water vendors. Unless data about their supplies is available, total consumer demand in a defined area would always be underestimated, thereby further reducing the confidence for private firms to bid for water service contracts.

#### *Consumers as co-creators of water data*

Several participants underscored that consumers should not be treated as passive recipients of (poorly managed) water services. Instead, they could participate as suppliers, resource managers and data providers to government agencies responsible for supplying water. Consumers' feedback on the quality of services is the ultimate water audit possible. Therefore, it is important to develop a good network with the consumers to understand the type of services they are getting and the areas needing improvement. For instance, there is a dearth of information about water use and conservation practices in slum areas. It is important to know how slum dwellers are managing their limited resources, the health impacts due to their water use practices, and the best water management practices that could be adopted in other areas.

### **BOX 3**

#### **SCADA installation in Pimpri Chinchwad**

In order to address the challenge of offering safe and reliable water supply, a recent concept in the Indian environment is 24x7 water supply. The main purpose in this type of service is to regulate the flow and pressure in the water supply system.

Pimpri Chinchwad, near Pune, Maharashtra, undertook this journey in 2008 when the utility invested in a supervisory control and data acquisition (SCADA) system comprising a range of field instrumentation including Krohne Flow Meters. According to the municipal corporation, the system helps with information on raw water lifted from the Pavana river, treated at the water treatment plants (WTPs), sent via the pipelines, and received at 85 elevated storage reservoirs. The system also helps in equitable water supply in the city. The department has set up benchmarks for the flow of water through the system. As part of the system, the corporation has installed flow meters at the raw water pumping stations at Ravet, the WTPs at Nigdi, the main water pipelines and ESRs. If there is any deviation from the benchmarks the official concerned is sent a message on his cell phone, after which he determines the reasons for the deviation and takes corrective action.

For these initiatives, PCMC received various awards under the JNNURM Programme. The civic body received the first prize in the category of improvement in water supply and waste water sector in 2011.

Emboldened by this success, PCMC next embarked on a pilot project to implement 24x7 water supply in a specified area. This project has also turned up trumps. Water demand has reduced because now there is no need to store water with corresponding wastage. The electricity bills of residents have reduced as there is no need to pump water, thanks to pressure being maintained in the system. However, the leakages in the system had to be controlled first, for which innovative helium-based technology was used.

With confidence levels high, the corporation is scaling up this concept to all the areas under its jurisdiction with help from the fast track funding under the JNNURM Programme, which has been extended by a year.

**Source:** Neville Bhasin, Forbes Marshall

*Uninformed planning, lack of information on assets and hesitancy in contracts*

The other main challenge is with regard to information about existing assets and their current state helps utilities to budget for future investment requirements and regular maintenance. But in India there is little information on utility assets, which tend to be decades old. Some utilities do not have complete maps of the pipe and drainage networks, resulting in even poorer operation and maintenance of the assets. Due to the lack of data regarding the assets of utilities and water resources availability, private sector entities are hesitant to bid for water supply contracts. Those who do succeed in winning the contracts often struggle to meet targets when the actual target population turns out to be much higher than assumed or if the quality of the infrastructure is worse than had been previously estimated.

*Priorities and recommendations for water data*

All capacity building activities for utilities and state level organisations must underscore the importance of data and information systems.

- **Allow utilities some time** (say, three years) to develop the database *before* initiating the PPP contracting process.
- **Prioritise data, which could be collected more easily**, such

as supply coverage, quality of water supply etc.

- **Identify low-cost technologies** for collecting reliable information on water: Investments could be encouraged via cost-recovery formulae, whereby initial investments are covered and only when surpluses are generated could a tariff increase be discussed. Further, the cost of installing meters should be included in the project cost and meters installed at least at the zonal level. Overhead tanks as proxies to measure water demand and consumption and to use metering to first get improved estimates of non-revenue water.
- **Encourage various institutions**, involved in work related to one or the other component of the water sector, to share information on water; provide incentives to develop water data and information systems. Examples include the supervisory control and data acquisition (SCADA) system deployed in Pimpri-Chinchwad in Maharashtra (**Box 3**) and Rajasthan's water resources information system (WRIS), which in turn serves as a decision support system.
- Act urgently to develop improved and **higher resolution databases on groundwater**.
- Urban planning should not be undertaken or sanctioned without sufficient information on water resources.

# Building capacity

With the 74<sup>th</sup> Amendment of the Indian Constitution, urban local bodies were expected to assume greater responsibility for delivery of services. But there is also need for close collaboration between the state governments, which have control over the water resources and other management/ financial resources and the ULBs, which have to build, maintain and administer the water supply (see **Essay 9**). Capacity building, consequently, has to occur at both the ULB and state government levels. In fact, the ability of individuals or organisations to perform their functions effectively and efficiently suggests that building capacity would be a continuous process, with human resources playing a central role but only in the context within which organisations have to deliver their functions.

*Do we have the capacity to build capacity?*

CEEW's interactions with several urban water sector experts and utility managers revealed that, in general, there is no defined training calendar or programmes within utilities. However, some training is provided, mostly on project design and planning, to higher officials. These trainings are limited to city-scale utilities with little or no training for officials managing utilities in smaller towns. According to urban water experts, the following are among the major skill gaps and training requirements in urban local bodies (ULBs):

- Water management skills
- Skills to handle adverse situations
- Induction training



Private sector, academicians and civil society organisations get together to discuss capacity building in the UWSS sector at the fifth CEEW-Veolia Water India roundtable

- Use of advanced instruments
- Knowledge of IT-enabled systems
- Water quality testing
- Communication skills
- Training of field-level officers
- Analysis of market conditions

Participants felt that capacity development was not given adequate importance with training programmes excluded from departmental budgets over time or the absence of training wings altogether. They also concluded that capacity building was different from training in that the latter seldom imparted the knowledge to conceptualise, design and implement systemic reforms.

Moreover, utilities remained dependent on external experts with few institutions providing trainings to urban local bodies. Although there are numerous institutions around the country engaged in training and capacity building activities, their curricula were still largely engineering focused. These had to be revised to cover a multi-disciplinary approach, which would focus more on issues such as demand side efficiency, service delivery, equity, etc.

#### *Capacity building at multiple levels but with flexibility*

Participants at the roundtable emphasised the need to build capacity at different levels. This would start with the political community, proceed further to senior management (whose role would expand to analysing the capacity of the utility to deliver proposed projects), then middle and lower management (who would give feedback on their training needs), and finally consumers (to sensitise them about their rights and responsibilities).

But the group also noted the need for learning local contexts rather than imposing a one-size-fits-all template for capacity. For example, although Jaisalmer and Cheerapunji differ completely in annual rainfall, livestock population, topography, weather conditions etc., according to the CPHEEO manual both cities have to be designed to deliver 135 litres per person per day (lpcd). Such guidelines and manuals restrict the flexibility for utilities to choose infrastructure design and technical options suited to their conditions.

Moreover, the informal sector also needs special attention with simplified methodologies that would allow for the most appropriate technologies and service delivery designs to the selected. The purpose of capacity building should be to merely nudge communities towards better practices. Urban water managers would have to re-think what types of solutions would be appropriate for informal settlements and build capacity in that regard.

#### *Recommendations*

- **Understand demand:** at centre, state, ULBs and consumers level, and including technology, design and also soft skills
- **Integrate:** water and sewerage systems, operations and maintenance, conservation measures, developing water efficient buildings etc.
- **Build capacity at all levels:** but senior officials have to be targeted first
- **Provide adequate funding and mandating capacity building programmes** is necessary
- **Modify existing institutions and developing new ones:** to understand the complex challenges, modify the existing modules, analyse the local situation in detail and for building capacity among a new generation of water managers; engage city-based engineering associations but only in conjunction with communities
- **Include climate change:** essential for future development plans, as urban water managers are currently not factoring in the impacts on available water
- **Adopt river basin management approach:** it could start at a sub-basin level to demonstrate proof of concept
- **Decentralise:** systems should be designed to complement, not completely replace, the centralised systems.
- **Recognise well performing utilities** and cities and reward them
- Overall, **simplify complex methodologies**, bringing in local knowledge, seeking expertise from various sector experts, acting according to the local situation and involving all the stakeholders should be the path to appropriate urban water management.



# Conclusion

This report has summarised the existing literature on urban water management issues, offered cases of successful and not so successful practices, captured the essence of a series of dialogues, showcased the individual opinions of experts who participated, and underlined key recommendations for policymakers. Yet, not all of the insights and recommendations that emerged from the series of dialogues on urban water management are necessarily new. Instead, the strength of the process has been to convene stakeholders from a range of different backgrounds, interests and experiences in the sector. The repeat participation of several attendees was testimony to the need for neutral forums where stakeholders could exchange frank opinions, contest others and yet manage to find consensus on key principles as well as specific and necessary actions.

The strength of this exercise – multi-stakeholder dialogues to find systemic solutions – should also sound a note of caution. A series of five dialogues is not nearly sufficient either to give voice to all stakeholders or to ensure that the recommendations would indeed be followed through by all interested parties. If we are indeed serious about securing the human right to water for all, ensuring dignity through access to improved sanitation, maintaining and adding to the infrastructure for urban water and sanitation services, including a range of service providers (public, private and from civil society), and sustaining the financial health of water utilities, we would have to continue the dialogues and oversee the actions. Anything short of such a commitment would be a waste of the opportunity for collective action.

# ANNEXURES



# Annex 1: List of CEEW- Veolia Water India roundtable participants

	First Name	Last Name	Organisation	Job Title
Mr	A K	Jain	Delhi Development Authority	Architect- town planner
Mr	Abhay	Kantak	CRISIL	Director, Urban Practice - CRISIL Infrastructure Advisory
Mr	Amar Singh	Sandhu	Forbes Marshall	General Manager
Ms	Anjali	Pancholi	Town & Country Planning Organization	Associate Town and Country Planner
Mr	Anshuman		Teri University	Associate Director, Water Resources Division
Dr	Arunabha	Ghosh	CEEW	CEO
Mr	Ashok	Natarajan	Tatva Global Water Technologies (P) Ltd	CEO
Mr	Ashish	Bhardwaj	FICCI	Research Associate
Ms	Ashufta	Alam	Department for International Development (DFID)	Senior Infrastructure Adviser
Mr	Babu	SVK	Veolia Water India	Director
Mr	Bastiaan	Mohrmann	IFC	Head Water Advisory South Asia
Ms	Brune	Poirson	Veolia Water India	Head of Sustainability and Corporate Social Responsibility
Prof	Chetan	Vaidya	SPA	Professor
Ms	Debashree	Mukherjee	Delhi Jal Board	CEO
Mr	Dirk	Walther	GIZ	Senior Advisor in Advisory Services in Environmental Management.
Mr	G S	Basu	JUSCO	GM Water Management
Dr	Isher	Judge Ahluwalia	Indian Council for Research on International Economic Relations (ICRIER)	Chairperson
Dr	J K	Bhasin	NEERI	Senior Principal Scientist
Dr	M	Ramachandran	Ministry of Urban Development	Ex- Secretary
Mr	Manu	Bhatnagar	INTACH	Principal Director
Ms	Marie Helene	Zerah	Centre de Sciences Humaines	Urban studies
Mr	Mukund	Vasudevan	Pentair	Country Head

	First Name	Last Name	Organisation	Job Title
Mr	Neville	Bhasin	Forbes Marshall	Data collection, project planning and implementation
Dr	Nirmalya	Choudhury	CEEW	Senior Research Associate
Mr	Nitin	Bassi	IRAP	Senior Researcher
Mr	Patrick	Rousseau	Veolia Water India	Chairman & Managing Director
Mr	Pawan	Gupta	AECOM	Executive Director Water and Urban Development
Ms	Prachi	Gupta	CEEW	Strategic Partnerships and Communications Manager
Mr	Pranab	Dasgupta	CII	Senior Counsellor
Mr	Prasad	Gadkari	IDFC	Director
Dr	R	Biswas	SPA	Professor
Mr	R	Johri	TERI	Senior Fellow
Mr	Ramani	Iyer	Forbes Marshall	Corporate Manager
Dr	Renu	Khosla	CURE India	Director
Mr	Rubinder	Singh	PDCOR Ltd. (JV of GoR and IL&FS Group)	Chief Executive Officer
Mr	Rudresh	Sugam	CEEW	Programme Officer
Mr	Subrata	Burman	IFC	Advisor
Mr	S Avudai	Nayakam	Water.org	Senior WatSan Officer
Mr	Shawahiq	Siddiqui	IELO(Indian Environment Law Offices)	Advocate and Partner
Mr	Shriman	Narayan	Veolia Water India	Assistant Manager, Communications
Ms	Suneetha D.	Kacker	World Bank	Water & Sanitation Program
Dr.	Suresh Kumar	Rohilla	CSE	Programme Director, Urban Water Management
Dr	Usha P	Raghupathi	NIUA	Professor
Ms	Urvashi	Sharma	CEEW	Intern
Ms	Vandana	Bhatnagar	World Bank	Water & Sanitation Program - South Asia (WSP-SA)
Mr	Vikas	Goyal	AECOM	Technical Director - Water & Urban Development



# Annex 2: Water utility management in the urban water sector

## Issue brief for the first roundtable

### I. Introduction

Water supply and sanitation management has always been a point of concern in Indian cities. Notwithstanding a few pilot projects and some areas of excellence, little of promise has been achieved so far to address this complex issue. Indian cities and towns are struggling to cope with water demand and resources overexploitation.

The management and optimal use of urban water resources require a different approach. An urban locality differs from a rural locality in several ways: higher population density, higher per capita water demand, huge industrial water demand, high water use in facilities like hospitals, educational institutions, railway stations, airports, bus terminals etc. The quality and quantity of wastewater generated is also a direct reflection of the consumption pattern. Current urban water use practice is causing large scale pollution resulting in polluted surface water bodies and increased pressure on already stressed groundwater resources.

In India, water supply and sanitation utilities are government bodies, which struggle to recover the costs incurred in operation and maintenance, let alone generate revenue for capital investment. The involvement of the private sector is limited and, to the extent available, it is mostly technical and management support rather than investment in infrastructure. In recent years, a few experienced private sector firms such as Veolia, IL&FS, JUSCO etc. have started signing long-term contracts or financing investments in the urban water sector. But there remain high degrees of trust deficit between utilities and private firms as well as consumers and civil society. Any attempts at reforming urban water management in India must begin with a critical appreciation of the problems and rigorous data to inform public debate.

#### Major challenges

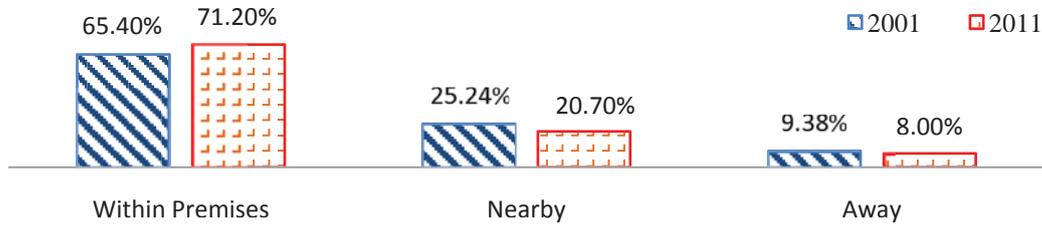
- Only 43.5% of the households in India are using tap water as the major source of drinking water.<sup>14</sup>
- In urban areas, 30% of households do not have access to water within their premises and 18.6% do not have access to even the most rudimentary forms of sanitation facilities.<sup>15</sup>
- The urban poor end up paying more than the rich per unit of water.
- Non-revenue water on average across 28 cities was 39% (2008-09).<sup>16</sup>
- India's urban population grew by 31.8% in the last decade to reach 0.37 Billion, compared with the national average of 17.64%.<sup>17</sup>
- Class I and Class II towns together generate 38,254 million litres of sewage per day; only 11,787 MLD (31%) are treated.<sup>18</sup>

- 14 Census of India (2011), "Main Source of Drinking Water: 2001-2011" available at: [http://www.censusindia.gov.in/2011census/hlo/Data\\_sheet/Drinking%20Water.pdf](http://www.censusindia.gov.in/2011census/hlo/Data_sheet/Drinking%20Water.pdf); accessed 4 September 2012
- 15 Census of India (2011), "Availability and Type of Latrine Facility: 2001-2011" available at: [http://www.censusindia.gov.in/2011census/hlo/Data\\_sheet/Latrine.pdf](http://www.censusindia.gov.in/2011census/hlo/Data_sheet/Latrine.pdf); accessed 4 September 2012
- 16 Press Information Bureau, Government of India (2012), "Leakage of Water", available at: <http://pib.nic.in/newsite/erelease.aspx?relid=84072>; accessed 10 September 2012
- 17 Census of India (2011), "Provisional Population Totals – India – Rural Urban Distribution", available at: [http://www.censusindia.gov.in/2011-prov-results/paper2/data\\_files/india/Rural-Urban-DataSheets\\_paper2.pdf](http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural-Urban-DataSheets_paper2.pdf); accessed 4 September 2012
- 18 Central Pollution Control Board, Government of India (2009-10), "Status of water supply, wastewater generation and treatment in Class-I cities & Class-II towns of India", available at [http://www.cpcb.nic.in/upload/NewItems/Newitem\\_153\\_Foreword.pdf](http://www.cpcb.nic.in/upload/NewItems/Newitem_153_Foreword.pdf); accessed 8 October 2012

Let us look at the overall status of water supply and sanitation facilities to recognise the need of reform in urban water management in India.

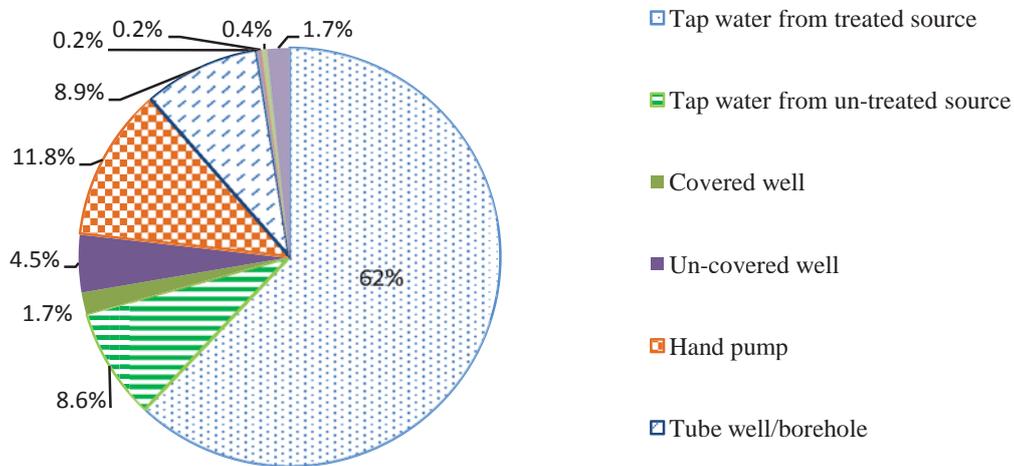
Figure A2.1-Figure A2.4 clearly represent a situation where the water utilities are struggling to provide equitable services to urban localities. Considering the situation, it is important

Figure A2.1: Availability of drinking water source



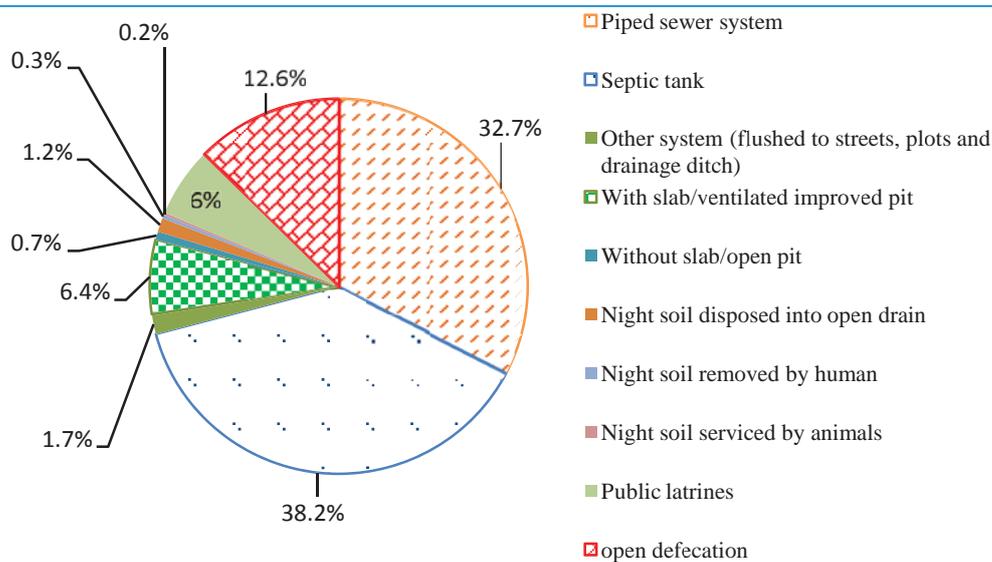
Source: CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

Figure A2.2: Main sources of drinking water in urban areas



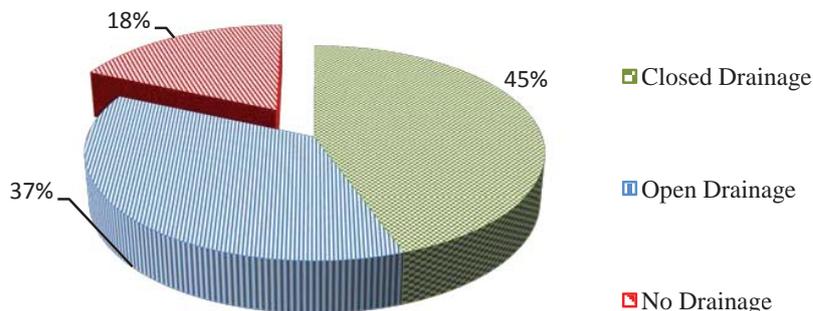
Source: CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

Figure A2.3: Availability of latrine facility in urban households



Source: CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

**Figure A2.4: Connection status of urban household wastewater outlet to a drainage**



**Source:** CPHEEO, Ministry of Urban Development, “An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country”, available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

to analyse the characteristics of an effective water utility management and then evaluate India’s position.

## II. Characteristics of effective water utility management

In May 2006, the U.S. Environment Protection Agency (EPA) and six major water and wastewater associations in the United States (the Association of Metropolitan Water Agencies, the American Public Works Association, the American Water Works Association, the National Association of Clean Water Agencies, the National Association of Water

Companies, and the Water Environment Federation) signed an for developing a joint strategy to identify, encourage, and recognise excellence in water and wastewater utility management.

After nine months of research and discussions between the Steering Committee (16 managers from water sector utilities across the country, nominated by the collaborating associations) and focus groups, a report detailing the findings and recommendation for effective management of an water utility was published in March, 2007. The committee recommended 10 attributes for effective water utility management (**Figure A2.5**). These attributes cover a range of desired utility outcomes in the areas of operations,

**Figure A2.5: Attributes of an effective utility management**



**Source:** EPA (2008) Effective Utility Management: A Primer for Water and Wastewater Utilities: Environmental Protection Agency

infrastructure, customer satisfaction, community welfare, natural resource stewardship, and financial performance.<sup>19</sup>

These attributes can be used by any water and wastewater utilities for defining priorities for improvement based on each organisation's strategic objectives and the needs of the community it serves. Let us look at these attributes one by one and then evaluate situation in India.

1. **Water Resource Adequacy:** Water sources estimation on both quality and quantity fronts and precise water budgets preparation seasonally and annually. Developing emergency plans and conservation strategies for lean periods.
2. **Stakeholder Understanding and Support:** Strong association between different stakeholders like consumers, regulators, service providers, researchers, managers, financiers etc.
3. **Product Quality:** Full compliance with the quality standards & environmental standards set by the government/ health agency for water and treated wastewater.
4. **Customer Satisfaction:** Providing reliable and affordable services on equity basis, accountability of utility for any faults. Customer feedback and survey programmes for identifying the problems in service delivery.
5. **Employee and Leadership Development:** Employee satisfaction and capacity building by organising training programs, creating healthy working environment, establishing regularised promotion system on equity basis, establishing expert teams by understanding and enhancing the skills of employees.
6. **Operational Optimization:** Maintaining high operational efficiency, reducing unwanted resources losses, ensuring cost-effective and sustainable performance.
7. **Financial Viability:** Recognising the full life-cycle cost of the utility and establishing and maintaining an effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenues future needs. Setting water tariffs such that it covers all the costs incurred.
8. **Infrastructure Stability:** Asset management in an effective manner, damage prevention to increase the durability, enhancement of assets over the long-term at the lowest cost possible. Regular repair and replacement activities to minimize negative consequences.
9. **Operational Resiliency:** Understanding the operational risks and developing a strong team to cope up with the negative situations quickly. Developing alternate risk management plan considering business risks (including

legal, regulatory, financial, environmental, safety, security, and natural disaster-related)

10. **Community Sustainability:** Promoting sustainability considering the social, economic and ecological need of the environment, prevention of over extraction of resources and developing plans for reuse, recharge and recycle.

A few recent research analyses evaluated water utility service situation in India. These studies analysed several water utilities across India using various indicators like duration of water supply, coverage, unaccounted for water loss, water tariff etc. Although these benchmarks do not refer to the attributes mentioned above in the **Figure A2.5**, they can be classified under one or the other attribute. For example reliable water supply and coverage comes under customer satisfaction; similarly water loss could be classified under operational optimisation. The India specific studies made the following observations in regard to the above mentioned attributes of effective water utility management:

**Asian Development Bank (ADB):** In association with Ministry of Urban Development (MoUD) ADB did an analysis of 20 WSS utilities in India using following 13 indicators:

Water coverage, water availability, consumption per person, production against population (**Customer Satisfaction**) unaccounted for water, metered connections, operating ratio, revenue collection efficiency, staff per 1,000 connections (**Operational Optimization**), average tariff, new connection fee, capital expenditure per connection, accounts receivable (**Financial Viability**). The result represented in **Table A2.1** is not promising and ADB recommended immediate attention on:

- Improving customer satisfaction by improved services both in terms of coverage and duration
- Operation optimisation by ensuring complete metering, reduction in UFW, reducing staffing ratio and operating ratio, and regular performance monitoring
- Achieving financial stability by setting appropriate tariffs to cover O&M costs and costs of expansion
- Stakeholder's support for increasing investment in the WSS sector
- Employee development by investment in capacity building for staff and management
- Developing a sustainable and equitable environment by providing support for services to the urban poor through lifeline rates and instalment payment of connection fees.<sup>20</sup>

**World Bank - India water supply and sanitation sector is suffering from poor and inadequate investments, poor**

19 EPA (2007) *Findings and Recommendations for a Water Utility Sector Management Strategy : A Final Report Submitted by the Effective Utility Management Steering Committee to the Collaborating Organizations Findings and Recommendations for a Water Utility Sector Management Strategy* : Environmental Protection Agency

20 ADB (2007) *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

operation and maintenance (O&M) practices, high non-revenue water (NRW), uneconomic tariff structure/levels and poor financial management. There is a lack of sound data system and statistics of coverage, metering and production are not fully reliable.<sup>21</sup>

**National Institute of Urban Affairs (NIUA)** – India’s WSS sector is struggling due to weak institutions, low resource mobilisation capacity, poor information dissemination system, deplorable service quality condition, low coverage, inadequate and ill designed supply system, insufficient treatment capacity, unstructured distribution system etc.<sup>22</sup>

**Infrastructure Development Finance Company (IDFC):** Under recovery of capital and management costs, the ‘state-dominated’ model for water provisioning, inadequate tariffs and lack of accountability of the frontline service providers are the major challenges in WSS sector in India.<sup>23</sup>

**Report on Indian Urban Infrastructure and Services:** WSS sector in cities suffers from inadequate coverage, intermittent supplies, low pressure and poor quality. In a City Sanitation Study conducted by the Ministry of Urban Development, none of the 423 cities was found to be ‘healthy’ and ‘clean’.<sup>24</sup>

21 WB (2008) *Benchmarking Urban Water Utilities in India : Water and Sanitation Program-South Asia Phase II*, The World Bank  
 22 Gupta S, Kumar S, Sarangi GK (2006) Measuring the performance of water service providers in urban India: implications for managing water utilities, National Institute of Urban Affairs (NIUA) WP 06-08, New Delhi

23 IDFC (2011) *Water: Policy and Performance for Sustainable Development*, India Infrastructure Report 2011: Infrastructure Development Finance Company  
 24 Report on Indian Urban Infrastructure and Services by High Powered Expert Committee chaired by Dr Isher Judge Ahluwalia, 2011

Table A2.1: Performance indicators of Indian water utilities

	Water Coverage (%)	Water Availability (hours)	Consumption/Capita (lpcd)	Production/Population (m <sup>3</sup> /day/c)	Unaccounted for Water (%)	Connections Metered (%)	Operating Ratio	Accounts Receivable (months)	Revenue Collection Efficiency (%)	Average Tariff (Rs/m <sup>3</sup> )	New Connection Fee (Rs)	Capital Expenditure/Connection (Rs)	Staff/1,000 Connections (ratio)
Ahmedabad	79	8.3	130	0.246	35	0.1	4.73	2.4	100	1.13	1000	2247	14.7
Amritsar	70	2	nd	0.16	nd	0	3.05	12.3	106	0.62	500	712	6.5
Bangalore	100	4	191	0.246	13	75	0.49	11.8	189	4.6	660	3790	17.2
Bhopal	91.5	5	100	0.267	52	40	0.76	9.6	80	6.6	1675	719	3.2
Chandigarh	92.6	3.5	93	0.248	60	80	1.18	0.03	92	4.32	1250	1268	3.4
Chennai	98.1	0.3	101	0.146	23	0.4	1.61	6.6	45	5.07	1850	817	1.1
Coimbatore	77.4	2.5	nd	0.188	nd	1.9	1.01	3.1	100	1.66	345	1102	1.7
Indore	77.7	7	147	0.217	30	0	1.3	4.9	64	3.17	2375	112	5.9
Jabalpur	70.5	3	158	0.22	24	6	1.14	1.6	114	2.18	5500	nd	5.7
Jamshedpur	49.2	1	124	0.305	14	1.3	0.78	3.3	86	8.55	2000	3891	5.4
Kolkata	81.2	4.3	123.3	0.244	31.8	24.5	1.63	4.9	99.5	4.91	1584	1591	7.4
Mathura	74.5	2	171	0.168	nd	3	1.43	8	67	1.39	100	427	2.2
Mumbai	75.7	11	86	0.213	57	4	1.36	5.6	69	9.34	950	331	4.8
Nagpur	92.9	4.5	74	0.185	45	95.5	0.8	7.1	112	20.55	1740	787	5.2
Nashik	83.4	1.5	72	0.182	nd	0	2.82	3.6	178	0.6	1500	39	20.7
Rajkot	100	12	147	0.332	39	79	1.36	nd	94	5.04	530	754	8.6
Surat	89.3	5	87	0.131	17	3.5	0.44	1.1	152	10.87	1930	10080	13.3
Varanasi	76.1	3	109	0.286	41	100	0.82	3	75	3.66	3000	954	4
Vijayawada	77.3	0.75	87	0.108	nd	0.1	5.33	5.2	89	2.79	2500	353	18.7
Visakhapatnam	75.2	4	139	0.222	14	0	1.68	3	75	1.5	1984	864	0.4
AVERAGE	81.58	4.2325	118.85	0.2157	33.05333	25.715	1.686	5.101765	99.325	4.9275	1648.65	1623.053	7.505

Source: ADB (2007) *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

### What is the solution? Can private ownership cure the diseased urban WSS sector in India?

A common notion often articulated is that if water supply and sanitation management were handed over to the private sector, performance and efficiency would improve. This is because private sector is assumed to be more efficient and accountable. Meanwhile, public opinion is often against private management because of the fear that water tariffs would increase significantly.

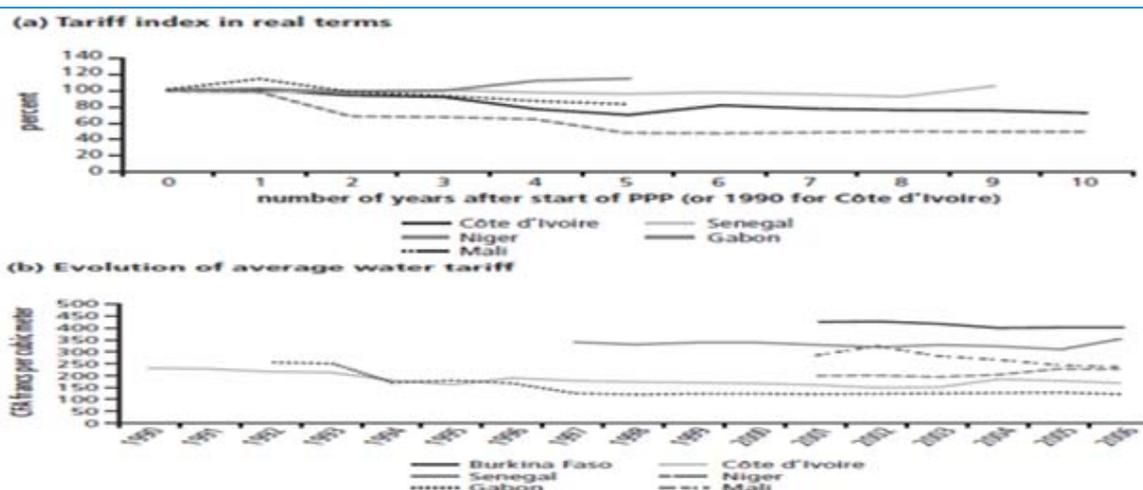
Are these hypotheses correct? There is no conclusive research as far as ownership is concerned. Some researchers (e.g. Bruggink, 1982; Lambert et al., 1993; Shih et al., 2006) argue that publicly owned water utilities are more efficient, while other research (e.g. Crain and Zardkoohi, 1978; Picazo-Tadeo et al., 2009a, 2009b) concludes in favour of the efficiency of privately owned utilities. Still others are non-conclusive (e.g.

The literature does not support the hypothesis that water tariffs rise significantly if the management is transferred to private institution. It is true that water prices have usually increased after private operator was handed over the operations of water utility. But a major reason has been the switch away from a system of high but mis-targeted subsidies or under-priced water. Impact of private operator on tariffs depends mainly on three factors:

1. Amount financed through tariff revenues, which is determined by the tariff policy adopted in a PPP project.
2. The precedent cost-recovery levels against set tariffs
3. Cost reduction that private partner can achieve using cost efficient measures and technology.<sup>26</sup>

The second way of comparing the prices is analysing the price that poor people ended up paying to informal vendors owing to inaccessibility to water supply connection (before

**Figure A2.6: Evolution of water tariffs after entry of private operators in western africa**



Source: Marin Philippe (2009), *Public-private partnerships for urban water utilities : a review of experiences in developing countries*, World Bank

Byrnes et al., 1986; García-Sánchez, 2006; Kirkpatrick et al., 2006; Seroa da Motta and Moreira, 2006).<sup>25</sup>

25 For a summary of the research cited, see Pedro Carvalho, Rui Cunha Marques (2011) "The influence of the operational environment on the efficiency of water utilities," *Journal of Environmental Management*, 92(10), October, pp. 2698-2707, 10.1016/j.jenvman.2011.06.008; and Giulia Romano, Andrea Guerrini (2011), "Measuring and comparing the efficiency of water utility companies: A data envelopment analysis approach," *Utilities Policy*, 19(3), September, pp. 202-209, 10.1016/j.jup.2011.05.005. The original papers are:  
Bruggink, T (1982) Public versus regulated private enterprise in the municipal water industry: a comparison of operating costs. *Q. Rev. Econ. Bus* 22, 111e125.  
Shih, J., Harrington, W., Pizer, W., Gillington, K. (2006) Economies of scale in community water systems. *J. Am. Water Works Associ.* 98, 100e108.  
Crain, W.M., Zardkoohi, A. (1978) A test of the property-rights theory of the firm: water utilities in the United States. *J. Law Econ.* 21, 395e408.  
Picazo-Tadeo, A., Sáez-Fernández, F., González-Gómez, F. (2009a) The role of environmental factors in water utilities techni-

cal efficiency. Empirical evidence from Spanish companies. *Appl. Econ.* 41, 615e628.

Picazo-Tadeo, A., González-Gómez, F., Sáez-Fernández, F. (2009b) Accounting for operating environments in measuring water utilities' managerial efficiency. *Serv. Ind. J.* 29, 761e773.  
Byrnes, P., Grosskopf, S., Hayes, K. (1986). Efficiency and ownership: further evidence *Review of Economics and Statistics* 68, 337e341  
García-Sánchez, I. (2006) Efficiency measurement in Spanish local government: the case of municipal water services. *Review of Policy Research* 23 (2), 355e371.  
Lambert, D., Dichev, D., Raffiee, K. (1993) Ownership and sources of inefficiency in the provision of water services. *Water Resources Research* 29, 1573e1578.  
Kirkpatrick, C., Parker, D., Zhang, Y. (2006) An empirical analysis of state and private sector provision of water services in Africa. *The World Bank Economic Review* 20 (1), 143e163.  
Seroa da Motta, R., Moreira, A. (2006) Efficiency and regulation in the sanitation sector in Brazil. *Utilities Policy* 14, 185e195.

26 Marin Philippe (2009), *Public-private partnerships for urban water utilities : a review of experiences in developing countries*, World Bank

private sector improved access to water).<sup>27</sup> Still, there are cases in Western Africa where prices have actually fallen after PPP were developed in the water sector. The evolution of average water tariffs for the PPP projects in Côte d'Ivoire, Niger (affermages), and Senegal, plus Gabon and Mali (concessions), is presented in **Figure A2.6** above.

The first panel in **Figure A2.6** shows the evolution of the tariff in real terms (average tariff level corrected for inflation) since the entry of the private operator; the second panel allows for comparison among PPP projects on tariff levels. The figure clearly demonstrates that the tariff rates in real terms fell down after the private sector entered into the market.

### III. Possible roles of public and private firms in utility management

Considering the operation and management services of WSS sector, the roles can be divided into core roles and non-core roles.

1. **Core roles:** Investments, financing, ownership, strategic planning and development.
2. **Non-core roles:** Design, construction, equipment supply, vehicles and machinery, repairs, inspections, operations

and maintenance, data processing, meter reading, laboratory services and research.<sup>28</sup>

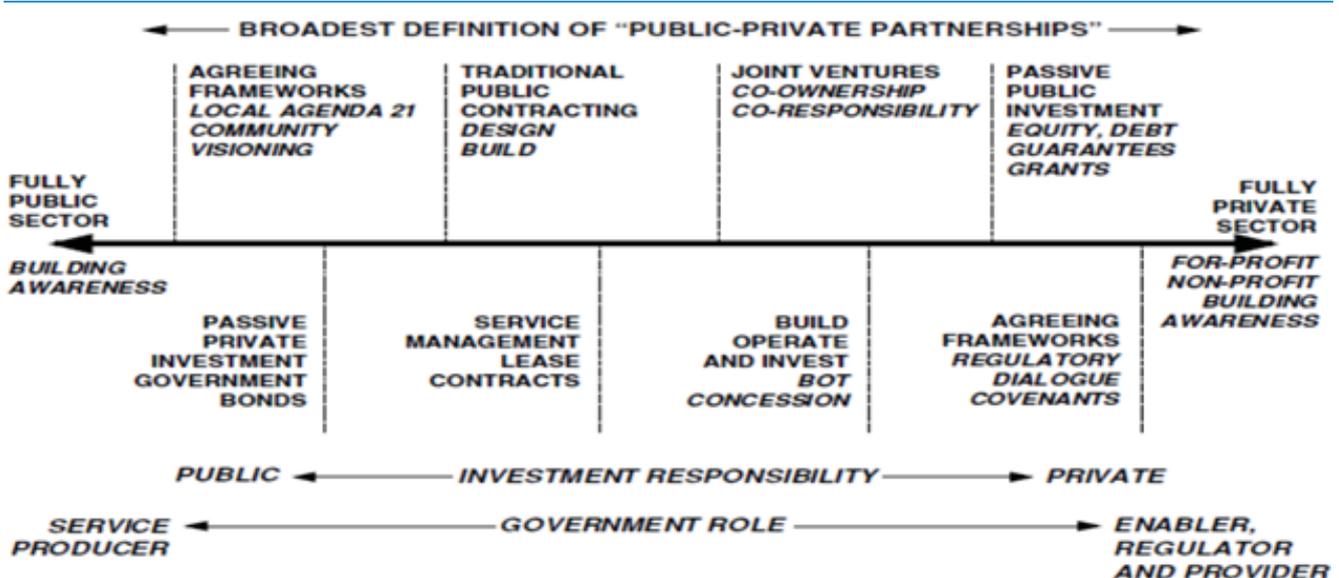
Now let us look at the spectrum of possible roles and relationships between public and private service providers in WSS sector. In **Figure A2.7** if we move from left to right the role of private sector increases. The involvement of private sector can vary from small works such as design and construction contracts to management and ownership of the assets. The type of PPP contract model adopted defines the role of public and private sector in the WSS sector.

The most common type of contracts being practiced in India is management contract where the private sector is responsible only for the management, operation & maintenance of the system without any role in investment. However, now the Build-Operate-Transfer contract model is also being signed where the private firm invests in infrastructure and takes care of operation and management for a fixed time.

### IV. What forms of public-private-partnerships (PPPs) exist in india? Functions and contracts

Traditionally in India, the WSS service provision is completely in the hands of government bodies. Several departments

**Figure A2.7: Spectrum of possible roles and relationships between public and private service providers in WSS sector**



**Source:** Jarmo J. Hukka, Tapio S. Katko, Refuting the paradigm of water services privatisation, *Natural Resources Forum* 27, pages 142–155, 2003

27 Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) WP -10, National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan, September, New Delhi: Council on Energy, Environment and Water

28 Jarmo J. Hukka, Tapio S. Katko (2003), Refuting the paradigm of water services privatisation, *Natural Resources Forum* 27, pages 142–155

are involved in regulating one or the other component of service provision like policy making, planning, funding, asset management, regulation, capital expansion, O&M etc. (see Table A2.2). There are overlapping responsibilities which affect the accountability. The second drawback in the existing system is that the policy and regulatory actions taken are always politically driven which usually are unsustainable and cost inefficient.

In many respects, the role of private sector has always been

important in utility management. However the role has been restricted to a consultancy nature or with sub-contracting from water utilities (see Table A2.3). But capital investment in physical infrastructure remains limited.

Let us have a look at the current contractual structure between a typical government and private institution to develop a PPP in water sector in India (Figure A2.8) and analyse the responsibilities and risks associated with each contract type (Table A2.4).

**Table A2.2: Responsibilities for service provision in India**

Function	GoI	SG	SPCB	UDA	SSA	PHED	ULB	Legend
Policy	√	√						GoI - Government of India
Planning	√	√			√	√		SG- State Government
Funding	√	√		√	√			SPCB - State Pollution Control Board
Asset Ownership							√	UDA - Urban Development Authority
Resource Regulation		√						SSA - State Level Specialist Agency
Discharge Regulation			√					PHED - Public Health Engineering Department
Economic Regulation		√					√	ULB - Urban Local Body
Capital Expansion				√	√	√		
O&M					√	√	√	

Source: Anand Jalakam, *Water Utility Management: Working Paper - 10*, page 435, National Water Resources Framework Study, CEEW, 2010

**Table A2.3: Roles already performed by private sector in water utility management**

Activity	Who	Sector
Planning	Consultants	Private
Design	Consultants	Private
Detail Engineering	Consultants	Private
Funding	Government/Multilaterals	Public/Private
Procurement	Consultants	Private
Construction	Contractors	Private
Supervision	Consultants	Private
Treatment Plant Operations	Contractors	Private
Annual Maintenance	Contractors	Private
Connections	Licensed Plumbers	Private
Leak repair	Contractors	Private
Meter reading	Own Staff/Contractors	Public/Private
Billing	IT Company	Private
Cash collection	Banks	Private

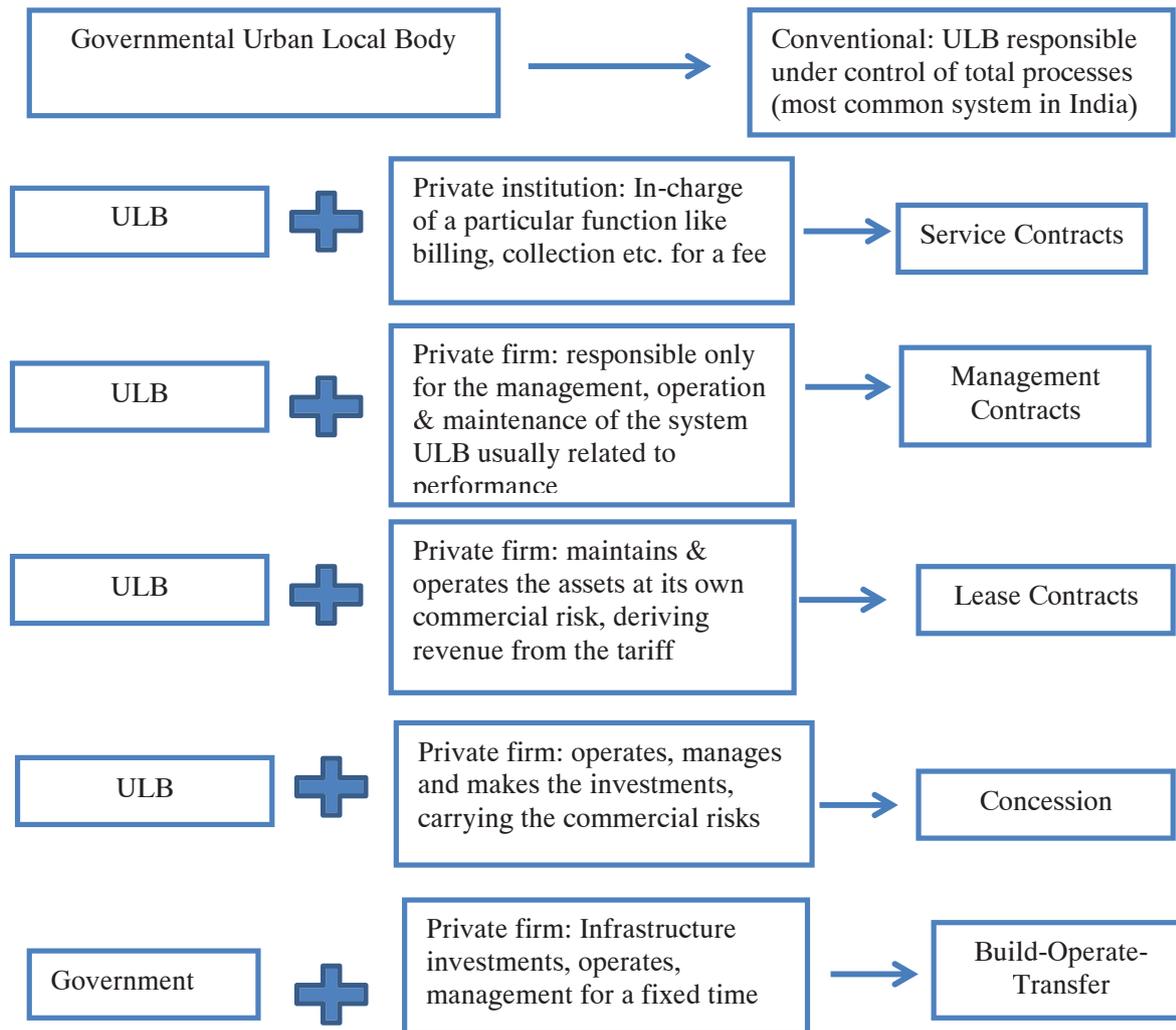
Source: Anand Jalakam, *Water Utility Management: Working Paper - 10*, page 439, National Water Resources Framework Study, CEEW, 2010

**Table A2.4: Responsibility and risk matrix for delegated management contracts**

Responsibility	Service Contract	Management Contract	Lease Contract	Concession	BOT/BOOT
Duration (years)	2 – 3	3 – 7	8 – 15	15 – 30	15 – 30
Ownership	Public	Public	Public	Public	Private and Public
Capital	Public	Public	Public	Private	Private
O&M	Private	Private	Private	Private	Private
Commercial Risk	Public	Public	Shared	Private	Private
Overall Risk	→				

Source: Simon Gordon-Walker and Anand Jalakam (2010) *Water Utility Management: Working Paper - 10*, page 472, National Water Resources Framework Study, CEEW

Figure A2.8: Existing contractual systems in water supply sector in India



Source: DEA (2009) *Position paper on the water and sanitation sector in India*: Department of Economic Affairs, Ministry of Finance, Government of India

Several PPPs have been established in the WSS sector in India, each using one of the contractual mechanisms mentioned above. A list of the current PPPs in the WSS sector in India is provided in **Table A2.5**. That said, concerns about

negative public opinion, contractual conditions, investment routes and regulatory leverage have been among the reasons why several states remain to enter into PPP contracts.

Table A2.5: Current public private partnerships in water supply and sanitation sector in India

	City/value	Operator	Scope	Private investment	Status (as of June 2011)
1.	Tirupur (1993) Rs 1000 crore	IL&FS	To build, operate and charge for water supply	Yes: Rs 1000 crore	Operational
2.	Salt lake, Koltaka (2010) Rs 60 crore	Jusco-Voltas	30 year contract for management of water supply and sewerage -- distribution contract	Yes: Rs 60 crore	Under implementation
3.	Chennai (2006) Rs 473 crore	IVRCL	100 mld desalination plant – bulk supply on fixed rates	Yes: Rs 473 crore	Operational
4.	Nagpur (2007)	Veolia	7 year contract for 24x7 for distribution system -distribution, rehabilitation, augmentation and bulk supply	No: Management contract	Under implementation

	City/value	Operator	Scope	Private investment	Status (as of June 2011)
5.	Hyderabad		Non-revenue water reduction and performance improvement	No: Management contract	Being tendered
6.	Hubli- Dharwad, - Belgaum - Gulbarga (2005)	Veolia	4 year contract to increase connections, supply 24x7 water – distribution contract – in pilot areas	No: Management contract	Operational
7.	Latur, Maharashtra (2008)	Subhash Projects	10 year contract for distribution	No: Management contract	Work suspended as disputes arose on terms of contract and delays
8.	Mysore Rs160 crore	JUSCO	24x7– over million people and 150,000 connections	No: Management contract	Under implementation but may require renegotiation as final contract underestimated work and money
9.	Haldia Rs 100 crore	JUSCO	25 year contract for design, development, operation and maintenance of water supply in Haldia on lease (of existing assets) and BOT of new assets	Lease cum BOT	Under implementation
10.	Dewas (2006) Rs 60 crore	MSK projects	Bulk water supply to industries	Yes: BOT	Ongoing but is facing problems as industries are reluctant to take water at agreed rates; domestic supply is irregular and theft from pipeline is common.
11.	Khandwa (2009) Rs 115.32 crore	Vishwa Infrastructure, Hyderabad	Conveyance of Narmada water over 52 km and ensure 24x7 water supply	BOT (90% public financing of Rs 96 crore); concessionaire to invest rest and pay for O&M; base price Rs 12/ kl	Under implementation but long-term viability of project is questionable
12.	Shivpuri (2010) Rs 60 crore	Doshion-Veolia, Ahmedabad	Bringing water from Modhikheda dam and supply 24x7 to city	BOT (90% public financing of Rs 54 crore); concessionaire to invest rest and pay for O&M; base price of water set at 15.40 kl	Under implementation
13.	Naya Raipur (2009) Rs 156 crore	Jindal Water Infrastructure	Wells on Mahanadi, pipeline to city, treatment distribution and billing for 52 mld	BOT	Under implementation
14.	Kolhapur (2010) Rs 75 crore	Vishwa	76 mld sewage treatment plant	BOT (70% – Rs 52 crore public financing and to pay for fixed and variable cost of treated sewage)	Under implementation

Source: Planning Commission (2011) *Report of the Working Group on Urban and Industrial Water Supply and Sanitation for the Twelfth Five-Year-Plan (2012-2017)*: submitted to the steering committee on water sector

## V. What are the key conditions for success?

India has experienced mixed results in PPP projects in the WSS sector. Projects like Chandrapur (Gurukripa), Latur (Hydro-Comp) KUWAS IP (Veolia), Salt Lake (JUSCO) etc

are running successfully while few projects like Bangalore (Biwater), Hyderabad, Goa, Pune etc. were abandoned. The result does not always determine that the step taken was wrong or right. But it depends on the process followed and existing environment. Among the above mentioned projects which were abandoned many lacked proper project plans and

enablers. For example in Pune there was lack of supporting political environment.<sup>29</sup>

After evaluating the success and failure cases of PPPs in the WSS sector in India, Department of Economic Affairs, Ministry of Finance, Government of India made several recommendations on establishing a successful PPP in water sector (Table A2.6).

Drawing on the experience so far as well as recommendations offered for India, it is important to start engaging in more

depth on key issues. If PPPs have to be a feasible solution – with ownership and regulatory power in the hands of a public agency and with management expertise and financial assistance from the private partner – then at least three conditions will need attention:

1. Focus on water utility management, rather than finding a PPP contract
2. Defining clear roles for all agencies
3. Investigating ways to increase capital investment in WSS sector.

**Table A2.6: Key recommendations for creating an enabling environment for PPP to be successful in the urban WSS sector in India**

Sl. No	Area	Recommendation
1	Policy Level	<ul style="list-style-type: none"> <li>■ Due to investor unwillingness to commit large investments, Public funding is necessary for network rehabilitation</li> <li>■ Clarity in Tariff policy based on metering and volume of consumption</li> <li>■ Not very high Bulk water tariff</li> <li>■ State support through govt. machinery where the private players are unwilling to enter like collection</li> <li>■ Clarity in performance outcomes and their regulation</li> <li>■ Customer Education</li> </ul>
2	Project Level	Appropriate project structuring based on risk appetite, financial analysis
3	Enabling Environment	<ul style="list-style-type: none"> <li>■ Water and Sanitation Policy favouring PPP</li> <li>■ State Support for Private partner performance</li> <li>■ Regulation by contract with clear defined role of Regulator</li> <li>■ Strong Communication channel with all stakeholders</li> </ul>
4	Utility Level	<ul style="list-style-type: none"> <li>■ Capacity Building</li> <li>■ Standardisation in documentation</li> <li>■ Improving Information availability and accuracy</li> </ul>

Source: DEA (2009) *Position paper on the water and sanitation sector in India*: Department of Economic Affairs, Ministry of Finance, Government of India

29 DEA (2009) *Position paper on the water and sanitation sector in India*: Department of Economic Affairs, Ministry of Finance, Government of India

# Annex 3: Water utility management in the urban water sector

Proceedings of the first roundtable

Thapar House, New Delhi, 20 December 2012

**Present (in alphabetical order):** Mr SVK Babu (*Veolia Water India*), Ms Vandana Bhatnagar (*World Bank*), Mr Pranab Dasgupta (*Confederation of Indian Industry*), Dr Arunabha Ghosh (*CEEW*), Mr Vikas Goyal (*AECOM*), Mr Ramani Iyer (*Forbes Marshall*), Mr Abhay Kantak (*CRISIL*), Ms Debashree Mukherjee (*Delhi Jal Board*), Mr K. Ashok Natarajan (*Tatva Global Technologies Pvt Ltd*), Ms Brune Poirson (*Veolia Water India*), Mr Rubinder Singh (*IL&FS*), Mr Rudresh Sugam (*CEEW*), Dr (Prof) Chetan Vaidya (*School of Planning and Architecture*)

**Absent:** Dr Isher Judge Ahluwalia



CEEW-Veolia Water India First Roundtable

## Background

The first CEEW-Veolia Water India Roundtable on Urban Water Management was convened on 20 December 2012. The theme of the discussion was “Water Utility Management in the Urban Water Sector”. An issue brief discussing India’s challenges in the water supply and sanitation sector (WSS) and the role of water utilities was prepared by CEEW and circulated among the participants. The first roundtable was framed along the following 5 questions.

- What are the main characteristics of successful water utility management?
- What are the roles of the public sector and those of private firms?
- What functions are already performed by private contractors in urban local bodies in India?
- What kinds of contracts would enable better water utility management (including via public private partnerships) in the urban water sector in India?
- What are the key conditions that would allow a PPP to be successful in the urban water sector in the Indian context?

### I. The current status of WSS management

In India, water supply and sanitation (WSS) utilities have traditionally been government agencies. They have tended to suffer from a number of challenges:

- *Poor design.* Supply systems are often ill-designed and do not account for adequate provisioning of water in relation to demand. The non-integration of the sub-units of the utilities, like the technical and planning sub-units, results in models that do not prove successful in the long-term.
- *Poor operation & maintenance (O&M) practices.* The distribution system is in a bad shape in many cities and the carbon footprint of India’s water and sanitation sector (WSS) is also high. Moreover, utilities responsible for WSS service provision in India have also been badly affected by the growth of urban infrastructure as incoherent planning practices in India are increasing as a result of increase in demand for urban infrastructure.
- *Lack of accountability.* Responsibilities pertaining to service provision are shared amongst several departments which affect the accountability. The utilities do not liaise sufficiently with local government bodies either, and thus fail to promote transparency.
- *Poor data and transparency.* There is a lack of sound data system and statistics of coverage, metering and production are not fully reliable. All participants recognised the absence of a well-managed data inventory system required for various purposes like modelling,

asset management, benchmarking, formulating healthy contracts etc. Moreover, utilities often tend to think of themselves being an engineering organisation instead of a service delivery body. This leads to an inefficient service and dissatisfaction by the end-users. A poor information dissemination system creates consumer dissatisfaction.

- *Inadequate investments.* Poor financial management leads to the weakening of institutions that are already short on capacity.

### II. What should be the characteristics of an efficient water utility?

The group discussed a range of desired outcomes for water utilities in the areas of operations, infrastructure, customer satisfaction, community welfare, natural resource stewardship, and financial performance. The group agreed that a utility should:

- be accountable for its services,
- be able to provide equitable service to all the sections of the society,
- have a well-managed, transparent distribution system,
- understand its stakeholders and ensure good communication with its consumers to understand their needs and inform them,
- have efficient billing and collection system,
- manage operations of its technical, commercial and planning units in an integrated manner, and
- have a robust system to ensure asset inventory and management practices.

### III. What are the reasons behind the poor status of the Indian WSS sector?

#### *Mindset of Indian utilities*

As utilities in India do not comprehend the responsibilities associated with service-delivery, no major initiative to develop communication with the consumers has ever been initiated by an Indian utility. Stakeholders are seldom consulted during any decision making (although the discussions revealed that in the case of the Delhi Jal Board, efforts were being made to engage with Resident Welfare Associations). Due to the lack of expertise and experience in an isolated decision making process, setting up entirely new, at times even investment-intensive design structures, is often proposed as a solution to the problems rather than managing assets in an efficient and intelligent way.

#### *Lack of capacity*

The entities working in the WSS sector have never focused on capacity development and have, thereby, accumulated a large unskilled labour force. The recruitment procedure is outdated and the WSS system lacks trained managers who could potentially give a lease of life to management processes within utilities. It was also noted by the group that capacity even within the private sector is limited in terms of the management and technical skills needed to run water utilities across the country.

#### *Lack of database preparation and management practices*

The practice of creating and managing data in order to estimate efficiency of various processes, manage asset inventory and conduct benchmarks is absent. Due to the lack of data it is very difficult to estimate the feasibility of any project. This has been one of the major reasons for failure of several initiatives taken in the WSS sector.

#### *Non-integrated Planning*

Utilities are often not the only agencies responsible for poor WSS services. Urban infrastructure development agencies have not taken into consideration suggestions by WSS utilities while planning development projects. As a result, new housing and commercial establishments suffer from poor water provision or secure water from unsustainable and costly sources. There are again instances of changes in this regard, such as in Ahmedabad where various departments were integrated to develop the strategy for water supply provision.

#### *Political instability and interests*

Politics cannot be dissociated from water. Politics, at the local as well as national level, plays a crucial role in determining the growth of the WSS sector. The problem resides in the fact that due to vested interests, politics does not allow rational and equitable growth of the WSS sector.

#### *Lack of private sector participation in the WSS*

The lack of interest of the private sector to invest in the WSS sector has led to further degradation of the sector. A few private players like Veolia, Suez, JUSCO etc. who have experience in the WSS sector are entering into partnerships with public sector in India. But private sector firms complain that they are unable to anticipate policy changes and, therefore, unable to account for the viability of their projects in future. In the absence of a standardised process for loan procurement, financiers are unwilling to finance WSS projects.

## IV. What could be done to create an enabling environment for India's WSS sector?

Restructuring critical components of water utility management will be essential to create an enabling environment for India's WSS sector. They could be categorised broadly into political, economic, social, and technical aspects.

#### *Political environment*

- a. Access to water is a human right, so it is not recommended that politics be completely disassociated from water. Effective and equitable water supply and sanitation has a crucial role in developing the overall health of the citizens and political actors are responsible to their constituents for the delivery of such a basic service.
- b. The group noted that at times it was possible that there would be a real or perceived conflict between water as a right and the desire to run water utilities as corporations. Therefore, a narrative and logic of change had to be articulated, so as to create the conditions under which such a conflict could be minimised.
- c. The political vision should be people-centric and should match the service-delivery mission expected of water utilities. This means that, both, the goals of the utility and that of political entities should be focused towards citizen welfare.
- d. Similarly, access to toilets and sanitation had strong political resonance and ways to increase investment had to be explored.
- e. Political leaders and agencies should be assisted by experts during the decision-making process. The group noted that while political will should support private investment and involvement, the responsibility of execution and achieving results would be that of the private sector.
- f. Once contracts have been finalised between utilities and other entities, political actors should not violate any of the clauses that could undermine the contracts.
- g. Finally, it was important to recognise that each state had its own culture, language, geographical and political setting. While certain principles would be common, the solutions had to be carefully crafted to fit unique settings.

#### *Economic environment*

- a. *Benchmarking:* Efficiency estimation and benchmarking against international utilities is required to set future goals. This process would require the creation of data inventories and mapping the attributes for each utility.
- b. The economic viability of a project, such as its ability to repay debts and generate capital in a sustainable manner,

should be tested before making any investments. This would also make it easier to garner support from financial institutions.

- c. *Standardisation:* Due to lack of any standard process of loan procurement for a WSS project, the private sector is often reluctant to invest. A core group of experts could define the document requirements and certification system for projects in WSS sector.
- d. The process for lending money for a WSS project in India should be also standardised. A set of requisite documents should be prepared, the availability of which would make it easier for banks to scan feasibility of a contract and approve loans. Standardisation of the process would also facilitate the task for those applying for loans.
- e. Governments should facilitate investment by financiers by providing complete TORs, economic security, political security.
- f. On increasing tariffs, the group recognised that after a basic minimum of water had been supplied to all households, there was a need to increase water tariffs rationally. But it also emphasised that only increasing water tariffs is not sufficient for improving the current status of utilities because the billing and collection system is inefficient.
- g. It was recognised that if non-revenue water could be reduced, then water utilities could also manage to service debts.

#### *Social Environment*

- a. Equitable service provision to all the sections of the society is a must. Therefore, the focus should shift to providing water to those who do not have access to it while designing extension of network lines.
- b. The minimum amount of water required for supporting life should be available to all the areas to prevent social unrest.
- c. A range of stakeholders from different constituencies should be involved in decision making. This will not only help promote transparency but could also ensure that civil society groups that are opposed to certain projects and policies have a voice in the design and execution of projects.
- d. A seamless process of information exchange between the customer and service provider is must for any project to succeed.
- e. It is necessary to inform the society by spreading public awareness about the water resources availability, challenges in service delivery, the water-health nexus etc. through workshops, roadshows, public information campaigns, etc.

#### *Technical / Human resources*

- a. Focus on water distribution as that is the key challenge. This would help to reduce non-revenue water and result in energy savings as well.
- b. Integrated resources management, through the involvement of various agencies engaged in urban planning, is required for sustainable growth and to ensure that water utilities are not overstressed.
- c. The group recognised that the overall efficiency of water utilities could not be improved simply by changing the management structure or the employees working at higher positions. Capacity building, more than structural change, was needed.
- d. Class III and Class IV employees of water utilities, who are actually working on the ground, need much more training in order to create a pool of skilled human resources at these levels.
- e. Lack of capacity in various departments and at various levels must be identified and catalogued with urgency.
- f. Utilities that are suffering from lack of skilled workers also fail to use state-of-art technologies. Besides encouraging use of new technologies in the WSS sector, attention must be paid to training of labour and recruitment of skilled labour.

## V. Ways ahead

It is important to consider certain steps to begin paving the way for a sustainable, equitable and efficient WSS sector in India:

- a. Better communication with employees to enhance understanding about the 'service-deliverer' role of a utility
- b. Capacity building and training workshops for workers at all levels.
- c. Development of mechanisms/instruments that would help integrate urban infrastructure planning with urban water management
- d. Asset management by creating data inventories using a single template.
- e. Benchmarking of utilities by mapping attributes of various Indian utilities and encouraging comparison and competition with other national as well as with international utilities.
- f. Creation of a core group of experts nationally as well as in each state, which could help in developing a proper framework as well as act as a consulting body to decision makers.
- g. Creation of a certification system in the WSS sector on the lines of existing practices of Navratnas.

- h. Strengthening independent monitoring and regulatory bodies.
- i. Making the loan process easy by standardising the loan procurement process.
- j. Development of a holistic feasibility study before validation of projects covering all aspects: engineering, resources management, existing social and political environment, and profit.
- k. Removal of existing bureaucracy from the system.
- l. Ringfencing of utilities.
- m. Integration of technical, commercial and planning units in the process of decision making.

A well-informed political system, a supportive social system, an evidence-based technical and skilled human resources system, and a standardised economic and regulatory system could help address shortcomings in India's WSS sector.

## VI. Research areas identified

1. Map attributes of Indian utilities for proper benchmarking
2. Outline the key clauses that should be common to all contracts
3. Compare and document the key features of some of the recent PPP agreements that have happened in India in water sector (viz. Haldia, Nagpur, Mysore, DJB Malvia Nagar, DJB Nangloi, etc.). The objective of the exercise would be:
  - To examine how various types of risks have been addressed (and distributed/ allocated) to different stakeholders and the context in which each of those projects happened
  - To examine how these project structures and risks compare with the Model Concession Agreement of the Planning Commission, especially in terms of the principles of risk sharing in the Indian context
  - To draw inferences on the key terms/ clauses of project structuring/ risk sharing that should be covered in future PPPs in the water sector
  - To serve as a guideline for a model concession agreement for BOT projects in water sector

# Essay 1: Building capacity and an efficient funding mechanism in the urban water sector in India

*Chetan Vaidya and Pushpa Pathak*



Chetan Vaidya

## Challenges of urban water supply sector in India

According to the Census of India 2011, the access to water supply has improved in urban India in the past decade. Access of urban households to tap water, or piped water supply, has increased from 68.7 per cent in 2001 to 70.6 per cent in 2011. The availability of drinking water within the premises has also increased from 65.4 per cent in 2001 to 71.2 per cent in 2011, although some of these households still depend on other sources of drinking water than piped water supply.<sup>30</sup>

The National Water Policy 2002 sets an ambitious goal of providing adequate safe drinking water facility to the entire population both in urban and in rural areas by 2025.<sup>31</sup> Considering the slow progress being made in improving access to safe drinking water in the past years, the inevitable question that can be raised is: Is the target of total coverage of population by safe water supply achievable in about a decade's time? This task is particularly daunting in view of the magnitude of investments required in the urban water supply sector in India. According to the High Powered Expert Committee (HPEC), the capital investment requirement of providing 24/7 water supply to all residents in urban areas of India alone is estimated to be Rs.320,908 crores for the twenty year period 2012-31.<sup>32</sup> Some of the key issues in delivery of adequate safe drinking water to the urban inhabitants in India are:

1. **Institutional Arrangement:** There are significant variations across states in the institutional arrangements for providing water supply service. However, state governments continue

to play an important role in the way water is supplied in most states. There is little decentralization to Urban Local Bodies (ULBs) as per subjects for devolution suggested in the 12<sup>th</sup> Schedule of the 74<sup>th</sup> Constitutional Amendment Act, 1992. In most states, elected Mayors do not have executive powers. The role of parastatal (such as utility boards/authorities) and ULBs is often not clearly defined for project planning, implementation and operation and maintenance (O&M). Separation of capital works, funding and operational responsibility creates O&M and cost recovery problems. ULBs have no say in the design of the capital works/schemes that they have to run and maintain. Limited local accountability, especially to the consumers, if service is provided by a state department/board/authority is another problem. Most institutional reforms for decentralisation, privatisation and CBO/NGO engagement are taking place under various centrally sponsored and donor funded projects and not on a regular practice basis.

2. **Financing, Pricing and Cost Recovery:** There are a range of issues associated with the financing of water supply services. State governments prescribe the minimum water charges and ULBs or service providing bodies can set up prices above it, subject to state approval. The price is fixed basically for recovering O&M cost. Capital or investment cost is often borne by the centre/state/donors. The incidence of non-revenue water is high in all cities. The billing is often done for a fraction of the O&M cost indicating that there is inadequate willingness to charge, not only limited willingness to pay. This also suggest that when even O&M cost cannot be met by the cost recovery of user charges, recovering capital cost and further financing of service expansion and improvement becomes a major challenge.
3. **Capacity Limitation:** The issue of weak technical and managerial capacity of the institutions engaged in delivering water supply service has been often emphasized. An important point to note in this regard is that if water supply

30 Census of India, 2011: Houses, Household Amenities and Assets: Drinking Water, Summary Tables.

31 Government of India, Ministry of Water Resources: National Water Policy, 2002.

32 HPEC for Estimating the Investment Requirement for Urban Infrastructure Service: Report on Indian Urban Infrastructure and Services, March 2011.

responsibility is handed over to the ULBs following the decentralised municipal service delivery principle, most of the ULBs will not be in a position to handle it efficiently and effectively without significant capacity enhancement initiatives.

## Major recent initiatives

In the context of various issues as outlined above, the following two initiatives need to be considered as important steps forward:

**Service Level Benchmarks:** The Ministry of Urban Development, Government of India has prescribed service level benchmark for a number of urban services including water supply.<sup>33</sup> The service level benchmarks shift focus from physical infrastructure to service delivery outcomes. The Thirteenth Finance Commission has made adherence to these a necessary condition for ULBs to obtain performance-based grants. Summary of Service Level Norms for Urban Water Supply are given below:

Norms for Urban Water supply	■ 100 per cent individual piped water supply for all households including informal settlements for all classes of cities
	■ Continuity of supply: 24x7 water supply for all classes of cities
	■ Per capita consumption norm: 135 Litres Per Capita Per Day for all size class

**JNNURM:** The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was launched in December 2005 to bring about urban renewal with a focus on inclusive development of urban centers. The mission is the single largest initiative of the Government of India for planned urban development that integrates the two pressing needs of urban India: (i) massive investments required for infrastructure development and (ii) reforms that are required to sustain investments.

The JNNURM was launched on a mission mode for a period of seven years to bring about planned urban development in India. With its two sub-missions, Urban Infrastructure and Governance (UIG) and Basic Services for Urban Poor (BSUP), the mission formulated reforms and projects. The Peer Experience and Reflective Programme (PEARL) is another programme under JNNURM for knowledge sharing

on planning and implementation of urban reforms and projects.

The States and ULBs accessing the JNNURM funds must complete a total of 22 mandatory and optional reforms, during the seven-year period (2005-12). These reforms for urban water supply are: (i) Implementation of 74th Constitution Amendment Act; (ii) Transfer of 12<sup>th</sup> Schedule functions to ULBs; (iii) Regular disclosure of budgets, projects, revenues, financial statements, etc.; (iv) Integration of City Planning and Delivery Function with ULBs; (v) Accounting Reform; (vi) Property Tax Reform; (vii) At least 100 per cent collection of O&M expenditure; (viii) Municipal Cadre; and (ix) Encouraging Public Private Partnerships.

JNNURM has certainly drawn attention of the policy makers at all three tiers of the government on the challenges faced by the cities and towns of India. It has succeeded in getting the state and city governments to commit to reforms in governance, but the commitments have not always been kept.

## Way forward

The service level benchmarks and JNNURM 1 have made a good beginning in reforming the urban water supply sector. The proposed JNNURM 2 offers an opportunity to bring in further urban reforms and make more investments in urban water supply. Some of the key recommendations to make these reforms more effective, especially for capacity development are as follows:

1. There should be a separate mission on capacity development.
2. The proposed program should focus on setting up municipal cadres in the states and capacity development of staff at the local level.
3. Performance should be based on measurement of service levels before and after implementation of the programme.
4. Water and energy audit should be a pre-condition for project approval.
5. There should be a financing window to encourage private sector participation and market-based financing of water supply projects.

33 Ministry of Urban Development, the *Handbook of Service Level Benchmarks*. 2008.

## Essay 2: Planning and design strategies for water

*A. K. Jain*



A. K. Jain

Planners and architects play a vital role in planning of a city, its infrastructure and building design which concern water production, supply and distribution. A city development plan provides a mandatory shape to the concepts of water oriented planning and sustainable development.

Unplanned developments viz. the industries, sanitary landfill sites, power stations, housing, unauthorised colonies, slums, etc. along the wetlands, water bodies and rivers adversely affect the quantity and quality of water and significantly alter the hydrology. Many water bodies in urban areas have vanished due to incompatible land uses and encroachments. It is necessary that the land use pattern is carefully worked out so as not to precipitate such a situation. It is equally essential to provide proper sanitation, sewerage and solid waste disposal system to avoid the pollution of water. It is a paradox that while on one hand we face the water crisis, on the other there is flooding during the monsoons. This is largely due to lack of water oriented planning and design. Excessive hard paving of open areas, disturbing the natural contour and flow of drainage, building of structures and roads in the natural depressions, silting of drains, water bodies and rivers, disposal of high amount of solid waste in water bodies, etc. are responsible for an impending water crisis.

Planning and design strategies need to consider a detailed analysis of hydrology, topography, aquifers, rainfall, flooding, drainage, vegetation cover and water harvesting potential, with site specific environmental considerations, local skills and traditional cultural and community practices.

### Water-oriented planning and watershed management

The starting point of urban planning is the convergence of “blue and green networks”. It means identifying the natural drainage, water channels, canals, flood zones, etc. and protect them by

green portals. It involves arresting the run-off and conservation of natural valleys, water bodies and aquifers. The natural drainage system should be meticulously studied for allowing maximum ground water recharge and rainwater harvesting in the natural or man-made catchment areas. The retention ponds, sediment traps and balancing lakes can be developed for storage of the surplus rainwater during the monsoons rather than allowing it to flood the downstream areas. Watershed management should ensure the conservation of natural valleys, water bodies and aquifers. This needs segregating wastewater disposal from storm drainage. Green networks enveloping the surface water bodies protect the ecology, as well as provide a pleasant environment. Simple methods of site planning, which incorporate porous/semi permeable paving, drop inlet/down pipe, sediment trap, storm sewer, retention ponds, etc. contribute in maintaining ground water table. In order to maintain the equilibrium between the natural eco-system, water and human activities, decentralised planning and community participation is the backbone of water oriented development. The basic principles of Water Oriented Development (WOD) is to confine urban development to the uplands, and protect the wet-lands, streams and water bodies by leaving adequate fringes of vegetation and giving them community ownership, sacred or legal shield. It aims to preserve and utilise the natural drainways and maximise conservation of water by various methods, such as, underground rainwater storage, contour trenching, pits, deep holes and wells, stepwells, tanks, baolis, ponds and balancing lakes. Porous paving on service roads, footpaths and parking areas over a bed of pebbles and coarse sand allows water percolation. To save underground water from pollution soak pits, septic tanks and landfills must be located at a safe distance (say 20 to 30 m). On-channel storage helps in groundwater recharge.

The quality of river water should be protected by securing a continuous flow, aquatic life and installation of water purification facilities. This needs a comprehensive and interlinked plan of

water sources, drainage, waste water treatment and sewage. This needs strict pollution control measures and eco-sensitive land use controls. Water flows need to be controlled at the riverbank and marked at each kilometre station. The valleys should be zoned for greenery and forests, so that an attractive water portal can be created in urban areas.

Mandatory performance bonds and liability insurance should pay for all damages plus any corrective measures, which might be needed in case of water pollution by any developer/industry or department. As a rule, no new development, manufacturing, process or operation of any polluting activity should be permitted, which may result in the significant degradation of any water resource. For example, Delhi Master Plan 2021 mandates recovery and landscaping of the old canals and water channels (350 km long) and conservation of 600 odd water bodies as prime areas of water storage and recreation. This would also help in a quicker, efficient and economical drainage, replenishment and enrichment of underground water table, availability of rolling greens and recreational areas, linking the population with the waterfront, improving the micro-climate, and interconnected parkways. Simple, wild and natural landscape of water corridors would be ecologically important rather than elaborate, exotic landscaping.

## Water conservation and efficiency

The wasteful practice of “drill, pump, and spill” has to be replaced by efficient methods of water conservation, use, and recycling. There is a need to incorporate the mandatory stipulations for water saving tanks, flushing system, gadgets, faucets, showers, pools, fixtures, tanks, etc. in the Building Bye-laws. All large buildings should incorporate the rainwater harvesting, wastewater recycling and dual piping system. While one piping system will feed the primary treated rainwater for washing, water coolers and garden taps, the second for supplying municipal potable water. All buildings having a discharge of over 10,000 litres a day should incorporate wastewater recycling, which can be used for horticulture purposes. For conservation of urban water supply, large public buildings should have twin or triple water systems: one for drinking water, which comes from public utility, second for the rainwater, which is supplemented by treated wastewater for washing, gardening and non-drinking purpose. Micro drip irrigation and xeriscaping can be adopted to save water for irrigation and gardening. To discourage

mosquito breeding in stagnant water, small fountains and cascades can be provided. Leak detection and rectification works should be assisted by the utilities. Meters should be installed for consumers of municipal water and ground water, and also for waste water discharge.

## Recharging of aquifers

Indiscriminate extraction of ground water can be controlled through registering boreholes and charging for water extraction. It can be regulated by measures, such as metering and taxing groundwater and augmenting its recharge through spreading techniques, check dams, percolation tanks, direct injection methods and utilizing the abandoned structures for rainwater harvesting.

## Minimise non-revenue water

One of the simplest, but cost-effective and pragmatic ways to improve quantity and quality of water supply is to reduce unaccounted flow of water (UFW) and production losses at the treatment plants. About one-third of the water in Indian cities that is treated and distributed at public expense is non-revenue water. This is due to unrecorded usage or illegal taps and water connections. Reducing water losses is cheaper than augmenting water capacity. Major strategies include installing, servicing and recalibrating meters, updating and reviewing consumer records to estimate consumption when meters are unserviceable and streamlining the procedures to assist consumers to take legal connection. With better cost recovery, it is possible to improve the quality and availability of water, even in low-income areas.

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## Essay 3: Using unconventional options for building an efficient urban water sector in India

*Manu Bhatnagar*



Manu Bhatnagar

Water resources are critical to the sustainability of urban regions. As India urbanises rapidly water supplies will be a constraining factor and vast capital investments will be required to keep pace with the demand. While financial sustainability is essential, resource sustainability is even more important. How the demand supply equation will be balanced without playing havoc with rivers, aquifers and eco-systems simultaneously averting societal conflict is the central question.

So far public utility engineers and “hydrocrats” have found it relatively easy to address the supply side of the equation. With opposition from local stakeholders, environmentalists, growing awareness of hazards of dam building in seismically active and geologically fragile regions and rising demand over space, this option is difficult to exercise and becoming politically explosive.

Thus, the time has come to address the demand side of the equation and for this there are several options. In a paper addressing the ‘Water Policy For Delhi’ the future water security is addressed through ten policy measures. With variation in emphasis these measures are replicable in most cities in India. The policy is built around 4 pillars:

- Demand management
- Optimisation of available resources
- Augmentation of local resources
- Equity

The policy measures are:

1. Focus on Demand Management with the objective of reducing present per capita consumption norm of 172 lpcd by a minimum of 10 litres every decade
2. Progressive use of recycled water thereby decreasing the fresh water footprint, closing the resource loop. Targets to

increase recycled water reuse are set as 25% by 2017, 50% by 2022, 80% by 2027

3. Decentralised treatment of wastewater will be promoted and alternative treatment systems will be encouraged provided they meet prescribed norms of treatment
4. Water devices efficiency rating system will be implemented encouraged by a progressive tax regime
5. Curtailing distribution losses at all levels of the distribution hierarchy to 10% by 2025
6. An overarching aquifer management strategy will be implemented with the objective of stabilizing the aquifers by 2020 and recovery to 1990 levels by 2030
7. Comprehensive database to be generated by metering up to micro-levels for water supply, macro levels for return water, real time data on aquifers, to assist policy implementation. Such metering is to be 100% completed by 2020 Ensuring access to water to every resident of the territory for their minimum water requirements in keeping with potential interpretation of Article 21 of Constitution of India and in accordance with UN Resolution to which India is a signatory. NCT Delhi would draw up a charter of water related duties and rights of the state and the citizenry in conformity with policy objectives
8. Delhi will take steps to restore river water quality to bathing quality by 2020 and also carry out ecological monitoring of the recovery of the riverine eco-system. Delhi will progressively reduce its abstraction of river water from Yamuna river by increasing its reliance on recycled water resources. The allocated unutilized volumes will remain in the river for maintaining river ecology
9. To track and integrate several strands of the dynamic water environment, internal and external to Delhi, a Water Resources Commission will be set up. The Commission would coordinate the actions of all agencies directly

concerned with water services, resource management, river issues, foster technological and administrative and financial innovations, track developments in the northern river basins, track climate change impacts on resources, benchmark performance on policy parameters

Urban water planning should start considering planning within urban watersheds as a planning unit. Groundwater, minimal surface water and maximum recycled water should form a virtuous and sustainable resource cycle. The aquifer management strategy would include the long delayed groundwater bill, regulation of water extracting mechanisms, ground water substitution by recycled water, using tertiary level treated effluent for indirect aquifer recharge, especially, through water bodies, abandoned quarries, storm water drainage channels. harvesting, The injunction of National Habitats Sustainability Mission on maintaining a fixed proportion of urban area as soft area for recharge needs to be seriously considered.

Surprisingly, there is no requirement for large urban user entities to state their water requirements while obtaining building licenses, unlike electricity where they are required to state their power requirements. Accordingly, large water users should submit their water management plan, including decentralised wastewater treatment and recycling, recharge strategy, conservation strategy. To sustain the plan there should be a regular water audit for such users and this exercise should be extended to existing large water users. Capacity building for water audit needs to be generated on the lines of energy auditors.

With all these measures vigorously implemented future water security can be ensured. In fact resilience to resource variability as a result of climate change is another intended impact of the policy. So far drought as an urban disaster event is not on the radar of disaster management agencies.

## Essay 4: Prioritising sectors that require improvement/investment for ensuring water for all

Vikas Goyal



Vikas Goyal

In their recently report, *Water in India: Situation and Prospects*, UNICEF (2013) has offered five key messages, namely:

1. New indices are needed to measure available water resources;
2. Water demand is far exceeding supply and leading to inter-sectoral conflicts;
3. The time bomb of increasing water pollution is ticking;
4. To achieve any headway in gender-sensitive policies, data disaggregation is urgently required; and
5. Reorientation and capacity building required for technocrats for a new vision for water management.

We all know the importance of above key messages. Still the core issues of rampant corruption and cheap politics impeding

the growth of water sector in India are not red flagged even after more than 65 years of our independence.

India is a diverse yet unified democracy. No single yardstick or policy can drive the business in water sector all across the regions as the complexity and adversities are different for each region and demography. So, how can the priorities for water for all be the same for them?

The stakeholders and their key roles, inter alia, in water sector development and management are presented below:

We understand the number of variables involved in above mentioned hierarchy. The priorities for each one of them is different, and we have listed them for the sake of fixing the order



of their Tasks for better delivery of water services.

The central government's top priority is policy formulation for the equitable utilisation of available natural resources (which includes water); budget allocation on annual basis for the development and management of water sector projects including providing counter guarantees for the sovereign lending to international financial institutions for the water sector projects in various states. As a river basin approach was adopted quite recently into our National Water Policy, its application and formulation of schemes based on integrated water resources management (IWRM) concept has not been complied fully at state level. Efforts are continuing at all levels through various national and state level programmes but it will take some more time to percolate down into the system.

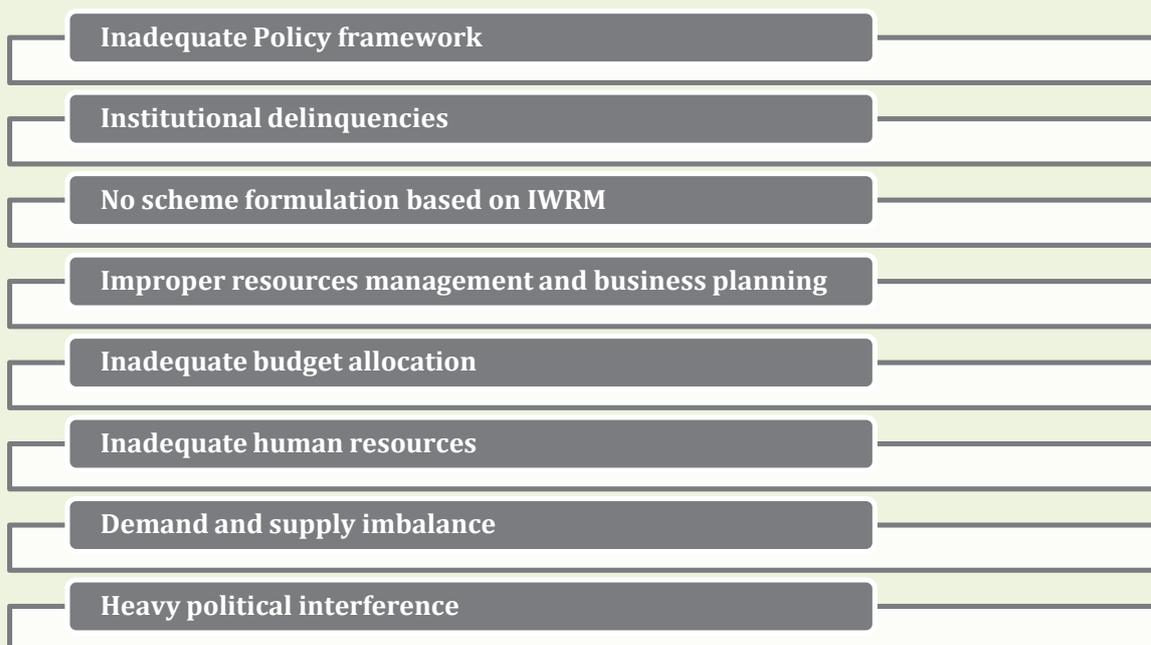
State governments' top priority is to formulate state water policy for the development and management of water sector as water is primarily a State subject. Their main impetus has been the development of new projects, which has rendered less focus on the rehabilitation of existing schemes. With the poor budget allocations for the operation and maintenance needs, the deferred maintenance needs have exceeded the optimum threshold levels and the schemes have lost their utilities. The primary reason for this failure is due to financial incapacity of the state governments which are even unable to recover the cost of O&M for each scheme generated. It has created the "B-N-R (Build-Neglect-Rebuild)" model,<sup>34</sup> which is looking for investments from either state or central governments.

A typical vicious cycle in which most of the states are reeling includes,

Despite the 74<sup>th</sup> Amendment to the Constitution, the situation of municipal bodies (except for some cities and states, which are covered under JNNURM-1) is not much better than state governments, because the former receive most of the support from the latter. It is a typical situation, wherein institutionally the state government has divested the responsibility of water supply to municipal corporations and have transferred their own staff to the assist the corporations. There has been no change in the current situation as the same of set of people who were controlling the water supplies earlier are now handling it in the name of different agency. There has been no fresh infusion of talent or business plan for each Corporation. The situation is grim for them due to following reasons:

- Inadequate policy support for the management of services;
- No outlook or master planning for the service delivery;
- Poor financial position due to inadequate budget and poor streams of revenue;
- Inadequate trained staff for the service delivery and its management;
- No "assurance" from State Governments for the supply side;
- Poor communication and outreach with the internal and external stakeholders;
- High expectations of delivery by State Government and local population;
- Local political interference

With growing pressure on urban areas in last two decades, the need for integrated planning and fund availability was felt by the Government of India. JNNURM has been instrumental in



34 Briscoe, John; Malik, R.P.S.. 2006. India's Water Economy: Bracing for a Turbulent Future. © New Delhi: Oxford University Press. <https://openknowledge.worldbank.org/handle/10986/7238> License: CC BY 3.0 Unported.

rejuvenating the urban space in the country. Since independence, it has been the country's first national flagship programme of this nature and size for the urban sector.

In a recent review report<sup>35</sup> many gaps have been identified at all the tiers as outlined above. It can be concluded that the proponents slipped through to understand the "atma (soul)" of the programme. They rushed through with project proposals, which were mostly ad-hoc in nature for which they were struggling to receive funds from their own state governments. The project proponents signed blindly on the dotted lines for the reforms required to be triggered for want of the funds required for the development of urban infrastructure. The delays were imminent as the project reports were poorly estimated and incomplete. Not much emphasis was given to the recovery of O&M costs and servicing of the debt. Due to acute shortage of trained staff, it was difficult to execute the project and it finally resulted into non-utilisation of funds provided for specific components. This situation has further complicated the matter by raising the expectations of the beneficiaries and raising their bill amounts, on one hand, and poor delivery on the supply side.

Learning from past, a workshop was conducted by Delhi Jal Board (DJB) in April 2013 to apprise the stakeholders about their expectations (CDP, DPRs, contract documents, PPP models, contracting models, etc., which are expected of prospective project participants). It is right approach wherein the project proponents have now understood their requirements and can thrive through a charted programme to achieve it. It is a wrong notion that once the document is approved by the authorities, it cannot be reviewed. In fact, it should be treated as "live" document, which can be modified as per the actual and future requirements.

The priorities at each tier of governance should broadly cover the following aspects.

## Central government level

The major priorities of central government should be as described below:

S. No	Priority at central government level	Why this priority is necessary
1	Robust database management of natural resources at National Level	For logical allocation of funds for various national level development program
2	Enabling policy directive for equitable utilisation of natural resources	For conservation and equitable utilisation of natural resources available within country
3	Political consensus on the supply and demand scenarios	The political consensus can only be built based on robust database analysis and management
4	Fund allocation on merit basis	The proponents adopting and practising reforms shall be awarded with financial support for bringing in the sense of competition among other states
5	Programme Management Support to State Governments	Programme Management Support Agencies are necessary to help State Governments in developing their vision documents, work with their institutions to formulate the systems and processes as per the requirement of proposed programmes and build capacities of partner departments by integrating their activities as per the need of each programme

The above priorities are interrelated and central ministries and the Planning Commission need to be consulted at each stage for effective implementation.

## State government level

The priorities for the state governments and their anticipated impact are presented below.

35 Appraisal of Jawaharlal Nehru National Urban Renewal Mission (JnNURM), Final Report 2011, Grant Thornton, New Delhi

S. No	Priority at state government level	Why this priority is necessary	Likely impact due to proposed priority
1	Database management and its yearly update	For logical allocation of funds for various state level development program	“Objective” planning the schemes with better transparency, governance, fund allocation and data availability in open domain
2	Political consensus on demand and supply scenarios	The political consensus can only be built based on robust database analysis and management	“Development” is now the political agenda
3	Policy planning and Regulation	For conservation and equitable utilization of natural resources available within state	Policy document with inclusion growth at regional and micro level
4	Institutional Planning and Management	For trained and motivated staff within each partner department to handle development mandate	Enabling environment to deliver services in time bound manner
5	Budget planning and management	Based on development plan as per available database and policy directive for each contributing department	Better fund flow between Central, States and Municipal agencies
6	Fund allocation on merit basis	The proponents adopting and practicing reforms shall be awarded with financial support for bringing in the sense of competition among other departments	Trigger “Competitiveness” so that beneficiaries are the real winners
7	Training, Capacity Building and Knowledge Management	It is a priority activity and continuous in nature. Dedicated budgets should be allotted for it in each programme	Social inclusion and mainstreaming of all class of people in the process
8	Programme Management Support to Municipalities/ ULBs	Programme Management Support Agencies are necessary to help State Departments in developing their vision documents, work with their institutions to formulate the systems and processes as per the requirement of proposed programs and build capacities of partner departments by integrating their activities as per the need of each program. Their tenure should not be more than 3-5 years	Holistically designed growth plans
9	Monitoring & Learning	It is necessary to review the implementation of program for any mid-term corrections and budgetary adjustments	For continuous improvements and mid-course corrections

The priorities as mentioned above may require reshuffling based on the social, economic and political situation of each state. For example, there are states which have greater experience in handling funded projects (e.g. AP, Maharashtra, UP, etc) and they need a different sequence of priorities versus the states which have very less experience (Bihar, Jharkhand, NE State, etc) will require different set of priorities.

### Municipal/ ULB level

The priorities for the municipal bodies/ ULBs and their anticipated impact are presented below.

The priorities as mentioned above may require reshuffling based on the social, economic and political situation of each municipal body/ ULB. For example, there are Corporations like Hyderabad, Surat and Bangalore, who have greater experience

S. No	Priority at municipal/ ULB level	Why this priority is necessary	Likely impact due to proposed priority
1	Programme Management Support	Programme Management Support Agencies are necessary to help in developing their vision documents, work with their institutions to formulate the systems and processes as per the requirement of proposed programmes and build their capacities by integrating their activities as per the need of each programme. Their tenure should not be more than 3-5 years	Competent agencies will work in time bound manner with Municipal bodies/ ULBs to act as interface with their staff and systems They will also defend them from queries raised by financial institutions, developers, suppliers, consultants and State and central government agencies
2	Master plan and vision document creation for urban services which includes water supply, sanitation, drainage, waste management, transport, mobility, etc;	This document shall act as “Bible” for each Municipal Body/ ULB for next 30-50 year horizon. Sufficient time and resources should be given for its development. Elaborate consultation and exposure visits of stakeholders are required during its development. Inputs of specialist agencies are required for its development.	It will pave the foundation for the short-term and long-term investment planning considering the available natural resources and challenges for the sustainability of schemes

S. No	Priority at municipal/ ULB level	Why this priority is necessary	Likely impact due to proposed priority
3	Database management and its monthly updation	For logical allocation of funds for various municipal/ ULB level development program	It is intended to eliminate the element of “subjective” approach and move towards “objective” approach in planning of schemes for better transparency, governance, fund allocation and ultimately robust regulation
4	Benchmarking of schemes on GIS Platform	It is essential to estimate the current health of existing infrastructure to compute investment requirements	It is essential for any developer to plan their investment requirement besides convincing financial institutions for funding It will also help “Regulator” to finalise investment plans, fixing up the KPIs for the Developers’ service levels and convincing the beneficiaries for fixing the tariff plans etc
5	Preparation of supply and demand scenarios	It follows the “bottoms up” approach for “actual” ground situation instead of “projected” scenarios. It has been found that “projections” have failed due to various social, political and economic reasons in most of the cases	It is essential for investment planning and cash flows for the sustainability of the schemes and investments
6	Regulation, budget planning and grass root level political consensus	For conservation and equitable utilisation of resources provided by state government based on actual demand and supply scenarios provided by each proponent  Make simple rules like adoption of “Integrated Water Management” models, instead of complex algorithms.	It is most crucial element for the sustainability and integrated development. The document needs to be customised for each zone/ city/ state as per milieu.  Bottom line is to build “Trust” which is essential for any Regulation to be successful. All parties should work towards this goal. Transparent procurement processes for services are required for better and time bound service delivery
7	Institutional planning and strengthening	For trained and motivated staff within each department to handle development mandate of the municipal and ULB. Priority should be given to local resources for enhancing employment opportunities and to create sense of “belongingness” among the local resources for the development	“A place for everything and everything in its place” can make any programme successful.  It is important to allow professionals to plan and operate this business.  The people associated with such projects should know well in advance about their career graph and opportunities for better deliveries and results
8	Training and capacity building	It is a priority activity and continuous in nature. Dedicated budgets should be allotted for it in each program  Focus should be on “Learning by Doing”	Hands on trainings are essential instead of sporadic short time exposure visits.
9	Service delivery, grievance redressal and CRM	“Customer is God” should be the theme.	Every customer is unique and should be tackled accordingly.  “Advance information” and “effective communication” both laterally and longitudinally is very important for winning trust among stakeholders.
10	Revenue recovery, Financial management and Regulation	Financially inclusive, customer friendly and technologically advanced tools should be created and implemented to address these aspects.	It is essential for cash flows, servicing the debt component, and sustainability of better services. More importantly, to build confidence among the financial institutions, contractors, developers and suppliers besides own employees
11	Technology, Innovation and Knowledge Management	Adoption of technology for environmentally and ecologically sustainable solutions, reduction of carbon footprint, rationalization of land resources, conservation of natural resources, Creation of Resilience for disaster preparedness should be the approach of each proponent Municipal and ULB	To rationalise the cost of operation, maintenance and management of services.  Learning from the past and to prepare oneself from natural hazards, especially related to climate change, economic uncertainty and political imbalance, etc

S. No	Priority at municipal/ ULB level	Why this priority is necessary	Likely impact due to proposed priority
12	Mainstreaming surplus budget with new schemes	Allocation of budgets for new schemes based on vision document and mid course corrections (if any) for the social inclusion within each municipal and ULB	Evolve oneself as “World Class City” or “Green City” or alike to evolve branding of the city based on its culture, heritage, opportunities once stability is achieved.

in managing resources and have evolved systems through pilot programs versus the Municipal bodies which have very less experience in understanding the concept of service delivery and financial sustainability.

As we have already moved into the 12th Plan period, Indian economy and society face daunting challenges in the water sector.<sup>36</sup> With traditional supply augmentation options running the course, the time for complacency is long over. The demands of a rapidly industrialising economy and urbanising society come at a time when water tables are falling and water quality issues have increasingly come to the fore. Most of the rivers during the lean periods have become fetid sewers and billions of dollars have been spent for their conservation without any success. As we drill deeper for water, our groundwater gets contaminated with fluoride and arsenic. Open defecation by around 600 million people is our biggest national shame. Since drinking water and sanitation continue to be treated in

separate silos, both the quality of drinking water and that of sanitation gets compromised. In urban areas, this makes a large difference to the cost of provisioning clean water to users. Bottled water has already become billions of dollar industry.

With growing conflicts, we need to focus on “building resilience”. Resilience forces us to think more strategically about how we plan, build and run our cities — and ensure that our systems are working for all citizens.

The time is running out. We need to act fast. We need to think rationally out of the box as conventional solutions will not help and will consume more time and energy to achieve targets. It is very important to sensitize and rejuvenate the “self confidence” of the active players into the system by “empowering” them for delivery purposes.

36 Opening Statement by Prime Minister at the 6th meeting of the National Water Resources Council, 2012; Available at <http://pib.nic.in/newsite/erelease.aspx?relid=91211> accessed on 11 November 2013



# Annex 4: Private sector participation in water management and water for all

## Issue brief for the third roundtable

### Major challenges

- Mindset of Indian Utilities: Indian utilities considering themselves as engineering institutions
- Lack of skilled work force in all the water resources concerned departments
- Poor condition of infrastructure in the WSS sector
- Lack of culture of database preparation and asset management
- No practice of efficiency estimation and benchmarking of services
- Non-integrated planning of resources: Development planning agencies are not working in coherence with service providers
- Absence of certification system in WSS sector on the lines of existing practices of Navratnas

2001 to 1545 cubic metres as per the 2011 census.<sup>37</sup> India is not a water poor country but due to unequal distribution, abuse and inefficient management practices it is becoming a water scarce country.<sup>38</sup> Figure A4.1 below shows that poor governance and low tariffs are the core problems of WSS sector in India. Illegal vendors, who charge very high price of water to poor, are flourishing due to poor governance. The WSS sector is operated under civil servant rules and salaries. These rules are complex, outdated, and not appropriate for transparency and decision making. Low salary is one of the reasons that cases of illegal connections and allocation of contracts to undeserving proponents exists in the country. Low income discourages employees from performing efficiently and helping consumers. The WSS sector also suffers from the lack of accountability, which prevent the establishment of a healthy relationship with consumers. Consumers, in turn, remain unaware about policies and their entitlements, and thus incapable of holding the government accountable.

### I. Introduction

The water sector holds a very unique position. While it is a public utility like electricity and transport, it is also very closely associated with sectors like health and food, which are vital sectors for supporting life. Therefore, it is very important to treat water sector in a unique way and recognise multiple objectives. While clean water supply needs to reach everyone, the water supply and sanitation (WSS) system should be operated in a cost efficient manner like other utilities.

According to the Ministry of Water Resources, the per capita availability of water has reduced from 1816 cubic metres in

Low tariffs undermine the value of water. Due to lower tariffs and low cost recovery the public sector lacks financial power to invest in strengthening infrastructure facilities and operation & maintenance. This vicious cycle of high expenditure in water supply and treatment, low tariff of water, low cost recovery, under investment in infrastructure, and

37 PIB (2012): *Per Capita Water Availability*: Press Information Bureau, Government of India available at: <http://pib.nic.in/newsite/erelease.aspx?relid=82676>; accessed 24 January 2013

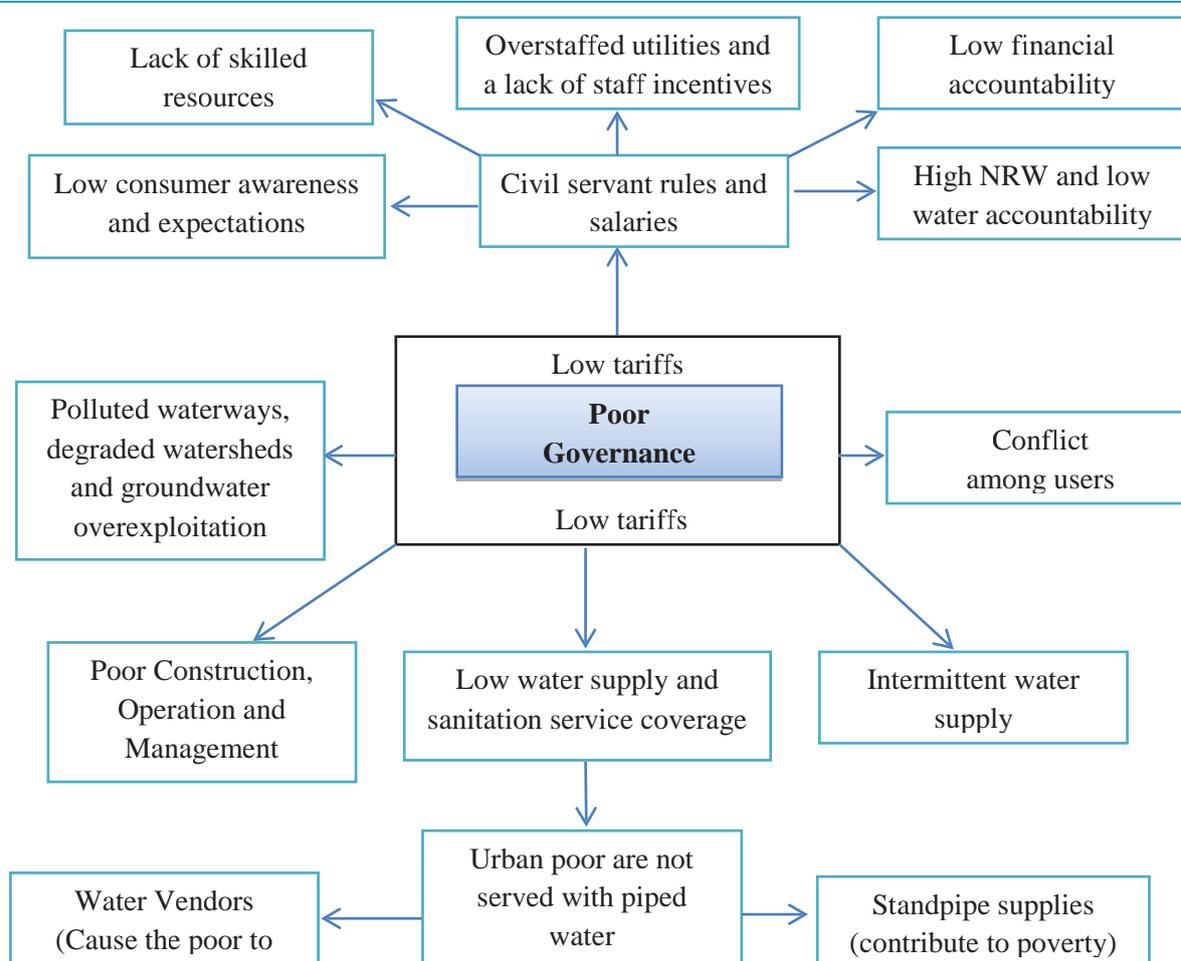
38 Narayan G. Hegde (2012) "Water Scarcity and Security in India," A presentation by Narayan Hegde, BAIF Development Research Foundation at the Indian Science Congress, 7 January. Available at [http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Water\\_scarcity\\_security\\_India\\_NGHegde\\_BAIFDRF\\_2012.pdf](http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Water_scarcity_security_India_NGHegde_BAIFDRF_2012.pdf); accessed 24 January 2013

low operation & maintenance (O&M) activity is weakening the whole WSS sector in India each day.<sup>39</sup>

Therefore, stakeholders need to come together to devise a way of using water in an efficient and sustainable manner. The public sector should provide a supporting environment

in water sector. With local, state and central governments feeling the heat of urbanisation, due to the inability of public utilities to meet the burgeoning water demand, they are also looking to the private sector to develop the WSS sector in India.

**Figure A4.1. Problem chart of Urban WSS system in India**



Source : ADB (2003): *Asian Water Supplies: Reaching the Urban Poor*: Asian Development Bank. Available at [http://www.partnershipsforwater.net/psp/tc/TC\\_Tools/004F\\_Asia%20reaching%20the%20poor.pdf](http://www.partnershipsforwater.net/psp/tc/TC_Tools/004F_Asia%20reaching%20the%20poor.pdf); accessed on 26 January 2013

by adopting and implementing an appropriate governance system, fixing accurate water tariffs, providing required incentives etc. while the private sector should help in investment and support in infrastructure development, capacity building, asset management, technology advancement, public awareness and research.

India has experienced huge private sector investment in infrastructure development of sectors like roads, telecommunication, power etc. However, water has been neglected so far. The major reason behind this is the lack of a well-established system and standardised processes to invest

Before proceeding further let us have a look at the current sanitation status (which includes water supply, sanitation facility and sewage treatment) of Indian cities in **Table A4.2**. The Ministry of Urban Development (MoUD), under the National Urban Sanitation Policy, developed a sanitation rating of 423 cities/towns of India, covering nearly all the states and union territories. The MoUD in consultation with cities identified 19 indicators, which are classified under output, process and outcome indicators, with a total of 100 points.<sup>40</sup> The survey was conducted in 2009-10 and on the basis of the points cities were classified into green, blue, black and red category, red being the worst. The classification system is given in **Table A4.1** below:

<sup>39</sup> Source : ADB (2003): *Asian Water Supplies: Reaching the Urban Poor*: Asian Development Bank. Available at [http://www.partnershipsforwater.net/psp/tc/TC\\_Tools/004F\\_Asia%20reaching%20the%20poor.pdf](http://www.partnershipsforwater.net/psp/tc/TC_Tools/004F_Asia%20reaching%20the%20poor.pdf); accessed on 26 January 2013

<sup>40</sup> Please find details in Annex - I

**Table A4.1: Rank of cities on sanitation 2009-10**

Category	Recommendation	Points
Red	Cities Needing Immediate Attention	<33
Black	Cities needing considerable improvement	34-66
Blue	Recovering	67-90
Green	Healthy and Clean City	91-100

MoUD (2010): Rank of Cities on Sanitation 2009-2010: National Urban Sanitation Policy, Ministry of Urban Development, Government of India. Available at [http://www.wsp.org/sites/wsp.org/files/rank\\_sanitation\\_rating.pdf](http://www.wsp.org/sites/wsp.org/files/rank_sanitation_rating.pdf); accessed on 23 January 2013

**Table A4.2. Result of sanitation survey of 423 cities in India 2009-10**

Category	Number	Percentage
Green	0	0
Blue	4	0.95%
Black	230	54.37%
Red	189	44.68%

MoUD (2010): Rank of Cities on Sanitation 2009-2010: National Urban Sanitation Policy, Ministry of Urban Development, Government of India. Available at [http://www.wsp.org/sites/wsp.org/files/rank\\_sanitation\\_rating.pdf](http://www.wsp.org/sites/wsp.org/files/rank_sanitation_rating.pdf); accessed on 23 January 2013

The results are alarming. None of the Indian cities could be listed under the green category and those categorised as blue were nominal. With almost all the cities surveyed being in the black and red categories, they need immediate attention for upgradation of the overall status of WSS sector. Whereas the private sector has played a crucial role in the development of many infrastructure sectors, there is a need to assess the conditions under which it could support the objectives of providing clean, safe, adequate and affordable water.

## II. Are private sector participation and water for all incompatible?

The short answer is no, with private entities performing various functions in the WSS sector throughout the world.

The scale and nature of work may vary from only leak repairs to management to ownership. **Table A4.3** below shows the diversity of work private players have already been doing. Even if we analyse the private sector contribution in WSS sector of developing countries overall, there has been an increase in the number of private players and the success of water PPPs.

An analysis of the four dimensions of performance (access, quality of service, operational efficiency, and tariff levels) by the Public-Private Infrastructure Advisory Facility (PPIAF) suggests that the overall performance of water PPP projects has been generally quite satisfactory. Out of 65 developing countries that entered into water PPPs during the past two decades, at least 41 still had private water operators, and 84% of all awarded contracts were active at the end of 2007. In the

**Table A4.3: Roles already performed by private sector in water utility management**

Activity	Who	Sector
Planning	Consultants	Private
Design	Consultants	Private
Detail Engineering	Consultants	Private
Funding	Government/Multilaterals	Public/Private
Procurement	Consultants	Private
Construction	Contractors	Private
Supervision	Consultants	Private
Treatment Plant Operations	Contractors	Private
Annual Maintenance	Contractors	Private
Connections	Licensed Plumbers	Private
Leak repair	Contractors	Private
Meter reading	Own Staff/Contractors	Public/Private
Billing	IT Company	Private
Cash collection	Banks	Private

Source: Anand Jalakam, Water Utility Management: Working Paper - 10, page 439, National Water Resources Framework Study, CEEW, 2010

last fifteen years, a total of 205 million people in developing and emerging countries have been served by water PPP projects. Some water PPPs have failed but that does happen in sectors experiencing new shifts.<sup>41</sup> The major reasons for failure were not project-specific, but linked with poor risk management, shortcomings in investment environments, and lack of capacities in host countries.<sup>42</sup>

The PPIAF study found that successful PPP projects exist in all regions of the developing world, including South

America (Colombia, Chile, Guayaquil in Ecuador, and several concessions in Brazil and Argentina), Sub-Saharan Africa (Côte d'Ivoire, Gabon, and Senegal), Asia (Eastern Manila in the Philippines), Eastern Europe and Central Asia (Yerevan in Armenia), and the Middle East and North Africa (Morocco). For some scholars, a positive development is that more and more local private players are entering into the water PPPs, a sector traditionally dominated by 5-6 big organisations.<sup>43</sup> **Table A4.4** offers examples of recent private sector entrants.

**Table A4.4: The diverse nature of the private sector: recent market entrants**

Categories of recent market entrants		Examples
Diversification into water of companies with core business elsewhere.	Firm moving into water as a business opportunity understanding the demand for WSS services and technologies.	Wastewater treatment plants: China. Desalination projects in arid, coastal countries (GE, Siemens). Trading companies offering water treatment systems, developing integrated services (Hyflux).
	Multi-utility spreading to water to enjoy economies of scale and cross-subsidisation across different parts of their business.	RUS & CES (Russian Federation), NWS Holdings (China), JUSCO (India), Ranhill & YTL (Malaysia), Davao Light & Power (Philippines).
	Construction firms involved in housing providing WSS services	In Asia and Latin America.
	Decentralised service provision by property developers.	Minimal water extraction and discharge in the case of the Payne Rd residential subdivision (The Gap, Brisbane).
Water Services by financial and investment companies	Due to water scarcity and competitive use issues. Water extensive companies like beverage, mining etc. entered into water resources provision and management services.	Nestlé, Coke. Penoles (Mexico).
	Growing worldwide interest of banks and financial groups, including institutional investors, in buying water service companies.	Consortio Financiero (Chile), CITIC1 (China).
Expansion by established water operators.	Local private operators taking over other projects internally or externally.	Latin Aguas (Argentina), Aguas Nevas (Chile), Tianjin Capital1 (China), ILFS and IVRCL (India), Ranhill (Malaysia).
	Public companies acting in a commercial fashion and venturing into the market.	Management contract won by Vitens Evides International (Netherlands) and Rand Water (South Africa) in Ghana. Affermage contract in Cameroon won by ONEP1 (Office National Eau Potable, Morocco).
	Privatisation of former public utilities.	Divestiture of EMOS (Chile). Partial privatisation of SABESP (Brazil) through share trading on the New York and São Paulo stock exchanges.
Joint ventures with foreign operators.	Utilising foreign investors' know-how, while mitigating the foreign exchange risk and facilitating local insertion. The local public and private sector are coming together with foreign private player.	<b>Public and private together:</b> Saltillo (Mexico) - SIMAS is a mixed company constituted by the municipality and Agbar. <b>Local and foreign private actors:</b> Manila Water - consortium of Ayala Corporation (Philippines), United Utilities Pacific Holdings, (subsidiary of United Utilities PLC, United Kingdom), Mitsubishi Corporation (Japan), IFC (World Bank Group), BPI Capital Corporation (Philippines)
Graduation of small-scale water operators.	The institutional and policy framework advocating more roles for small scale operators.	Mauritania delegated management model in small towns.
	Association of local operators to have their voice heard and share information and practices.	APWO (Uganda)

**Source:** OECD (2009): *Managing Water for All: An OECD Perspective on Pricing and Financing*: Organisation for Economic Co-operation and Development. Available at <http://www.oecd.org/tad/sustainableagriculture/44476961.pdf>; accessed on 25 January 2013

41 Philippe Marin, *Public-Private Partnerships for Urban Water Utilities: A Review of Experiences in Developing Countries*, PPIAF, 2009

42 OECD (2009): *Managing Water for All: An OECD Perspective on Pricing and Financing*: Organisation for Economic Co-operation and Development. Available at <http://www.oecd.org/tad/sustainableagriculture/44476961.pdf>; accessed on 25 January 2013

43 Philippe Marin, *Public-Private Partnerships for Urban Water Utilities: A Review of Experiences in Developing Countries*, PPIAF, 2009

India has experienced mixed results with PPPs in water. Until the mid-2000s there were many failures with even contracts that had been awarded being abandoned prematurely. More recently, the success rate of PPP contracts being awarded has increased; there were 16 PPP projects operational in India in 2011. Originally restricted to a few southern states, PPP projects have now spread throughout the country. Several models of PPP contracts, ranging from management contracts to build-operate-transfer (BOT) arrangements, are being developed. Such a shift in focus has probably been facilitated

and less dependence on multilateral agencies for funding has been observed. The most promising development is that the number of private players, especially domestic players, thus showing signs of increasing competition in the WSS sector. **Table A4.5** and **Table A4.6** below show the reasons behind the failure and success of recent PPP projects, respectively in the WSS sector in India.<sup>44</sup>

**Table A4.5: Factors contributing to the failure of PPPs projects in WSS in India**

Parameters	Inconsistent Stakeholder Support	Weak Financial Capacity and Tariff Mechanisms	Low Awareness and Capacity for PPP Projects
Krishna Raw Bulk water Supply project, Hyderabad	-	Unaffordable bulk water charge	Weak risk mitigation measures
Selaulim Bulk water Supply project, Goa	Lack of support at state level	Unaffordable bulk water charge	-
Water Supply and Sewerage project, Pune	Limited political consensus at local level	-	-
Cauvery Bulk water Supply project: Stage IV, Phase-II	Inadequate state government support	Unaffordable bulk water charge	Weak risk mitigation measures and lack of transparency in procurement
O&M contract, Sangli, Maharashtra	Limited political consensus at local level	Inability to raise capital	-
O&M contract for Mumbai K east	Civil society organisations (CSOs)/ Non-Government organisation(NGO) opposition	-	Lack of clarity on project need
O&M contract for 21 Pilot Zones, Delhi Jal Board	Limited employee engagement	-	-
O&M contract for 2 pilot zones, BWSSB	Limited employee engagement	-	-
O&M contract for 8 municipal councils, BWSSB	Limited employee engagement	-	-

**Source:** WSP (2011): *Trends in Private Sector Participation in the Indian Water Sector: A Critical Review: Water and Sanitation Program*. Available at [http://urbanindia.nic.in/programme/uwss/PSP\\_IWS\\_Detailed.pdf](http://urbanindia.nic.in/programme/uwss/PSP_IWS_Detailed.pdf); accessed on 26 January 2013

**Table A4.6: Factors contributing to the success of PPPs projects in WSS in India**

Project Name	Public Funding	Project ownership & expertise	Stakeholder Support	Strong Project Need	Reduced revenue risk	High Private operator Interest
KUWASIP: 24x7 water supply for Belgaum, Hubli-dharwad, and Gulbarga	World Bank loan to the state government	Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC)	Local political, NGO, and consumer support	High O&M inefficiency	Performance fees	-
Chandrapur O&M contract	-	Municipal department	Local political and consumer support	High operating loss	-	Domestic local operator

by the increased and changed nature of public funding support to water PPP projects in recent times. A shift from bulk water supply towards O&M of the distribution systems

<sup>44</sup> WSP (2011): *Trends in Private Sector Participation in the Indian Water Sector: A Critical Review: Water and Sanitation Program*. Available at [http://urbanindia.nic.in/programme/uwss/PSP\\_IWS\\_Detailed.pdf](http://urbanindia.nic.in/programme/uwss/PSP_IWS_Detailed.pdf); accessed on 26 January 2013

Project Name	Public Funding	Project ownership & expertise	Stakeholder Support	Strong Project Need	Reduced revenue risk	High Private operator Interest
Chennai desalination plant	-	Chennai Metro Water Supply & Sewerage Board (CMWSSB)	-	Water shortages	-	-
Lease contract for water supply system, Sector V Salt Lake City, Kolkata	Jawaharlal Nehru National Urban Renewal Mission (JNNURM)	Kolkata Metropolitan Development Authority (KMDA)	End user support	Unreliable supply	Safeguards provided	-
O&M contract for pilot zone, Nagpur	Nagpur Municipal Corporation (NMC)	Municipal department	-	High O&M inefficiency		
Management contract for O&M, Latur, Maharashtra	Prior public investments*	Maharashtra Jeevan Pradhikaran (MJP)	-	High O&M inefficiency	Performance fees	Domestic national operator
Industrial water supply contract, Haldia, West Bengal	-	-	-	Inadequate supply & high O&M inefficiency	Safeguards provided	-
O&M contract for water supply system, Mysore	JNNURM	-	-	-	Safeguards provided	Domestic national operator
Concession agreement for distribution system, Khandwa, Madhya Pradesh	Urban Development Scheme for Small and Medium Towns (UIDDMST)	Urban Administration & Development Department (UADD)	Local political and consumer support	Inadequate and unreliable supply	Safeguards provided	Domestic regional operator
Concession agreement for distribution system, Shivpuri, MP	UIDDMST	UADD	Local political and consumer support	Inadequate and unreliable supply	Safeguards provided	-
Concession agreement for bulk water supply system, Naya Raipur	UIDDMST	Naya Raipur Development Authority (NRDA)*	-	-	Safeguards provided	Domestic operator

Source: WSP (2011); *Trends in Private Sector Participation in the Indian Water Sector: A Critical Review: Water and Sanitation Program*. Available at [http://urbanindia.nic.in/programme/uwss/PSP\\_IWS\\_Detailed.pdf](http://urbanindia.nic.in/programme/uwss/PSP_IWS_Detailed.pdf); accessed on 26 January 2013

\* Factor of low significance in contributing to the success of the project.

### III. What are the main fears/risks of private sector participation in the urban water sector?

The main fears/risks involved with private sector participation in the urban water sector have been described below in **Table A4.7**:

**Table A4.7: Main fears/risks of private sector participation in the urban water sector**

What is the risk?	How does it arise?	What steps can mitigate the risk?	Who typically bears the remaining risk?	In what PPP option does the risk arise?	What steps can minimize risks?
<b>Design and development risk</b>					
Design defects in water or sewerage plant.	Design fault in tender specifications.	The public sector to provide a remedy or compensate project company.	The public sector.	BOT, concession (especially with new infrastructure).	Check tender specifications / specify outcomes not inputs.

What is the risk?	How does it arise?	What steps can mitigate the risk?	Who typically bears the remaining risk?	In what PPP option does the risk arise?	What steps can minimize risks?
	Design contractor fault.	Provisions in design contract requiring contractor to provide remedy or pay damages (insurance cover).	Design contractor. Once liquidated damages are exhausted, finance from project lenders is drawn down.	BOT, concession (especially with new infrastructure).	Monitor design work; replace contractors' insurance.
<b>Construction risk</b>					
Cost overrun	Within control of construction consortium Inefficient work practices, waste of materials.	Fixed lump-sum price in the construction contract with provision for reasonable cost overrun.	The construction contractor. Once liquidated damages are exhausted, standby finance is drawn down.	Concession, BOT.	Monitor and inspect construction work; provide for early warning mechanisms in the contract.
	Beyond the construction consortium's control Changes in law, delays in obtaining approvals or permits, increased taxes.	Allocation of cost overruns in the concession contract; purchase business interruption insurance.	The insurer. Once insurance proceeds are exhausted, the investor's return might be eroded because of timing effects.	Concession, BOT.	Obtain approvals in advance; anticipate problems and allocate risk in contract; use insurance.
Delay in completion	Within the construction consortium's control Lack of coordination between subcontractors	Liquidated damages from turnkey contractor (sufficient to cover interest to lenders and fixed operating costs).	The constructor. Once liquidated damages are exhausted, standby finance is drawn down.	Concession, BOT.	Monitor / inspect works; provide for early warning mechanisms in the contract.
	Beyond the construction consortium's control Insured force majeure event	Draw on proceeds from business interruption insurance policy.	The insurer. Once insurance proceeds exhausted, standby finance is drawn down, debt service coverage ratios reduced and investor's return perhaps eroded.	Concession, BOT.	Rely on insurance.
Failure to meet performance criteria on completion.	Within the construction consortium's control Quality shortfall, defects in construction	Liquidated damages payable by the construction consortium, supplemented by insurance.	The construction consortium and, once liquidated damages are exhausted, the insurer. Once insurance proceeds are exhausted, investor return is eroded.	Concession, BOT.	Monitor and inspect construction work; provide for early warning mechanisms; use insurance.
<b>Operation Risk</b>					
Operating cost overrun.	Change in operator's practices at project company's request	Project company to provide a remedy or compensation under the operating contract.	The project company bears the risk under the operating contract; debt service coverage ratios are reduced; sponsor's return is eroded.	Operation & Maintenance, concession, BOT.	Build flexibility into contract; cost changes in practices in advance; define acceptable reasons for changes; provide for changes in remuneration after initial period.

What is the risk?	How does it arise?	What steps can mitigate the risk?	Who typically bears the remaining risk?	In what PPP option does the risk arise?	What steps can minimize risks?
	Operator failure	Liquidated damages payable by the operator under the operating contract.	The operator. Once liquidated damages are exhausted, debt service coverage ratios and return are reduced.	Operation & Maintenance, concession, BOT.	Monitor and inspect operating practices; provide for early warning mechanisms.
Failure or delay in obtaining permissions, consent, approvals.	Public sector discretion	Risk allocated in the operating contract.	The public sector. Where there is no public sector discretion, licenses are processed quicker by the project company, so the project company bears the risk.	Operation & Maintenance, concession, BOT.	Obtain approvals in advance where possible; ensure clear division of responsibilities in the contract.
Shortfall in water quality or quantity	Operator's fault (malpractice)	Liquidated damages payable by the operator.	The operator. There is no effect on other parties until liquidated damages are exhausted, when debt service coverage ratios are reduced and the owner's return is eroded.	Operation & Maintenance, concession, BOT.	Monitor and sample water quality and quantity; provide for early warning mechanisms.
	Project company's fault	Liquidated damages payable by project company to the public authority.	The project company. There is no effect on other parties until payment of liquidated damages completely erodes shareholder returns, when cash flow may become insufficient and the project company's return is eroded.	Operation & Maintenance, concession, BOT.	Quantity: Ensure security of supply; enter into bulk water supply contracts. Quality: Monitor and sample water quality; provide for early warning mechanisms.
<b>Revenue Risk</b>					
Increase in bulk water supply price.	Service difficulties No security of supply.	Risk allocated by contract; adjust tariffs; if there are off- take and bulk water supply agreements, both guaranteed by the government, pass through the price increase.	As allocated by contract; bulk water supplier.	Lease, concession, BOT.	Fix price by contract and pass through price changes.
Change in tariff rates	Fall in revenue	Risk depends on extent of government support. Market risk can be mitigated by an off-take agreement / revenue guarantees. Otherwise, owners may use hedging facilities such as forward sales, futures and options.	The project company. There is no effect unless there is no common off- take agreement and unless hedging facilities are not in place or do not compensate for losses, in which case the return can be severely reduced.	Lease, concession, BOT.	Ensure a clear regulatory regime.
Water demand	Decreased demand	Risk depends on extent of government support. Use shadow tolls; use long-term take-or-pay off-take agreement that leaves the demand risk with the public utility (guaranteed by the government).	Risk depends on extent of government support. If there is no support and no off-take agreement, the risk is borne by the project company.	Lease, concession, BOT.	Ensure exclusivity of supply or level playing field against competitors. Regulatory regime may provide incentives to promote conservation (reduce water demand).

What is the risk?	How does it arise?	What steps can mitigate the risk?	Who typically bears the remaining risk?	In what PPP option does the risk arise?	What steps can minimize risks?
<b>Financial Risk</b>					
Exchange rate (ER).	Devaluation of local currency, fluctuations in foreign currencies.	Security package includes hedging facilities against ER risks such as currency rate swaps, caps, and floors.	There is no effect unless hedging facilities are not in place or do not compensate for losses, in which case the return can be severely reduced.	Operation & Maintenance, concession, BOT.	Require loans in local currency and same currency as revenue (if market exists).
Foreign exchange.	Non-convertibility or non-transferability.	Government guarantee availability, convertibility, and transferability (with ministry of finance a party to contract); project company can terminate if government defaults. Central bank to ensure foreign exchange availability.	The government. If the government defaults on its guarantee and the project company terminates, the government pays compensation for termination.	Operation & Maintenance, concession, BOT.	Transfer funds offshore as much as possible.
Interest rate.	Fluctuations in interest rates.	Same as above (for exchange rate risks).	Same as above (for exchange rate risks).	Operation & Maintenance, concession, BOT.	Negotiate fixed rate loans.
<b>Force Majeure Risk</b>					
Force majeure	Flood, earthquake, riot, strike, etc.	If risk relates to an insured event (such as earthquakes in certain regions), the policy is called; if not, standby finance is drawn down.	The insurer. There is no effect unless the event is not insured or is uninsurable. If the insurance policy is exhausted, there might be a severe impact on project returns.	Operation & Maintenance, concession, BOT.	Use insurance and government guarantees; clearly define <i>force majeure</i> in contract; include provision that government bears risk if changes project specific (rather than general).
<b>Regulatory Risk</b>					
Legal and regulatory.	Among others, changes in tax law, customs practices, environmental standards.	If, during the operating period, adjustment is possible (see provisions in contract on compensation).	The project company or operator.	Operation & Maintenance, concession, BOT.	
		During construction period, draw-down standby finance.	The contractor. Standby finance could be required.	Operation & Maintenance, concession, BOT.	
<b>Political Risk</b>					
Political.	Breach or cancellation of the contract.	The project company is entitled to terminate if the government defaults.	The government pays compensation to the project company if the company terminates.	Operation & Maintenance, concession, BOT.	Use insurance.
	Expropriation.	Take out political risk insurance with official bodies, such as export credit agencies, private companies, or involve multilateral agencies (IBRD, IFC) in the financial package.	Once the insurance policy is exhausted, the project company bears the risk. See clause in contract on expropriation.	Operation & Maintenance, concession, BOT.	Use insurance.
	Failure to obtain or renew approvals.	See contract.	The government.	Operation & Maintenance, concession, BOT.	Obtain approvals in advance where possible.

What is the risk?	How does it arise?	What steps can mitigate the risk?	Who typically bears the remaining risk?	In what PPP option does the risk arise?	What steps can minimize risks?
	Creeping expropriation (discriminatory) taxes, revocation of work visas, import restrictions.	See contract.	See contract. If the government has discretion, it should bear the risk.	Operation & Maintenance, concession, BOT.	
	Interference, causing severe prejudice (sometimes referred to as force majeure).	See contract.	The government.	Operation & Maintenance, concession, BOT.	
<b>Insurance Risk</b>					
Uninsured loss or damage to project facilities.	Accidental damage.	Insure against all the main risks.	Once standby debt finance is drawn down, the project company's return is reduced.	Operation & Maintenance, concession, BOT.	Quantify and allocate risk in advance in the contract.
<b>Environmental Risk</b>					
Environmental incidents.	Operator's fault.	Indemnity from the operator.	The operator. There is no effect unless the operator's payments are exhausted and standby finance is drawn down, in which case the project company's return is reduced.	Operation & Maintenance, concession, BOT.	Use insurance.
	Pre-existing environmental liability.	Provision for public sector clean-up or compensation.	The public sector.	Operation & Maintenance, concession, BOT.	Carry out detailed environmental survey; use insurance.

**Source:** MoUD&PA (2004) *India: Urban Water and Sanitation Services, Guidelines for Sector Reform and Successful Public-Private Partnerships*, Ministry of Urban Development and Poverty Alleviation, Government of India

#### IV. What are the specific roles of the non-profit, public and private sector in ensuring equitable access to water for all while reforming the water supply system?

##### *Role of Civil society organisations / Non-Governmental Organisations<sup>45</sup>*

- Community engagement for social mobilisation, raising awareness, generating demand and facilitating change:** Organising meetings of all stakeholders to build community consensus on equity, accountability and participation principles of decision-making and social action; information dissemination at different levels, mass mobilisation, campaigns through posters, leaflets, radio and television spots etc. For example, under the Total Sanitation Campaign (TSC) launched by the Government of India, the Anganwadi worker (AWW), the Accredited Social Health Activists (ASHA) workers
- Capacity building support to communities and implementing institutions:** Facilitation and capacity building support to ensure sustainability of drinking water coverage and sanitation coverage and usage; from the block to the state level, CSOs can play a major role in prioritising the issue of sanitation by guiding the implementing bodies, helping implementing institutions in forming strategies to achieve total drinking water coverage, sanitation coverage and usage, developing monitoring systems, and formulating communication strategies for behavioural changes. For example, the International Federation of Red Cross and Red Crescent Societies (IFRC) and the Red Cross Society of Côte d'Ivoire are working with Nestlé to provide water and sanitation facilities and hygiene training in Côte d'Ivoire. They claim

<sup>45</sup> Planning Commission (2011) *Report of the Working Group on Rural Domestic Water and Sanitation for the Twelfth Five-Year Plan (2012-2017)*: submitted to the steering committee on water sector

to have benefited 60,000 children and adults by training them at schools, water and sanitation points etc. They are planning to extend the programme to increase the number of beneficiaries.<sup>46</sup>

- **Innovation and model creation:** Creating various models through the development of low cost, sustainable and acceptable technologies; scaling up these models through partnerships with capacity building institutions and the government; developing special models for those sections of society that are often marginalised in access to water and sanitation services. For example, Development Alternatives, a not-for-profit research institute, along with NGOs such as Ehsaas Foundation and the Indian Society for Applied Research & Development (ISARD) has started a solar water disinfection (SODIS) project called “Provision of Safe Drinking Water in 15 slums of Delhi, through point of use (p-o-u) treatment method – SODIS” project. In these areas there is no access to clean and safe drinking water. These organisations provide training and awareness to slum dwellers about the importance of clean drinking water and correct application of SODIS techniques.<sup>47</sup>
- **Participation in assessments and reviews for a reality check:** Surveys to assess accuracy of programmes, like the sanitation rating of a city; finding coherence between policies/programmes and ground realities and helping government to make policies addressing real situation. For example, Public Affairs Foundation, another not-for-profit company, has used the Citizen Report Card (CRC) approach for assessing quality of public services. The feedback from the public helps the service delivery agencies to understand the demands and problems of consumers. The Delhi CRC study report resulted in the Food and Civil Supply Department developing a novel idea of distributing kerosene in a sachet. The innovation resulted in reduced wastage at the source of distribution and the users receiving the designated quota of kerosene per month. The result: malpractices in distribution of kerosene reduced, the number of users reporting corruption came down from 0.4% to 0.2% and compared to the first social audit, when only 18% of the beneficiaries reported complete satisfaction with kerosene distribution, 42% were satisfied when the second social audit was conducted.<sup>48</sup>
- **Enhancing transparency and governance:** Establishing dialogue between service providers and user communities by processes such as social audits and joint monitoring

to achieve programme efficiency; ensure sustainability of sanitation coverage and usage by assisting local governance bodies in setting up appropriate community monitoring mechanisms; helping urban local bodies (ULBs) in setting up a Report Card System to assess the performance of duty bearers. For example, local NGOs in Uganda organised meetings of residents and health service providers in 25 randomly selected communities to discuss the status of health services in public clinics. Within a year of these group meetings, the health services improved significantly. These communities experienced an increase in the rate of immunisation and decrease in child death rates, as compared to other communities where no meetings were organised.<sup>49</sup>

- **Research and documentation to influence policy and programmes:** Documentation of water supply and sanitation health (WASH) issues, challenges, approaches and practices can help in optimising programmes and practise; need based research and technology innovation. For example the Council on Energy, Environment and Water (CEEW), in its report to the Planning Commission, documented and advocated the benefits of Participatory Irrigation Management (PIM) in various states of India, the need of a National Water Commission etc.<sup>50</sup> The report’s findings were used in the Approach Paper to the 12<sup>th</sup> Five Year Plan, which gave PIM a central role in water management in the country. Subsequently, CEEW applied its learnings at the national level to develop a plan for reorganising Bihar’s Department of Minor Water Resources, outlining a strategy for improved service delivery to small and marginal farmers.<sup>51</sup>
- **Strengthening supply chain for better sanitation coverage:** Conducting training programmes for workers involved in total sanitation campaigns to educate them about the benefits of following technical specifications, quality maintenance and timely construction of public toilets, which would ultimately lead to greater usage. For example, the Centre for Environmental Education (CEE) South, in collaboration with the Zilla Panchayats (ZPs), United Nations Children’s Fund (UNICEF) and Karnataka Rural Water Supply and Sanitation Agency

46 Information available at <http://www.nestle.com/csv/water/communityengagement/engagementinitiatives>; accessed on 30 January 2013

47 DA (2012): *SODIS: Safe drinking water for all: Development Alternatives*. Available at <http://www.devalit.org/sODIS.aspx>; accessed on 29 Jan 2013

48 PAF (2010) : *Critical Success Factors for Citizen Report Cards: The experience of Public Affairs Foundation: Public Affairs Foundation*; available at [http://indiagovernance.gov.in/files/workingpaper\\_PAF.pdf](http://indiagovernance.gov.in/files/workingpaper_PAF.pdf); accessed on 30 January 2013

49 Martina Björkman and Jakob Svensson (2007) *Power to the People: Evidence from a Randomized Field Experiment of a Community-Based Monitoring Project in Uganda*. Available at [http://www.cid.harvard.edu/neudc07/docs/neudc07\\_s2\\_p11\\_bjorkman.pdf](http://www.cid.harvard.edu/neudc07/docs/neudc07_s2_p11_bjorkman.pdf); accessed on 31 January 2013

50 Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) *National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan*, September, New Delhi: Council on Energy, Environment and Water. Available at <http://ceew.in/water>

51 Rudresh Sugam and Arunabha Ghosh (2012) *Institutional Reform for Improved Service Delivery in Bihar: Economic Growth, Agricultural Productivity, and a Plan for Reorganising the Minor Water Resources Department*, Research Report submitted to the Government of Bihar, July, New Delhi: Council on Energy, Environment and Water, and International Growth Centre, Patna. Available at <http://ceew.in/water>.

(KRWSSA), implemented a series of educational programmes on water and sanitation in Gulbarga, Chitradurga, Chikmagalur, Mandya, Raichur, Mangalore and Bangalore Rural districts. In addition to Information, Education & Communication (IEC) activities, ten training programmes were held in the Panchayats, in which 400 masons were trained to build cost-effective toilets for households. These training programmes led to the construction of 386 toilets.<sup>52</sup>

#### *Role of the Public Sector*<sup>53</sup>

The public sector partner in a PPP should look at the broader interest of the community and defend the long-term public interest. It should ensure that the services are equitable and has no negative environmental impacts. The public sector is represented by the local community and government agencies. Government provides several resources to the private partner like land, water, infrastructure etc. for operations but the two most important roles for government agencies in PPPs are as regulators and subsidy providers.

**Regulators:** In developing countries, one major reason for the failure of PPPs is the lack of an adequate regulatory framework. A public partner should not also be the regulator as it creates insecurity in the private sector, which feels that in case of conflict there is no guarantee of fair and equal treatment. Therefore, a separate and independent regulatory authority should be established by the government.

The regulatory body should also be in charge of examining regulatory issues specifically affecting pro-poor schemes. At one end, regulators should have the flexibility to adapt the water tariffs according to demand, offering private suppliers a business opportunity to extend water coverage. But pro-poor PPPs also have to take into account informal water supply arrangements. For example, the Water for the Poor initiative in Manila (Philippines) waived the legal tenure requirement, which allowed the programme to offer piped water services to over 100,000 households in the slums (ESCAP, 2005).

**Subsidy Providers:** The poor are often incapable of bearing the cost of services provided to them, and are yet often burdened with high rates charged by informal water suppliers. However, PPPs are formed with the assumption that poor would pay for the services provided by the private partner if the services are of good quality and serves the purpose of poor. Therefore, government needs to design a

subsidy system which benefits the poor. The subsidy should be targeted to subsidise connections to increase access. Moreover, with the support of a well-informed political class and government subsidy a decentralised system can be adopted. In a decentralised system, the chances of subsidy reaching the poor are greater. Subsidies can be also provided to the local community/ private sector for constructing toilets and decentralised wastewater treatment system in these areas. The concept of waste to assets should be accepted. For example, in Dhaka, the organic waste is recycled into valuable compost, which is then sold to farmers and hence the system is self-sustainable.

#### *Role of Private Players*<sup>54</sup>

- The success of any contract lies in the development of a strong relationship between the service provider and the consumers. Private partner should identify key stakeholders present in the area.
- Involve these key stakeholders in decision making. This may involve gathering information and communicating decisions, as well as finding ways to engage in dialogue, harnessing the knowledge and creativity of consumers and other stakeholders, and involving them in decision making.
- The private sector should understand the requirements of different sections of consumers. An innovative approach like decentralised bulk water supply to the poor can be adopted if the area does not have pipeline networks.
- The vision and outcome of the decision should be clear to the consumers.
- The private sector, in association with NGOs, can reach out to traditionally marginalised groups, including poor households, people in informal settlements, and alternative providers.
- Understanding the risks involved in the PPP contract is very important. Therefore, a project feasibility study should be carried before entering into contract.
- Private firms should not consider small contracts as insignificant contracts because a successful experience in delivering water to a community, although small, may have a big potential for replication in other similar communities for the company that initiated it. Furthermore, in fast-growing economies, entering the lower income markets of today can be seen as investing in the middle income markets of tomorrow.<sup>55</sup>

52 CEE (2010): *Total Sanitation Campaign Gulbarga Project*: Centre for Environmental Education. Available at [http://www.ceeindia.org/cee/project\\_pages/tsc\\_gulbarga.html](http://www.ceeindia.org/cee/project_pages/tsc_gulbarga.html); accessed on 30 Jan. 13

53 UNESCAP (2009): *Working Paper on Towards a New Model of PPPs: Can Public Private Partnerships Deliver Basic Services to the Poor?*: United Nation's Economic and Social Commission for Asia and the Pacific

54 PPIAF (2006): *Approaches to Private Participation in Water Services*: UNESCAP (2009): *Public-Private Infrastructure Advisory Facility*

55 UNESCAP (2009): *Working Paper on Towards a New Model of PPPs: Can Public Private Partnerships Deliver Basic Services to the Poor?*: United Nation's Economic and Social Commission for Asia and the Pacific

## V. Can PPP in the urban water sector ensure equitable supply of water for all? How?

PPPs are as good as the governance of the jurisdiction within which they operate. Private partners operate under the conditions provided by the regulatory authorities and the public agency with which the contracts have been signed. If private companies are to be attracted to the provision of water to the poor, a profitable climate is necessary to be created by the public institutions. The public sector, in association with NGOs, can create innovative plans to attract the private sector in getting involved in water PPPs, including those that service the poor. It is the government that will have to facilitate the private actors to enter the sector: by providing an environment with lesser risks; spreading awareness and educating local communities about PPPs and its benefits with the help of NGOs; ensuring equity by offering subsidies; introducing stringent clauses in the contracts to ensure that local political entities do not violate the contract; and bringing together different stakeholders on board while forming PPP contracts so that no section of society feels neglected or marginalised.<sup>56</sup>

The public sector, in cases where inefficiencies persist or where technical and managerial capacity is limited, could use the expertise of private firms with WSS experience. But the prime motive of any private sector is profit therefore there is a disinterest to extend the services to low-income groups (LIGs), at least in the short to medium term. NGOs, by constantly raising the issue of negligence of LIGs, have played and continue to play an important role in developing PPP structures that would be considered equitable in scope and practice. The most explicit of these approaches is a new approach called output-based aid or OBA (see below). There are several other pro-poor approaches, such as the introduction of compensation incentives in lease contracts, prioritising development of LIG areas by introducing incentives in the concession contracts, involving NGOs representing LIG communities in policy formulation, decentralised supply of water and treatment of waste by involving local people, and so forth. If adopted, these measures could create an attractive environment for private investment while also ensuring the provision of services to the poor.

### *Pro-Poor Characteristics of PPP Options<sup>57</sup>*

Let us analyse what are the different options available under

56 UNESCAP (2009): *Working Paper on Towards a New Model of PPPs: Can Public Private Partnerships Deliver Basic Services to the Poor?*; United Nation's Economic and Social Commission for Asia and the Pacific

57 ADB (2008): *Public-Private Partnership Handbook*; Asian Development Bank. Available at <http://www.adb.org/Documents/Handbooks/Public-Private-Partnership/Public-Private-Partnership.pdf>; accessed on 29 January 2013

different contractual structures, which could help PPPs provide an equitable service.

### **Service and management contracts**

The investment is completely in the hands of the public sector and the private partner provides expert services. As the operator has no responsibility to invest in the system, these contracts, by their very nature, cannot require the operator to extend or provide service to low-income areas. However, the contracts can require expertise in social issues and in developing and implementing any funded low-income strategies.

### **Lease and affermage contracts**

Encouragement of service provision to LIG within the served area can be done through restructuring of compensation incentives into the lease. The extension of the supply network in a lease/affermage contract lies in the hands of the contracting authority (public partner). The operator has a disincentive in supplying water to the poor because the probability of cost recovery is low. However, if the government restructures the lease contract and includes a component of incentives (paying on behalf of poor) for supplying water to LIG areas or allowing the operator to charge slightly higher rates for water use in high income areas (in lieu of low cost recovery in LIG areas) then the problem of inequitable distribution could be partially mitigated.

### **Concessions**

In this type of contractual structure the private concessionaire collects tariffs and invests in the extension of the network. However, the poor are unable to play the water tariff, which discourages the private sector from extending its services to the LIG areas. The extension of services to the LIG areas could be made possible if the government wants a concessionaire to prioritise expansion to low-income areas by providing incentives or by introducing such clauses in the contract. For example, the Government of Peru has structured PPP arrangements that award a subsidy for pay phones installed in predefined target areas, which serves as an incentive for private telecommunications operators to expand services to rural areas of the country. The private partner that bids to work for the lowest amount of subsidy is selected.

### *Pro-Poor Interventions in the Context of PPPs*

Service delivery to the LIG areas can be ensured by restructuring contracts or by making changes in the overall approach to the reform agenda. Specifically, the steps include:

## Reform framework

- Strengthening of the policy commitment to poor.
- Clear classification of the LIG segment and establishment of an entity to take care of the service provision to this segment of population.
- Database creation for keeping a track of service delivery in these areas.
- Arranging regular consultations with the LIG to understand current service levels, constraints, and preferences.
- Setting up of a baseline of service accessibility to LIG area and providing a deadline for achieving the minimum target.
- Local vendors and small scale private players should be encouraged to continue their services to the LIGs until these areas are connected through regular network.
- Re-examination of the existence of any legal prohibitions against serving informal settlements in order to extend services to this section of the society.

## Financial considerations

- The government's policy on subsidies should be re-examined in the context of cost recovery goals under PPP.
- If connection fee are proving to be a greater disincentive than the on-going payments for service, the connection fee should be re-examined in terms of level and application.
- Several options like pre-paid meters, increased pay points, mobile bill payment etc. should be considered to facilitate payment.

## The PPP contract

- Minimum levels of service should be guaranteed.
- The contract should be structured in a manner that it provides services to the poor according to their payment capability (rather than no service at all) and has a provision for upgradation of services.
- Likewise, low cost technology could be adopted for these areas.
- The contract should also consider the ways in which LIG can pay back. For example cheap labour for construction, waste collection etc.
- Small scale providers, who provide services to LIG areas, should not be ruled out in the contract and there should be provision of co-existence or partnership of the larger concessionaire with them.

## The PPP bid process

- While selecting the private partner the past record of bidders in context of their attitude towards LIG should be considered.
- Reliable data should be provided to the bidders so that they have a clear idea of the type and composition of community they have to serve.

## VI. Should incentives be provided by the government to motivate more PPP in urban water management? If so, which incentives can be provided?

Urban water reform can be brought out in several ways and PPP is just one of the ways of doing so. Urban water reforms with techno-economic and financial objectives should be accompanied by social, democratic, and environmental objectives. Provision of water to all at an affordable tariff should be the major concern of the government. The current practice of continuing to form PPPs is not going to help, unless there is a robust database of the quality and quantity of water resources available, status of assets, metering coverage, cost recovery records against investment incurred, and various risk assessments and feasibility studies have been carried out. PPPs should be looked as long term planning instead of a quick-fix to get financial contributions from the private sector. Equally, the private sector cannot view PPPs as a short cut for getting contracts that focus solely on high-paying consumers at the expense of long-term investment planning and implementation for water supply as well as sanitation.

PPPs should proceed with systematic data-building and sectoral studies, and the local community and stakeholders should play a crucial role in designing the PPP contract. A politically accountable regulatory system needs to be established for entry-level regulation. Institutional development at all the levels is required to develop a common vision and to address the disjointedness in reform. Any reform can only be successful if it is legitimate and acceptable to the stakeholders.<sup>58</sup> Before providing any incentive or subsidy for any water PPP project it should be confirmed that subsidy reaches the desired section of the society i.e. the poor.

## Output-Based Aid Contracts (OBA)

OBA provides a way in which international financial institutions (such as the Asian Development Bank) can directly structure its financing to benefit poor people, even when the service provider is a private company. In this case

<sup>58</sup> IDFC (2011) *Water: Policy and Performance for Sustainable Development*, India Infrastructure Report 2011: Infrastructure Development Finance Company

the international financial institution pays for the services on behalf of the poor. OBA also transfers risk to the operator in several ways. First, OBA links payment of the subsidy to performance outcomes, maintaining pressure on the operator to reach agreed upon service and commercial targets. Secondly, OBA schemes determine and pay the total level of subsidy *ex post*. Thus, the operator runs some risk that payment will not be made if its performance falls under par.

Under OBA a basic service provision contract with third parties such as NGOs, community-based organisations (CBOs) or any other company can be formed while the subsidy payments are subject to the delivery previously specified outputs. Typically, OBA payments relevant to pro-poor service would be linked to outcomes related to consumption and coverage expansion. But OBA schemes are also applied to BOT projects that might have an indirect, positive impact on the poor. For example, in Morocco, the Global Partnership on Output-Based Aid (GPOBA) has established an OBA project, which is working with several incumbent service providers (both public and private) to extend water and sewerage services into unplanned urban settlements, which were formerly excluded from regular service provision. The project is embedded within the National Initiative for Human Development (INDH), which focuses on the extension of basic services to the poor, particularly in settlements previously considered illegal and ineligible to receive public services. The subsidy is paid in two instalments: 60% on completion of the connection and 40% upon verification of at least six months of sustained service. Verification is carried out by an independent third party. The progress was initially slow due to little information about the financing process; however, during the later stages the project's pace increased.<sup>59</sup>

## VII. What could be an ideal financial model for a PPP?

The typical structure of a financial model consists of Inputs and Outputs as shown in **Figure A4.3** below.

**Inputs:** The inputs for the financial analysis would include the following:

- **Working Capital:** It is the amount of money required to cover the time difference between payment of the project company's operational expenditure (OPEX) and receipt of revenues in cash.

- **The life-cycle costs** of the project, which include the estimated capital costs and operating and maintenance (O&M) costs identified in the cost assessment and a depreciation schedule for physical assets.
- **CAPEX budget:** The capital expenditure (CAPEX) budget for the project takes into account costs incurred during the bidding, development, and construction phases of the project, i.e., both "hard" construction costs and the "soft" costs for financing, advisory fees, and administration.
- **Revenue options:** It includes tariffs (where user-charges are possible), and secondary revenue sources from the project.
- **Demand forecast:** As calculated during feasibility study.
- Assumptions for the capital structure (debt - equity mix) of private sector investment vehicle are required for debt and repayment schedule.
- Project specifications (investment timing, lifetime etc.)
- **Sensitivity:** The range of sensitivity assumptions should be optimum without over-reliance on optimistic demand or revenue forecasts. Sensitivity should estimate the effect on debt service cover ratio (this ratio signifies the ability of the project's cash flows to meet the debt service requirements) and the equity Internal Rate of Return (IRR) of the following parameters:
  - Construction-cost overrun;
  - Delay in completion (say for six months);
  - Deduction or penalties for failure to meet availability or service requirements;
  - Reduced usage of the project (where the project company assumes usage risk);
  - Higher OPEX and maintenance costs;
  - Higher interests' rates (where these are not fixed);
  - Changes in inflation.

**Outputs:** The components of output of a financial model for PPP have been shown below in **Figure A4.2**.

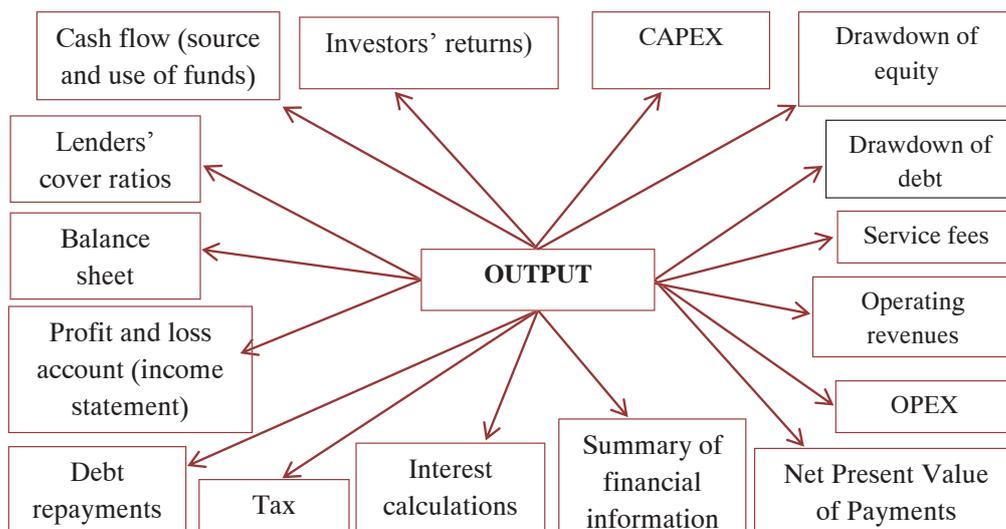
Financial viability should be analysed in present value terms, which means the costs and revenues over the life of the project are expressed in terms of today's money. This is essential for making meaningful comparisons of benefits and costs that occur at different times and for comparing different projects. The overall success of a PPP project depends completely on accurate calculations and scenario creations for the input and output parameters.<sup>60,61</sup>

59 Sophie Trémolet and Barbara Evanswith, Output-Based Aid for Sustainable Sanitation: OBA Working Paper Series: Paper No. 10, page 25, World Bank, 2010.

60 Source: Ministry of Finance, Government of India: Public Private Partnership in India. Available at: <http://toolkit.pppinindia.com/urban-transport/module2-ffaapdd-fvapdd.php?links=fig6#>; accessed on 28 January 2013

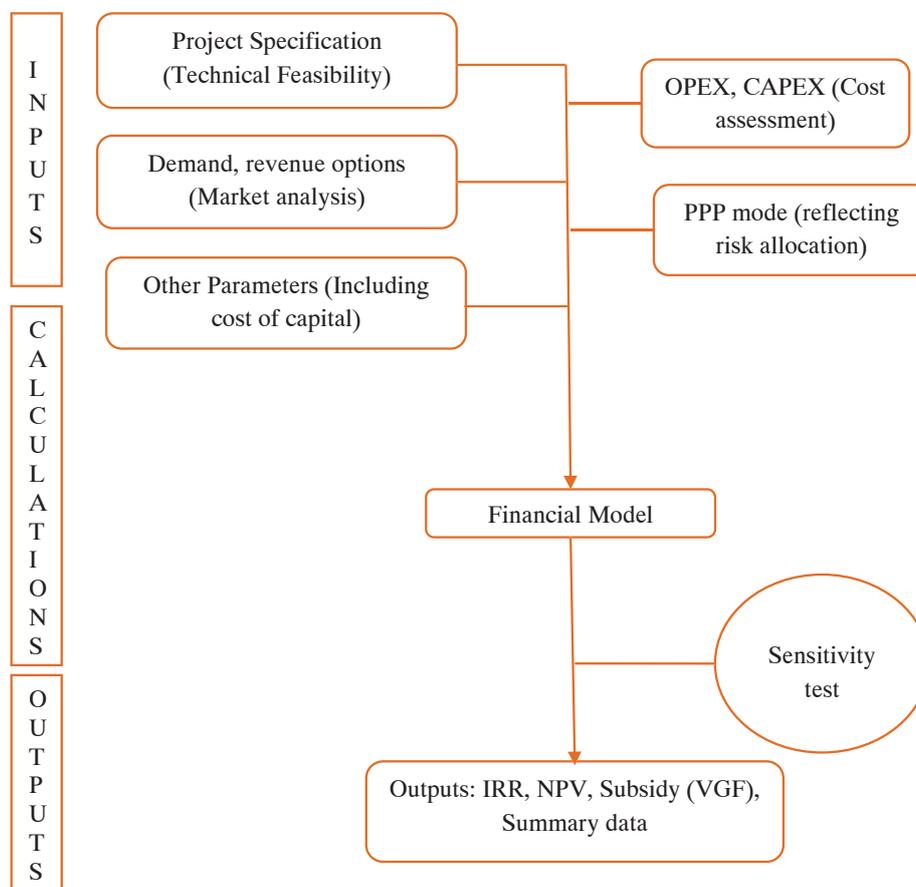
61 Altin Turhani, Ali Turhani (2012) "Financial Model of a PPP Project," *Journal of Modern Accounting and Auditing*, July, Vol. 8, pp. 975-982.

Figure A4.2. The components of outputs of a financial model for PPP



Source: Altin Turhani, Ali Turhani (2012) "Financial Model of a PPP Project," *Journal of Modern Accounting and Auditing*, July, pp. 975-982, Vol. 8. Available at [https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDMQFjAA&url=http%3A%2F%2Fwww.davidpublishing.org%2FDownload%2F%3Fid%3D7818&ei=RfkJUZKyKITNrQeu7IGoBA&usg=AFQjCNFwThQ\\_vrKWVQZLnX8\\_uVfUAZiLTQ&sig2=ICkkHXSy2oRaL7ngQBjSjA&bvm=bv.41642243,d.bmk](https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDMQFjAA&url=http%3A%2F%2Fwww.davidpublishing.org%2FDownload%2F%3Fid%3D7818&ei=RfkJUZKyKITNrQeu7IGoBA&usg=AFQjCNFwThQ_vrKWVQZLnX8_uVfUAZiLTQ&sig2=ICkkHXSy2oRaL7ngQBjSjA&bvm=bv.41642243,d.bmk); accessed on 30 January 2013

Figure A4.3. Typical structure and flows in a financial model



Source: Ministry of Finance, Government of India: Public Private Partnership in India. Available at: <http://toolkit.pppinindia.com/urban-transport/module2-ffaapdd-fvapdd.php?links=fig6#>; accessed on 28 January 2013

## Appendix - Detailed methodology for sanitation rating of cities

The MoUD, GoI, proposes to commission agencies, appointed on the basis of competitive bidding amongst short-listed ones, to carry out sanitation rating exercises for the 436 Class-I cities of India. In order to ensure that bidders bid for providing standard outputs and these are administered uniformly across cities to enable comparison, it is necessary to lay out a methodology that follows a standard set of steps, fixes the protocol for data collection and analysis, and uses a consistent analysis and evaluation scheme leading to valid and comparable results. This note details the methodology that will form a part of the Request for Proposals (RFP) from short-listed agencies. This will become the basic framework that will guide the agencies' rating exercises, and sets out the standard tasks to be accomplished as a part of the rating exercise.

### Three Categories of Indicators

**1. Output Indicators** pertain to the city having achieved certain results or outputs in different dimensions of

sanitation ranging from behavioural aspects and provision, to safe collection, treatment and disposal without harm to the city's environment. There are nine main output- indicators accounting for 50 points of the total of 100 points.

**2. Process Related** indicators pertain to systems and procedures that exist and are practiced by the city agencies to ensure sustained sanitation. There are seven main process- indicators accounting for 30 points of the total of 100 points.

**3. Outcome Related** indicators include the quality of drinking water and that of water in water-bodies of city, as also the extent of reduction in sanitation-related and water-borne diseases in the city over a time period. There are three main outcome-indicators accounting for 20 points of a total of 100 points.

Ideally, data for the above outputs, processes and outcomes are regularly collected by city authorities but at present, very few cities have, at best, partial data available. This rating exercise could help in highlighting the need for regular data-collection and monitoring of indicators.

### Indicative objective rating chart for sanitation in cities (draft)

No.	INDICATORS	Points*
1	OUTPUT-RELATED	50
A	No open defecation sub-total	16
i.	Access and use of toilets by urban poor and other un-served households (including slums) - individual and community sanitation facilities	4
ii.	Access and use of toilets for floating and institutional populations - adequate public sanitation facilities	4
iii.	No open defecation visible	4
iv.	Eliminate Manual Scavenging and provide personnel protection equipment to sanitary workers	4
B	Proportion of total human excreta generation that is safely collected (6 points for 100%)	6
C	Proportion of total black waste water generation that is treated and safely disposed of (6 points for 100%)	6
D	Proportion of total grey waste water generation that is treated and safely disposed of (3 points for 100%)	3
E	Proportion of treated wastewater that is recycled and reused for non potable applications	3
F	Proportion of total storm-water and drainage that is efficiently and safely managed (3 points for 100%)	3
G	Proportion of total solid waste generation that is regularly collected (4 points for 100%)	4
H	Proportion of total solid waste generation that is treated and safely disposed of (4 points for 100%)	4
I	City wastes cause no adverse impacts on surrounding areas outside city Limits (5 points for 100%)	5
2	PROCESS-RELATED**	30
A	M&E systems are in place to track incidences of open defecation	4
B	All sewerage systems in the city are working properly and there is no ex-filtration (Not applicable for cities without sewerage systems)	5

No.	INDICATORS	Points*
C	Septage / sludge is regularly cleaned, safely transported and disposed after treatment, from on-site systems in the city (Maximum 10 marks for cities without sewerage systems)	5
D	Underground and Surface drainage systems are functioning and are well-maintained	4
E	Solid waste management (collection and treatment) systems are efficient (and are in conformity with the MSW Rules, 2000)	5
F	There is clear institutional responsibility assigned; and there are documented operational systems in practice for b)/c) to e) above	4
G	Sanctions for deviance on part of polluters and institutions is clearly laid out and followed in practice	3
3	OUTCOME-RELATED	20
A	Quality of drinking water in city compared to baseline	7
B	Water quality in water bodies in and around city compared to baseline	7
C	Reduction in water-borne disease incidence amongst city population compared to baseline	6

\* The marks for the above indicators will be revised every two to three years. Over time, indicators about more stringent conditions e.g. no-urination, or spitting in open/public spaces, etc. will be introduced as indicators. The weights accorded to each category and specific indicators will also be revised.

\*\* In this context, bigger cities may consider instituting good practice systems that comply with ISO (International Standards Organization) and/or BIS (Bureau of Indian Standards) process systems.

# Annex 5: Private sector participation in water management and water for all

Proceedings of the second roundtable

IIC Annexe Building, New Delhi, 11 February 2013

**Present (in alphabetical order):** Mr SVK Babu (*Veolia Water India*), Mr G S Basu (*JUSCO*), Mr Neville Bhasin (*Forbes Marshall*), Dr R. Biswas (*School of Planning and Architecture*), Mr Prasad Gadkari (*IDFC*), Dr Arunabha Ghosh (*CEEW*), Mr Vikas Goyal (*Aecom*), Mr Neeraj Gupta (*IFC*), Mr Pawan Gupta (*Aecom*), Mr Abhay Kantak (*CRISIL*), Dr Renu Khosla (*CURE India*), Ms Brune Poirson (*Veolia Water India*), Mr M Ramachandran (*Ex-Secretary, Ministry Of Urban Development, Government of India*) Mr Patrick Rousseau (*Veolia Water*

*India*), Mr Amar Singh Sandhu (*Forbes Marshall*), Ms Urvashi Sharma (*CEEW*), Mr Rubinder Singh (*PDCOR Ltd. (JV of GoR and IL&FS Group)*), Mr Rudresh Sugam (*CEEW*), Mr Mukund Vasudevan (*Pentair*)

**Absent:** Mr Subrata Barman (*IFC*), Dr Kapil K. Narula (*CII-Triveni Water Institute*), Mr K. Ashok Natarajan (*Tatva Global Water Technologies Pvt. Ltd.*), Mr Paolo Spantigati (*ADB*)



CEEW-Veolia Water India Second Roundtable

## Background

The second CEEW-Veolia Water India Roundtable on Urban Water Management was convened on 11 February 2013. The theme of the discussion was “Private sector participation in urban water management and water for all”. CEEW prepared an issue brief highlighting the initiatives led by private bodies in the water sector across the globe, successes and failures of water PPPs in India, the risks that the private sector encounters in executing water PPP contracts, possible roles of different actors (government, civil society, and private sector) in achieving the target of water for all, and the appropriate financial models for PPPs. The roundtable discussion was framed along the following six questions:

- Are the private sector and water for all incompatible?
- What are the main fears/risks of private sector participation in the urban water sector?
- What are the specific roles of the non-profit, public and private sector in ensuring equitable access to water for all while reforming the water supply system?
- Can PPP in the urban water sector ensure equitable supply of water for all? How?
- Should incentives be provided by the government to motivate more PPP in urban water management? If so, which incentives can be provided?
- What could be an ideal financial model for a PPP?

### I. Compatibility between the private sector and services to the urban poor

The WSS sector in India has experienced lower investment in infrastructure by the private sector as compared to other utility services. However, whether it is repairing leaks or designing pipes, managing treatment plants, or supplying high-tech machinery, etc. the private sector has been active in the Indian water sector for a long time.

Given this background, when we analyse the issue of compatibility between private sector and water for all, the most important concern whether the motive of making profits is also consistent with low cost recovery in low income areas. Another recurring concern is over the question of tariffs. One participant noted that, unlike electricity which has to be generated, there is a tendency to think that water can be made available freely. Under the circumstances, why would the private sector come forward to participate in water management; and if it does, how would it ensure water for all?

It is therefore very important to understand the role of private sector, when assigned a water PPP contract, to have a better

idea about their limitations and scope of work. The role, scope of work and targets are elaborated in a contract, essentially prepared by representatives from the public sector. When a private company signs the water PPP contract, it agrees to work under the ambit of the clauses mentioned in the contract as well within the framework of current regulatory norms. It is in the hands of the public sector to design PPP contracts in a manner that it meets all the criteria of service standards. For example, a clause on providing supply of the same quality of water to all in the contract binds a private operator to provide same quality of water to all. If a private entity bids for a contract with such terms of reference, and wins the contract, it is then obligated to fulfil the responsibility of providing water for all citizens in the designated area.

The discussion drew on experiences from across the country. These included successes within Jamshedpur and Hubli-Dhadwad. In the former case, a controlled city with known assets and demand were key factors. In the latter, the quality of the last mile infrastructure was cited as a basis for success. But participants also highlighted challenges in Mysore and Haldia. In Mysore the challenge has been with wrong estimations of the number of customers that had to be serviced under the contract. In the case of Haldia, revenue estimations were based on assumptions of bulk industrial demand for water, which would offer higher revenue. Since industrial investments have been lower than projected, the revenue model for the project became distorted.

That said, a bigger question loomed in the discussion. What is the definition of water for all? There is a fundamental problem if access to water is linked to legality of land tenure. This results in slum dwellers either not being counted in the system or having little or no recourse to quality and affordable drinking water. If public utilities and the private sector are serious about ensuring water for all, they would first need to recognise customers. This meant that water provision had to be delinked from the legality of the dwelling. Once this principle had been accepted, the role of civil society organisations could become an extended arm for service delivery through innovative means. Examples included the installation of water kiosks in Delhi and Agra, following the water network to improve drainage, etc.

### II. Role of various stakeholders and required initiatives

During the discussion, participants noted the different roles for various actors and other initiatives that were necessary to ensure water for all.

1. **Role of Government:** Regardless of whether a private sector or a public sector entity is operating/managing the WSS system, the responsibility of service provision lies

with the public sector. The public sector has the duty to ensure that equitable services are being provided to all the consumers. The role of government does not end after allocating a water PPP contract to a private partner. The government should play a proactive role and should support the private sector in execution of the project.

The water PPP contract should clearly state the targets and priorities. There are various mechanisms like dual tariff system for water supply where the operator charges higher water tariff to high income areas, which in turn compensates for lower water tariff to low income areas. This not only helps achieve the target of supplying water to all, but also lays the foundation for a sustainable business model for the private sector player.

2. **Role of Civil Society Organisations:** It is equally important to generate awareness among the urban poor about the benefits of good water quality services at affordable prices. Currently, the urban poor end up paying higher prices to informal vendors and yet continue to struggle to get good quality and quantity of water. The private sector, in association with NGOs, can reach out to traditionally marginalised groups, including poor households and people in informal settlements. Conducting Information, Education and Communication (IEC) programmes is essential to spread awareness regarding hygiene and sanitation. CSOs/NGOs could play a very important role in bringing all the three components of WSS sector (public sector, private sector and consumers) together on the same platform at a decentralised level and, thereby, ensure greater accountability.
3. **Pilot projects:** When the quality of WSS services in India falls short of the requirements and expectations of consumers there is also limited willingness to pay. One of the reasons why the private sector's participation is sought is to help introduce efficiency and good management practices to the sector. But current tariff rates for water are very low and nowhere reflect the actual capital expenditure and operational expenditure incurred in treating and supplying water. To add to the problem, the level of cost recovery is very low. Private sector entry into the market often translates to an increase in the tariff to bring it to a rational level. But it gives the impression that tariff increases are because of the entry of private sector.

What is the solution? It is very important to, first, improve the quality of service delivery and, thereby, increase the willingness to pay among consumers. Only then can tariffs be increased and that too in a gradual manner. Pilot projects can be a solution as they can be implemented while keeping investments from the private sector low meanwhile helping it to understand the risks. At the same time, the consumers start gaining trust as they witness improved service delivery. These projects if proved successful could be scaled up. Even if the pilot fails, the

loss is comparably lesser than what it would be if long term investments were made. Moreover, pilot projects help identify shortcomings, which could be dealt with before making long term investments.

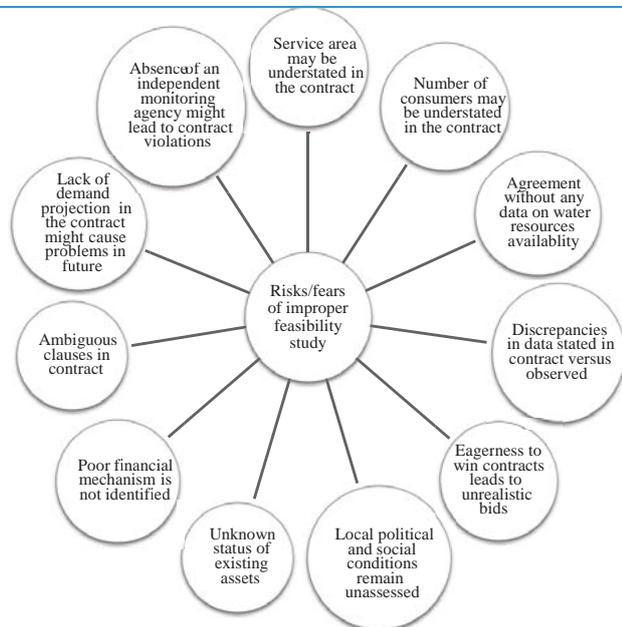
4. **Transparency:** The success of any project lies in the development of a strong relationship between the service provider and the consumers. The consumers are hardly aware about the nature of water PPP contracts and are, therefore, insecure about the outcomes of the contract. A transparent process should be adopted and consumer education about the contract and operations should be one of the tasks of the private partner. A public relationship officer hired by the private operator could help establish regular interactions with consumers and provide detailed information to them. This would be one step towards winning the trust of consumers.
5. **Stakeholders involvement:** Knowing which stakeholders constitute the range of interests, demands and concerns in a given operational area is very important for the private partner. Private entities should consider involving key stakeholders in decision making. This may involve gathering information and communicating decisions, as well as finding ways to engage in dialogue, harnessing the knowledge and creativity of end-users and other stakeholders, and involving them in decision making. Local political leaders, who are influential in their area, could also play a significant role in facilitating efficient communication between consumers and the service provider.
6. **Differentiation in tariffs, not service:** The approach of the private partner should be indifferent towards different sections of the society as far as quality of service delivery is considered. However, in terms of tariff and revenue generation the private sector should understand its social responsibility towards the urban poor. Low income localities cannot be considered solely as areas to generate revenue. Instead, innovative payment mechanisms should be developed. For example, poorer households could contribute through labour rather than money, say for the installation of new pipes and drainage systems.
7. **Subsidy provision:** Although water tariffs remain subsidised for many utilities, the subsidy beneficiaries are usually richer consumers with connections to piped water. Subsidies for access to water have to be targeted to ensure that they reach the underprivileged sections of the society.

### III. Risks/fears of private sector participation

The general perception is that here are many fears/risks of private sector participation in the urban water sector. However, throughout the discussion the most important risk that was highlighted was associated with lack of specificity in

the contract or of shifting targets once the contract had been awarded. These risks can be clubbed as risks associated with improper feasibility study prior to contract bidding (figure A5.1)

**Figure A5.1: Risks/fears of improper feasibility study**



Source: CEEW-Veolia Water India second roundtable discussion

#### IV. How to mitigate the risks/fears?

**Database Management:** A proper database should be prepared by the public sector in consultation with technical experts. Experts should be asked to carry out a detailed research in order to understand the local conditions and assets. After commencing the research study a detailed project report, illustrating data for the service area, number of consumers, social mix, condition of assets, growth trends etc. should be prepared. This report should form the basis of the PPP contract. Well informed private partners would be then able to make realistic bids.

**Rechecking the database:** Private bidders for a contract should be allowed to carry out an internal evaluation study, so that the accuracy of data reported in the detailed project report can be verified.

**Independent monitoring agency:** There should be an independent monitoring agency which can resolve the conflicts between the public and private partners and ensure that contract violations on both ends are minimised.

**Allocating contracts to experienced partners:** Currently many PPP projects end prematurely because the private partner bids a very low price, not understanding the project complexity

and associated costs completely. The public sector entities should not consider urban water supply projects merely as means of bringing in investment but as a crucial support to the citizens. It is necessary to assign these contracts to private partners who have a proven track record. In the absence of an experienced private sector player, a contract should first be provided on a pilot scale, thereby allowing them to prove the management capabilities.

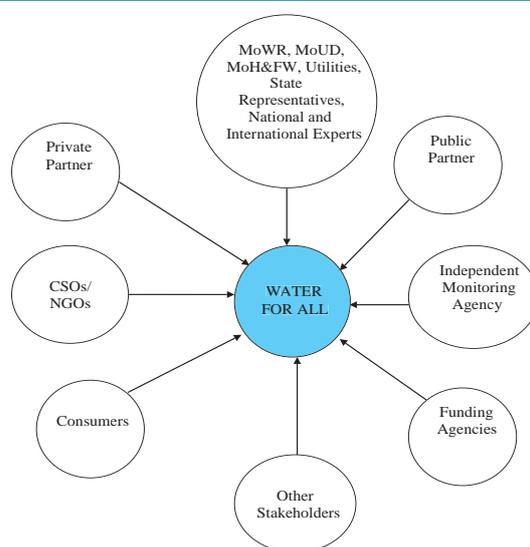
**Unrealistic targets:** Some of the water PPP contracts have unrealistic targets. It is very important for the private sector to identify these targets well in advance and bring it to the notice of the monitoring agency, in case there is one, or else to the public partner who can take necessary action. The public partner should also set up targets in consultation with experts.

**Understanding the contract:** It is the most important step in order to avoid future risks. The scope of work, targets mentioned, type of technology, level of support from the public partner, hidden clauses etc. are essential to be understood prior to any commitment by the public or private parties to a contract. When utilities and city governments have very little idea of the state of the existing assets, the contracts might also be inappropriate. If the problem is largely about non-revenue water, then management contracts are desirable. But if there are real losses from the infrastructure, then longer-term investment contracts are necessary.

**Proper Financing Mechanisms:** A well structured financing mechanism is lacking in the urban water sector. A proper financing mechanism needs to be set up to assure the private sector that it will get its due operational charges on time.

#### V. How should the new Water for All framework look like?

**Figure A5.2: Water-for-All network**



## VI. What is the way ahead?

### Lessons to be learnt

**Learning lessons from other sectors:** Participants pointed to other sectors from where lessons in PPPs could be learnt. One of the examples was the road sector and the roles played by the National Highway Authority of India (NHAI) in association with ministries linked with road and transportation, state governments and independent to develop PPP models. Similarly, the Ministry of Water Resources, Ministry of Urban Development, Ministry of Health & Family Welfare, water utilities, state governments and others needed to work together to develop standard models for water sector PPPs.

**Learning from other countries:** Singapore's government body, the Public Utilities Board (PUB), has corporatized the municipal services and has entered into a performance management system. They have started several water conservation programmes to encourage domestic consumers and industries to conserve more water.

### Capacity building and embracing technology

**Innovative Models:** Traditional measures are proving insufficient to reach the goal of providing water for all. There are various innovative models which have been tried in local areas successfully but they have not been scaled up. Decentralised wastewater treatment system for the urban poor was identified as one such innovation.

**Capacity Building:** Capacity building is required for all the departments and stakeholders associated to WSS sector. A separate roundtable will be dedicated to capacity building as part of this series.

**Technology sharing and awareness building:** The WSS sector in India still suffers with poor quality and poorly installed technology and lack of awareness about state-of-art technologies. Currently, even basic instruments like meters, which are essential instruments to estimate water losses, are not installed at most places. There are many systems like the Supervisory Control and Data Acquisition (SCADA), which would not only reduce the problem of finding and repairing leakages but would also reduce the burden on staff.

## VII. A more robust PPP

**Understanding the problem:** There is a definite need of investment for WSS infrastructure. However, the bigger problem is not the amount of money that has to be invested; it is the intra-sectoral issues, which have to be addressed first. It should be well understood that a bad project structure cannot be solved by a good concession agreement.

**Planning a proper time frame:** In the race to win contracts, the need for pre-feasibility studies is often ignored or underplayed. The difficulty with private partners is the availability of time to bid for a contract. Therefore, it is advised for the public partner to prepare an appropriate timeframe for carrying out the feasibility study as well as for achieving the targets. The targets should be framed realistically. The public partner has the responsibility of performing the project analysis and developing a database detailing the assets, consumer mix and growth scenarios. The private sector, in turn, should also invest some time and money in order to understand the contract structure and possibility of achieving mentioned targets *before* projects commence.

**Designing unique contracts:** No single contract document has the potential to fit in every situation. Therefore, there is a need to spend more time to understand the available resources, condition of assets and stakeholder mix while designing a contract. This step will provide longevity and greater chances of success to the project.

**Financial framework:** Financing mechanisms have to be analysed for assuring the operator that he is going to be paid for his services. As in the current scenario, the Jawaharlal Nehru Urban Renewal Mission (JNNURM) is acting as a sole financial resource for WSS sector improvement. The MoUD should link the release of grants to performance.

**Delinking services from tariff:** In water PPP contracts, for achieving water for all, it should be strictly mentioned that the level/quality of services should be the same for all sections of the society. There might be a dual tariff system or a subsidised service delivery system for urban poor but the services offered should be equitable. The public sector should ensure that the services first reach the neglected areas and this should explicitly be mentioned in the contract. The private sector should also understand its social obligation and can devise innovative/price differentiating mechanisms in association with CSOs/NGOs for the low income group areas.

**Working together:** The public sector's responsibility of ensuring equitable services to all does not end with assigning a PPP contract to a private partner and it is the responsibility of public partner to cooperate with the private sector in its operations. The public partner and other government departments, political entities, stakeholders and CSOs/NGOs should work in close association with the private operator to ensure that the objective of water for all is achieved. The CSOs/NGOs and the private sector should also look at areas where they could formulate a joint venture. For example, feasibility research, IEC programmes, policy research, pilot projects etc. could be performed by CSOs and the private sector together. A more holistic approach is required where all stakeholders have a role to play.

## Essay 5: Water for all: connecting the unconnected

*Renu Khosla*



Renu Khosla

Access to clean, safe water is a need and a right. Those who lack access to water are usually the poor. In cities, they live in slums and the informal low-income settlements unconnected to city's piped water supplies, making up between one-third and one-half of the city's population. Connecting poor people to water also makes good economic and health sense. Safe drinking water improves health and productivity which can alleviate poverty by doing two things; one, reducing the number of working days lost to illness, and two, reducing time and effort, particularly of women for collecting and storing water.

Supplying water to slum communities has several challenges. First, slum dwellers squat on public or private lands and lack legal land tenure and house ownership. As per State policy, such illegal lands cannot be connected to network services. Instead of piped supply to homes, water to the poor is provided through shared stand posts, water tankers, or bore wells and hand pumps that draw untreated ground water for people's use.

Second, services to the slums are normed to be unequal - of lesser quality. The poor get less per capita water than the rich; 40lpcd at stand posts and 10lpcd in water tankers; the assumption being that this is what is actually served. Water also comes for; a. limited time at inconvenient hours - periods when women must be at work; b. at low pressure, each bucket taking longer to fill and people digging down into the ground closer to the pipes itself, or attaching hand held motors to increase the pressure; and c. of poor quality that needs to be boiled, filtered or chlorinated, with frequent bouts of sickness if not. Poor people are known to pay between 5 and 10 times what the formally connected pay in cities to access water. On the other hand, the clichéd understanding within municipalities is that a better service encourages migration.

Third, occasionally it may be infeasible to connect slums to city

water supply networks because of engineering difficulties. Slums located in inaccessible corners, ditches, drains, roadsides, or in the suburban fringe are hard to connect. Also building a piped network in the unorganised and informal spaces of slums and their very small houses can prove a challenge too. Fourth, while on the one hand, the State is obligated to serve the poor and is unwilling to charge them for water, on the other people are reluctant to pay for poor quality services.

On the demand side too, there are an equal number of challenges. One, low-income/slum communities are informal and 'illegal', which makes them invisible, uncouncted, unorganized and voiceless. Preoccupied with survival issues, they are unable to collectively raise demands for improved services. Two, being poor, these households have several spending priorities and demands on their limited funds, of which water may not be their topmost. Three, women who are responsible for water are not the decision-makers at home, and sometimes are unable to prevail upon the men to agree to finance a household connection, or put together the lump sum needed for the same. There is also the recurring cost of water bills that may also be unaffordable to poor whose wages are irregular and on daily basis. It is, however, possible to nudge people to connect to and pay for services provided these are improved over what is currently supplied.

In order to connect the unconnected, service provider agencies – public and/or private service providers must reimagine the service architecture and ensure water availability, access and affordability. Making the poor water secure is about providing access to in-house water supply at 165 lpcd with adequate pressure, decent timings, sufficient duration and good quality. To do this, the city will need to uncouple land tenure from water provision so that infrastructure could be extended into slum areas. Based on individual slum spatial layouts and trunk infrastructure, engineering designs could mainstream

or provide decentralised options with equivalent standards. Where there is political willingness, the supply could also be metered with user charges as per affordability/on subsistence slabs. Water connections themselves may be free of charge, subsidised or amortised or linked with low-interest micro-finance – encouraging all to hook up. Monthly user charges may not just be kept low (and flat if it is possible to regulate

water use) but also matched with earning patterns. Poor in informal occupations also earn erratically. This often makes it hard for them to pay lump sum charges even when affordable. With convenient collection mechanisms (door-step collection) the poor will be happy to pay in small sums.



CURE India work in Agra for providing water and sanitation facilities to the low income group

## Essay 6: Improvements in infrastructure and contracting mechanisms to ensure water for all

Rubinder Singh



Rubinder Singh

### Background

As per the figures released by the Ministry of Statistics & Programme Implementation (2010), the national average of percentage of households with access to water through individual connections in urban areas is 74.3% and for rural areas is 30.1%. There are wide regional variations ranging from mere 3% to 99%. Also as per various studies, the duration of water supply in most Indian cities ranges from 1 hour to 6 hours, which is partially attributable to high percentage of non-revenue water (NRW) – generally close to 50% of water produced. As per the Report on Indian Urban Infrastructure & Services (March 2011), to achieve service standards benchmarks prepared by MoUD for water sector (which includes 100% coverage of population through piped connection in urban areas), the capital expenditure required is a staggering Rs.3,209 bn over a 20-year period, whereas the O&M requirement for the same period is even higher at Rs.5,460 bn.

It is, therefore, undeniable that achieving the objective of ‘water for all’ requires huge financial resources; and it is also undeniable that one of the key reasons for shortage of funds is the low user tariff regime for most of the water utilities, that does not even recover the cost of O&M of the system. However, the moot question is – *If certain quantum of investments have to be made to achieve ‘water for all’ are we better off making it through public sector agencies themselves through traditional contracting mechanisms or are there any other contracting mechanisms that can be adopted to have a bigger-bang-for-the-buck or in other words higher efficiency?*

### Traditional contracting mechanism

Given the social orientation of water as a “merit good” and the inherent monopolistic characteristics of water systems, the provision of water supply services has essentially been

handled by agencies in the public domain (hereinafter referred to as Public Water Utilities or PWUs) in most of the developing countries including India.

The usual contracts that the PWUs enter into (with private sector contractors/ operators) in their endeavour to provide water supply services can broadly be classified as follows:

1. **Service Contracts** – typically short duration contracts (say for 1-2 years) for various services such as meter reading, bill preparation & distribution, routine maintenance, operation of pump houses, etc.
2. **Rate Contracts** – for construction of facilities (viz. pumping stations, reservoirs, laying of pipelines and networks) as per individual rates specified for each item
3. **EPC Contracts** – for construction of facilities such as WTPs on a lump-sum turnkey basis as per specified technical parameters. In some variations these may also include management & maintenance of the facilities for a specified time period (say 5 years)
4. **Fixed Fee Management Contracts** – for operation and routine maintenance of facilities such as pumping stations or small plants for a specified time period (say 5 years)

An analysis of the traditional contracts shows that they suffer from two fundamental problems:

1. The contracts are restricted largely to Tier-I and Tier-II of the entire water supply system (refer Box-1), whereas the operational problems that plague the water supply systems are in Tier-III, viz. physical leakages, pipe breakages, unwieldy network design with ad hoc expansions, non-working meters, illegal connections, etc.
2. The contracts use only the muscle of the private sector (i.e. its equipment, machinery, and manpower to execute construction projects) and not its brain (i.e. its inherent

efficiency in management & operations for achieving targeted quality of services in cost effective manner)

It is only in the last decade and a half that some of the contracting mechanisms have attempted to use the 'brains' of private sector through PPP models. However, most of these early attempts have either targeted Tier-I or Tier-II of the system or have focussed primarily on the water requirement for industrial use (viz. Chennai desalination, Bhiwandi, Dewas, Tirupur, Haldia), thereby ignoring the key area where efficiency improvements are actually required i.e. Tier-III of water distribution for domestic use.

## Addressing the operational issues

### Three-tier water system

In a schematic form, a water supply system can be depicted as a three tier system comprising the following:

1. Tier-I: Water Treatment Plant – covering raw-water intake system from a water source and its treatment to potable standards
2. Tier-II: Water Transmission System – covering large diameter water transmission pipelines and pumping stations to transfer treated water in bulk to distribution overhead or underground reservoirs
3. Tier-III: Water Distribution System – covering entire network from distribution reservoir onwards to water supply connections at individual consumers' end, consumer metering, billing and collection

Leaving aside the issue of paucity of financial resources, it is clear that addressing the plethora of operation problems at Tier-III level would require the following:

1. **Network Mapping** – availability of accurate GIS based network map of all underground pipelines, valves, junctions, pumping stations, service reservoirs, etc. along with information on technical attributes of each asset
2. **Use of Technology** – use of intelligent decision support system for making informed decisions on new projects, network expansion, etc.; also use of simulation software and IT-based SCADA systems for not only balancing the system through District Metering Area (DMA) approach, but also for its monitoring, control and leak detection
3. **Accountability** – direct accountability of the management and vast number of field staff for cost and quality of services, coupled with empowerment of the middle-level management to take decisions without getting lost in bureaucratic procedures

While the first two factors can arguably be addressed by both PWUs and private players, the third factor i.e. 'accountability' is an oxymoron for monopolistic PWUs (think BSNL/ MTNL before opening up of telecom sector; think VSNL when it was

the only ISP; think power distribution in most parts of India even today). It is often argued that the accountability of state-owned agencies to the public can be achieved through elections that the political functionaries at the helm of affairs have to face. However, this indirect and longer route of accountability mechanism, has not really worked in practice. PWUs are further bogged down by compulsions of political interference in routine functioning, forced procedural-orientation rather than result-orientation, and mammoth army of field level functionaries that enjoy low answerability to their supervisors due to unionism and political patronage.

## Key features of contracting mechanism

From the foregoing it is clear that accountability for cost and quality of services can realistically be expected only from private sector. Hence, to leverage the efficiency of private sector, the contracting mechanism should essentially be a "**performance based management contract**" targeted at achieving specified level of service. The contracts may require part funding to be brought in by the private sector, but this should not be the *raison d'être* for bringing it in. The key principles of such contracts should be:

1. **Focus on Tier-III of the value chain** – since maximum interventions are required in this tier to improve and expand the water supply systems while reducing NRW, the focus of contracts should primarily be on this tier
2. **Focus on project preparation** – even before the contracts are bid out, the PWUs should undertake extensive exercise to define the existing baseline level of services and a clear scope of work for private sector
3. **Focus on outputs** – the contracts should clearly define the outputs in terms of service levels to be achieved (viz. system coverage, pressure, water quality, working meters, NRW targets, energy consumption, etc.) rather than usual approach of BOQs and item rates. This would enable private sector to use its ingenuity in developing appropriate plans to achieve the same
4. **Balance risks** – as is the cornerstone of any PPP project, the contracts should identify and allocate risks to parties that are best equipped to handle it; for example while PWUs are best equipped to handle risk related to availability of raw water, private operator is best equipped to handle risk related to operation of facilities under its management. It is also important that the contracts have some built-in flexibility to account for unforeseen change of circumstances or ground realities during the long tenure of the projects
5. **Delink projects from consumer tariffs** – since the consumer tariff is a sensitive issue which most PWUs hesitate to touch, the contracts should delink payments of the private sector from the tariff regime
6. **Incentivise efficiency** – the contracts should link payments of private operators to the actual outputs (say per kiloliter

of water billed through working meters) with incentives or penalties for extent of service levels achieved

It is only in recent years, that a few projects have been attempted on the basis of above principles, viz. Nagpur city and Delhi Jal Board's projects for Malviya Nagar and Nangloi.

### Conclusion

It is clear that if the objective of 'water for all' has to be achieved in its true sense then financial resources would have to be made available for carrying out system expansion, rehabilitation

and effective O&M. However, there is a significant scope to optimize the costs through involving private sector through contracting mechanism that leverage their efficiency and restrict the role of public authorities to regulation and monitoring of the performance. The benefits of this are not only economic (in terms of lower disease burden, lower coping costs, lesser wages lost), but also financial (in terms of lower energy costs, more water available for distribution, lower breakdown costs, higher efficiency), and even potentially political (as equitable of water to even the most disadvantaged sections of society would translate into political mileage). The recent projects hold a promise that we are moving towards plugging the "leaking bucket" through efficient mechanisms.



MBR-SCADA control room, Tirupur



ETP, Tirupur

Credit: IL&FS

## Essay 7: Unavailability of standard PPP contracts: challenges and solutions

*Brune Poirson and S.V.K. Babu*



S.V.K. Babu

With India's growing urban population and pressure on water resources, the Indian government is encouraging collaboration between the public and private sectors as one of the solutions to manage urban water services in a more sustainable and equitable way.

Over the past few years, an increasing number of public-private partnership projects have been launched in the field of urban water management. However, such public-private arrangements have come with a number of risks and uncertainties for all parties. Legal and institutional fragmentation as well as differing understanding of PPP clauses amongst public institutions increases risks and uncertainties for the private sector. A way of mitigating them would be to standardise the core requirements of a PPP contract in the field of urban water supply in the form of a set of model contract clauses. The Ministry of Urban Development of the Government of India could take the lead in drafting and promoting such standardised clauses.

Standardised PPP provisions would help create a common understanding among all the parties about the technical, operational and financial risks to address in an urban water management PPP. It would also reduce the time and costs of negotiating PPP contracts. And finally, it would be a tool to help standardise basic provisions within PPP contracts among Indian public sector agencies.

### Legal and institutional fragmentation in the field of urban water management hampers the development of PPPs

Urban water management in India is characterised by legal and institutional fragmentation, both within and between states and

central governments. A wide number of overlapping government departments, local government bodies or parastatal agencies as well as legal and political institutions govern and manage the urban water environment, while major differences exist between state laws in the field of water.

Therefore, in the context of public-private arrangements, private companies have to deal not only with a number of different government organisations, which differ from state to state and even city to city, given India's federal government structure, but also with different interpretations of the fundamental and key characteristics of PPP contractual clauses.

### Standardising the key requirements of a PPP contract would reduce risks and uncertainties

A way of dealing with the risks and uncertainties that result of legal and institutional fragmentation would be to standardise the key requirements of a PPP contract in the field of urban water management in the form of recommended contract clauses built on international best practices and experiences.

First, standardising the key requirements of a PPP contract would reduce the uncertainties for all parties involved. One of the characteristics of PPPs is that it generally involves a wide range of actors. In India, it often includes the central government, a state government, an urban local body, a private operator and possibly a financial institution. All of these stakeholders have a different understanding of the technical, operational and financial risks associated to urban water PPPs. They may even have a different understanding of how such risks could be transferred or shared among the parties involved in the delivery of such

PPPs. A standardised definition of the issues above mentioned would allow all the parties involved to share a common interpretation and minimize misunderstandings. It would also act as an incentive for private companies to participate in urban water PPPs as it would reduce the uncertainties linked to the interpretation of the PPPs' key characteristics.

Second, standardised PPP contract clauses would allow a reduction of the time and cost of negotiation for the parties involved. For the public party, standardised documentation would considerably reduce the time to issue the tender documents and the duration of the bidding process. For the private party, it would help secure financial support from financial institutions faster as it would provide a trustworthy and consistent framework. Standardised contract clauses would help expedite the process of entering into an appropriate contract for all the parties involved in the PPP project.

Finally, a standardised documentation would help public organisations to avoid pitfalls in structuring and managing the PPP contract. The set of recommended contractual clauses may address issues regarding liabilities of all the parties, termination, remuneration, dispute resolution mechanism, lenders rights and public sector employees concerns. These standard provisions, once finalised, could be the basis for any urban water PPP contract and should be part of the bid package of any municipal corporations eager to launch a PPP.

### The Government of India should take the lead in drafting and promoting a standard document for urban water management PPP contracts

With respect to the above circumstances and, as the Ministry of Urban Development (MoUD) of the Government of India is in charge of providing broad direction and guidelines to the states and municipalities, it is ideally positioned to create and promote a set of model contract clauses to be used as basis for urban water management PPPs. Such model clauses may draw on international best practices and consultation with the various stakeholders involved in urban water management. The MoUD should also ensure that such clauses promote financial and environmental sustainability, along with equitable service provision.

Going a step further, the municipal corporations should impose the incorporation of such standardised clauses in the call for tenders as a condition precedent for release of the subsidies being provided under JNNURM (phases 1 and 2).



Credit: Veolia Water India

- Top left - Old corroded and leaking pipeline, Nagpur, Maharashtra
- Top right - New water pipelines to replace old corroded pipelines, Nagpur, Maharashtra
- Bottom left - Old Pench water treatment plant before upgradation works, Nagpur, Maharashtra
- Bottom right - Water treatment plant, Kanhan, Nagpur, Maharashtra



# Annex 6: Regulatory framework for urban water management in India

## Issue brief for the third roundtable

### Major challenges

- Lack of government support after allocating the project to private partner
- Lack of pre-bid feasibility study leading to failure of water PPP projects
- Lack of involvement of various stakeholders while decision making
- Subsidies are not reaching the urban poor
- Absence of independent agencies for monitoring water PPP projects
- Targets set under contracts often shift or are unrealistic
- A well structured financing mechanism is lacking in the urban water sector
- Poor regulation on groundwater draft.

### I. Introduction

Clean, adequate and affordable water is one of the most crucial inputs for human development. Unplanned urban growth has put available water resources under pressure. Insufficient wastewater treatment capabilities are adding to the existing problem. Therefore, it is very important to regulate the WSS tariff and service quality to assign *true cost* to water, reduce wastage and manage the water resources sustainably.

Under the Indian Constitution, 'Water' is a State subject and the Union comes in only in the case of inter-state river waters. List II of the Seventh Schedule, dealing with subjects over which states have jurisdiction, has the following Entry

17: "Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of Entry 56 of List I."

Entry 56 of List I (Union list), reads as follows: "Regulation and development of inter-state rivers and river valleys to the extent to which such regulation and development under the control of the Union, is declared by Parliament by law to be expedient in the public interest."

The Constitution has a specific article (Article 262), dealing with adjudication of disputes relating to matters of inter-state rivers or a river valley, which reads as follows:

Article 262 (1): Parliament may by law provide for the adjudication on any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-state river or river valley.

(2) Notwithstanding anything in this Constitution, Parliament may by law provide that neither the Supreme Court nor any other Court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in clause (1).

In the Eighth Schedule (Part IX) dealing with Panchayats, the subjects, "Minor irrigation, Water management and Watershed development", "drinking water" and "maintenance of community assets" are listed. In the Twelfth Schedule (Part IX A) dealing with municipalities, the subjects "water supply of domestic, industrial and commercial purposes" is listed. Functional responsibilities are, thus, visualised for local Governments in respect of several aspects of water use.<sup>62</sup>

62 CWC (2013) "Water in Indian Constitution", Central Water Commission, Government of India, available at: <http://www.cwc.nic.in/main/webpages/statistics.html> accessed 13 March 2013.

With states having a major role in the management of water resources, the central government can only interfere when there is a water dispute amongst two or more states. However, the central government can exercise more power as 90% of India's land area lies within the catchments of inter-state rivers.<sup>63</sup> Further, the importance of local governing bodies has been realised and their position has been strengthened.

The governance of water resources definitely requires an administrative body; however, management should not be along administrative boundaries. A basin-wide management approach is needed as rivers do not follow administrative boundaries. Integrated watershed management (IWM) approach is more refined version of river basin approach,

which integrates social growth, economic development, ecological security, land use and land cover planning etc. along with water management. Whatsoever approach is followed the prime motive of the public sector should be to ensure equitable supply of clean and safe water to all sections of the society.

Against this background, the urban water supply and sanitation (UWSS) sector in India suffers from low cost recovery, poor operation and maintenance, high non-revenue water losses, huge volume of untreated wastewater discharge, poor governance, low tariff, and depleting groundwater. **Table A6.1 and Table A6.2** show the condition of UWSS in India.

**Table A6.1. UWSS services in India**

Indicators	Current scenario	Target	Shortfall
Availability of Drinking Water Source within premises	71.2%	100%	28.2%
Tap water from treated source	62%	100%	38%
Duration of water supply	4 hrs (avg.)/day	24 hrs /day	83.34%
Sanitation facilities in Urban Households	18.6%	100%	
Connection of Urban Household Wastewater Outlet to a Drainage	45 % (closed) 37 % (open)	100%	18% (if the target is to connect the entire household with closed drainage system then shortfall is 55%)
Waste water treatment capacity (Class I & Class II cities)	30%	100%	70% (26,467 MLD that goes untreated) <sup>64</sup>

**Source:** CPHEEO, Ministry of Urban Development, "An Analysis of 2011 Census Data on Household Amenities with respect to Drinking Water Sources and Latrine Facilities in Urban Areas of the Country", available at: <http://urbanindia.nic.in/programme/uwss/AnalysisHouseholdAmenities.pdf>; accessed 22 November 2012

**Table A6.2: Performance indicators of UWSS sector in India (20 utilities were analysed)**

Indicators	AVERAGE
Water Coverage (%)	81.58
Water Availability (hours)	4.2325
Consumption/Capita (lpcd)	118.85
Production/Population (m3/day/c)	0.2157
Unaccounted for Water (%)	33.05333
Connections Metered (%)	25.715
Operating Ratio	1.686
Accounts Receivable (months)	5.101765
Revenue Collection Efficiency (%)	99.325
Average Tariff (Rs/m <sup>3</sup> )	4.9275
New Connection Fee (Rs)	1648.65
Capital Expenditure/ Connection (Rs)	1623.053
Staff/1,000 Connections (ratio)	7.505

**Source:** ADB (2007): *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

63 Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) WP -8, National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan, September, New Delhi: Council on Energy, Environment and Water.

64 Central Pollution Control Board (2009-10), "Status of water supply, wastewater generation and treatment in Class-I cities & Class-II towns of India", Government of India available at [http://www.cpcb.nic.in/upload/NewItems/NewItem\\_153\\_Foreword.pdf](http://www.cpcb.nic.in/upload/NewItems/NewItem_153_Foreword.pdf); accessed 8 October 2012.

Management practices and capital investment are not effective enough unless supported by strong regulatory framework.<sup>65</sup> At the 6th meeting of the National Water Resources Council in December 2012, Prime Minister Manmohan Singh said, “One of the problems in achieving better management is that the current institutional and legal structures dealing with water in our country are inadequate, fragmented and need active reform”.<sup>66</sup> Realising the need for strengthening regulatory functions, the Ministry of Urban Development (MoUD) also issued an advisory note in 2012 for formulating a comprehensive sector development plan at the state and local body levels. The note mentioned regulatory functions that could cover service delivery standards for the service provider, monitoring of compliance, periodic resetting of tariffs, etc.<sup>67</sup>

## II. Roles and designs of water regulatory agencies in India

### Role of the regulator

Every regulator need not have the same terms of reference. There are several functions that could define the role of water sector regulators.

1. Regulating monopolies
2. Monitoring the quality of the WSS service
3. Regulating the water tariff system
4. Encouraging safe practices
5. Enforcing regulations
6. Working with other regulators
7. Regulating pollution

Moreover, there are some common and key principles that ought to guide the design of regulatory bodies, even though the specifics would vary on a case by case basis.<sup>68</sup>

- **Legal framework:** The regulatory agency should be created by law with defined jurisdictional authority, powers, duties and responsibilities. Basic regulatory principles, practices, procedures and policies should be articulated in the legislation.
- **Legal powers:** The regulatory agency should have the

power to make final decisions within its statutory domain without having to obtain approval of any other agency of government. It should be able to approve tariffs at reasonable levels both for consumers and regulated entities, to set binding technical standards and benchmarks for commercial service quality, to make rules and subsidiary policy, to perform routine administrative functions, to prevent the abuse of monopoly/market power, to promote competition where appropriate and feasible, to adequately protect consumers, to prevent undue discrimination, to monitor the performance of regulated entities, the functioning of the market and reliability of supply.

- **Clarity of role & comprehension of regulatory decisions:** The law should also provide for clear and comprehensive allocation of powers and duties between the regulatory agency and the government. The basic policies outlined in the law and which are prospectively binding on the regulatory agency should be developed in a transparent manner. The key principles and methodologies by which regulatory decisions would be made should be clearly articulated in advance.
- **Predictability & flexibility:** Regulatory decisions should, to the extent reasonable and feasible, be consistent with previous decisions. Whenever deviations from previous practice are necessary, it should be undertaken by regulators only after first providing public notice and providing all interested parties with a meaningful opportunity to be heard on the matter. Any fundamental change in regulatory practice or policy should, to the extent feasible, be undertaken on a gradual, prospective basis.
- **Regulatory independence:** Regulatory agencies should be created by law (or under the Constitution) rather than by decree or other subsidiary legislation. The regulatory should be free to take independent decisions.
- **Regulatory accountability:** The accountability for any decision taken by the regulator should be well defined.
- **Regulatory processes and transparency:** The process for taking decision should be transparent in nature.
- **Public participation:** There should be a provision of public participation prior to all the decisions being taken by the regulator.
- **Appellate review of regulatory decisions:** Finally, the regulator is not the ultimate authority and cannot make random decisions. Therefore, there should be a defined appellate procedure in case any decision of regulator needs to be challenged.

### Current regulatory frameworks for water and wastewater regulation in India

In India, traditionally the focus had been to regulate water

65 DWAF (2012) “National water resource strategy 2”, Department of water affairs, Republic of South Africa, available at <http://www.dwaf.gov.za/nwrs/LinkClick.aspx?fileticket=4VTO7F2Ekiw%3d&abid=72&mid=435> accessed on 14 March 2013.

66 Singh, Manmohan (2012) “The National Water Resources Council” *Opening statement at 6<sup>th</sup> meeting*, 28 December.

67 MoUD (2012) “Advisory Note on “Improving Urban Water Supply & Sanitation Service”, Ministry of Urban Development, Government of India.

68 Brown, Ashley C. (2006), “The Independent Regulator Model”, Harvard Electricity Policy Group, John F. Kennedy School of Government Harvard University, available at [http://www.hks.harvard.edu/hepg/brown\\_papers/ABrown\\_WFIII\\_100906.pdf](http://www.hks.harvard.edu/hepg/brown_papers/ABrown_WFIII_100906.pdf) accessed on 22 March 2013

pollution. Two acts were enacted in the 1970s towards this end:<sup>69</sup>

1. The Water (Prevention and Control of Pollution) Act was enacted in 1974 to prevent and control water pollution, and for maintaining or restoring water quality in the country.
2. The Water (Prevention and Control of Pollution) Cess Act was enacted in 1977, to levy a cess on water consumed by persons operating and carrying on certain types of industrial activities. This cess is collected with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974. The Act was last amended in 2003.

The Environment (Protection) Act, 1986 regulates any activity, mostly industrial activity, which has the potential to pollute the environment. The Hazardous Waste (Management and Handling) Rules, July 1989 regulate the handling and transportation of hazardous substances. These two serve as supporting Acts to regulate water pollution.

Deriving power from the Water (Prevention and Control of Pollution) Act 1974, the Central Pollution Control Board and the State Pollution Control Boards were created. These institutions are the regulators of water pollution in India. The Central Ground Water Authority was constituted under Section 3(3) of the Environment (Protection) Act, 1986 to regulate and control the development and management of groundwater resources in the country.

However, as regards regulation of urban water supply in India, there was hardly any legislation to govern the quality of service for water supply in India. Municipal bodies get the authority to regulate connections and supply via the respective state municipal acts. However, there is no act which makes the service provider accountable for its services. This deficiency is indeed surprising because drinking water is accorded the highest priority in national as well as various states water policies. The right to safe drinking water is not explicitly articulated under the Indian Constitution but various court rulings have declared it to be a fundamental right, interpreting it as a part of 'right to life', which is guaranteed under the Constitution.<sup>70</sup>

Almost every state policy advocates 24x7 water supply and the provision of drinking water is paramount, in case of a

water stress situation, even in projects meant for irrigation or industrial use. However, state water policies in India hardly mention regulation of domestic water supply. Only a few states –Andhra Pradesh, Arunachal Pradesh, Maharashtra, and Uttar Pradesh – have a state policy for an independent regulator or a regulation committee of water.

Maharashtra was the first state to enact legislation to establish a water regulator, the Maharashtra Water Resources Regulatory Authority (MWRRA) in 2005. The MWRRA Act provides that the MWRRA is to be a legal entity with three members, a chairperson and two other members, one with expertise in water resources and the other with expertise of water resources economics. These are full time positions for a three-year term which can be renewed once. All three members are appointed by a selection committee headed by the Chief Secretary of the State. Apart from the three members who comprise the MWRRA, all other employees (currently 20) are engaged in short-term (six month) contracts. They are not government servants and do not enjoy pension privileges. The three main functions of the authority are:<sup>71</sup>

- i. to determine, regulate and enforce the distribution of entitlements for the various categories of use and the distribution of entitlements, within each category of use;
- ii. to establish a water tariff system for levying water charges on various categories of water users with a view to establishing a stable and self-sustainable management of service delivery to such users;
- iii. to review and clear water resources projects, with a view to ensuring that a project proposal is in conformity with the Integrated State Water Plan (ISWP).

The Authority is also required to support and aid the enhancement and preservation of water quality and promote sound water conservation and management practices. It has been vested with a special responsibility under Sections 11(f) and 21 of the MWRRA Act with regard to clearing projects in districts and regions with irrigation backlogs as per the Governor's directives.

Other states have followed Maharashtra but there are few differences. The Uttar Pradesh Water Management and Regulatory Commission Act, 2008, provides for the establishment of a 'commission' rather than an 'authority', which envisages the role of an advisor rather than an active regulator. The UP commission comprises five rather than three members. Nevertheless, its tasks are broadly similar to those of the MWRRA.

The Andhra Pradesh Water Resources Regulatory Commission Act of 2009 also provides for the establishment of a 'commission' albeit one with three members. However,

69 MoEF(2003) "Water Pollution Rules and Regulations", Government of India; available at : <http://www.moef.nic.in/modules/rules-and-regulations/water-pollution/>; accessed on 6 April 2013.

70 Paranjape,Suhas ,K.J. Joy (2011) *Million Revolts in the Making: Understanding Water Conflicts, India Infrastructure Report*, Infrastructure Development Finance Company; available at <http://www.saciwaters.org/CB/water%20and%20equity/water%20and%20equity/IV.%20Readings/4.%20Conceptual-Normative/4.2.%20understanding%20water%20conflicts.pdf>, accessed on 5April2013.

71 Government of Maharashtra(2005), "Maharashtra Water Resources Regulatory Authority";available at [http://www.mwrra.org/functions\\_duties.php?link=abt](http://www.mwrra.org/functions_duties.php?link=abt) : accessed on 06 April 2013.

its tasks are significantly different to those of the MWRRRA. These are:<sup>72</sup>

- i. to determine the water requirements of various categories of water use sectors, including the requirements of individual WUAs based on approved cropping patterns;
- ii. to determine adequate operation and maintenance costs for water projects, which the State is then bound to provide;
- iii. to promote the efficient use of irrigation water by various means; and
- iv. to promote the efficient use of water resources and the minimisation of wastage by fixing, and ensuring, the implementation of, water quality management standards relating to water resource management, service provision, waste water disposal, water resource protection etc. as well as supporting and aiding the enhancement of water quality.

The main difference between the Maharashtra Water Resources Regulatory Authority Act, 2005, and the Andhra Pradesh Water Regulatory Commission Act, 2009, is that the former primarily focuses on determining water entitlements and its trade and fixing water tariffs, while the latter focuses on non-tariff regulations such as operation and maintenance, project performance, water quality and service delivery standards and its monitoring.

Regarding quality control of drinking water, the central government has introduced various quality standards for drinking water supply. These include the Bureau of Indian Standards (BIS) Water Quality Standards (BIS: 10500) 1991 and the *Manual on Water Supply and Treatment* issued by the Central Public Health and Environmental Engineering Organization (CPHEEO). While these are, in principle, applicable countrywide, the absence of any legislation directly referring to these standards means that to date their legal status is partly inchoate. They are applicable but not legally binding on water service providers.<sup>73</sup> Under these conditions let us analyse the potential reforms in the current regulatory framework that could alleviate the poor condition of UWSS sector.

### III. Key regulatory bottlenecks in urban water management in India

There are various regulatory bottlenecks, which need to be unplugged for efficient urban water management. **Figure**

A6.1 highlights the regulatory shortcomings in UWSS sector in India, which are also summarised below.<sup>74-75</sup>

*Lack of regulation for efficient use:* There is no regulatory authority which monitors the efficiency of water use in different consumptive practices. In fact, there is no set efficiency standard for various urban water uses, which leads to a huge amount of water loss. For instance, water efficient systems like dual-flush systems or high-efficiency toilets in new buildings could be mandated. These use 4-6 litres of water per flush as compared to traditional flushes used in India which use 10-15 litres.<sup>76</sup> In 1992, the U.S. Congress passed the Energy Policy Act of 1992, which mandated that within two years common flush toilets use only 1.6 U.S. gallons (6.1 L).<sup>77</sup>

*Lack of inclusion of environmental costs in tariff structure:* The environmental cost of water has not been estimated and the cost of water nominal. There are the Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) guidelines for industrial effluent discharge standards. However, there is a need to estimate the environmental cost of water in order to reflect the true cost of water, especially if the same amount of water were used for other purposes or for ecological needs or if the damage caused to the ecosystem from effluents were counted. A regulation internalising the externalities of not only industrial effluents but also domestic wastewater is lacking.

The example of regulatory reforms in Germany to solve the water pollution issue is appropriate. Direct regulation, the Federal Water Act implemented in 1957, did not lead to an internalisation of external costs caused by untreated effluent discharges (SRU, 1974). The water management administrations of the Federal states were not implementing regulations on effluent discharges (Kraemer, 1995). The private and municipal sectors were also not complying with prescribed discharge standards (Ecotec, 2001:84). In response, an effluent tax charge was introduced in 1976. The size of the tax is based on damage units, i.e. quantities and concentrations of pollutants, and the quantity of discharged effluents, for which permits must still be obtained. The objectives of the effluent charge included: (1) mitigating and avoiding the discharge of pollutants into waterways, soil, and

72 Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) *WP -8, National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan*, September, New Delhi: Council on Energy, Environment and Water.

73 Cullet, Philippe (2011) *Evolving Regulatory Framework for Rural Drinking Water*, India Infrastructure Report 2011: Infrastructure Development Finance Company.

74 Wagle, Subodh, Pranjal Deekshit, (2011) "Regulation of Urban Water and Sanitation; Matching Sectoral Challenges with Regulatory Opportunities" Presented at Prayas, available at [http://www.urbanindia.nic.in/programme/uwss/uiwww/PPT\\_8th\\_Meeting/Regulation\\_UWS\\_TISS\\_PPT.pdf](http://www.urbanindia.nic.in/programme/uwss/uiwww/PPT_8th_Meeting/Regulation_UWS_TISS_PPT.pdf) accessed on 15 March 2013

75 CEEW-Veolia Water India (2013) *Private Sector Participation in Water Management and Water for All*, Roundtable on Urban Water Management, 11 February, at India International Centre, Delhi.

76 Jadhav, Radheshyam (2013) "Efficient fixtures can help save water, says research organisation", TNN28 January, available at [http://articles.timesofindia.indiatimes.com/2013-01-28/pune/36595597\\_1\\_water-efficient-fixtures-dual-flush-toilets-dual-flush-toilets](http://articles.timesofindia.indiatimes.com/2013-01-28/pune/36595597_1_water-efficient-fixtures-dual-flush-toilets-dual-flush-toilets) accessed on 15 March 2013.

77 Flush Toilets (2013), available at [http://en.wikipedia.org/wiki/Flush\\_toilet](http://en.wikipedia.org/wiki/Flush_toilet); accessed 5 April 2013.

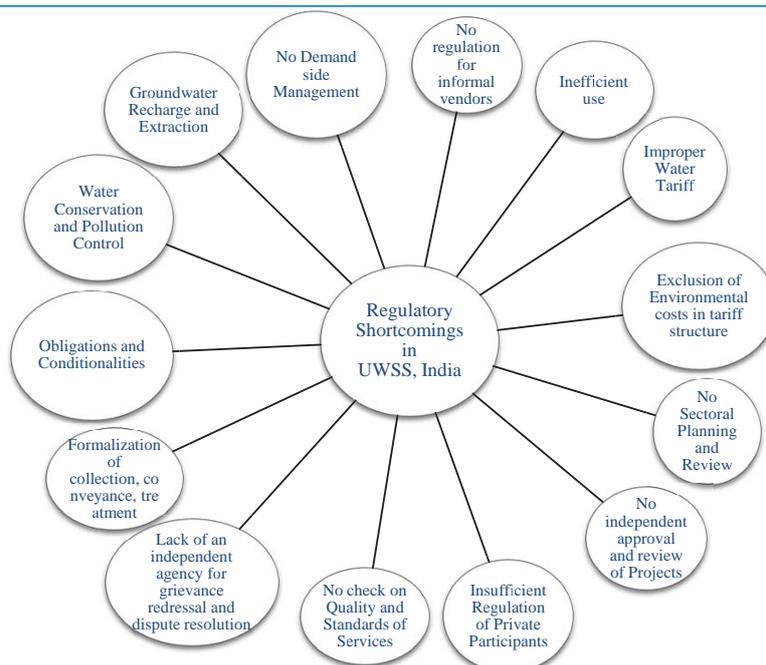
drainage systems; (2) maintaining clean water bodies; (3) keeping water treatment plants consistent with the state of the art; (4) developing production processes with less or no wastewater development; (5) and appropriately distributing the costs to mitigate, eliminate, and balance damage to water bodies (Sächsisches Staatsministerium für Umwelt und Landwirtschaft).

This measure resulted in the overall reduction of discharge by 4%, while discharges of private emitters decreased by 18%. Mercury discharges were reduced by 99% from industrial sources and by 65% from municipal treatment plants in 2003-2005, against the baseline of 1987. Nitrogen discharges from point sources were reduced by 76%. The quality of water bodies increased substantially, with 65% of all surface water bodies achieving a water quality II status. Waste water treatment plants were upgraded to the state of the art. In 2007, 92.6% of effluents in Germany underwent tertiary treatment. Every industry adopted water efficient technologies. Given the similarity between the current situation in India and what existed in Germany before the effluent charge tax was introduced, this could serve as a salutary example for India.<sup>78</sup>

the water tariff does not reflect the cost incurred in water treatment and supply, let alone wastewater treatment. As a result, the condition of operation and maintenance of water and wastewater infrastructure and the quality of service has been negatively affected.

*Groundwater recharge, extraction and quality:* The rate of extraction of groundwater has exceeded the rate of recharge in many urban localities like Ahmedabad, Bangalore, Chennai, Delhi, Hyderabad, Jaipur etc.<sup>79</sup> This has led to falling groundwater levels, in turn increasing the demand for energy and other infrastructure to pump groundwater. Even the quality of groundwater is a major issue. with Thirteen states – Andhra Pradesh, Bihar, Delhi, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh – have been identified as endemic to fluorosis due to the abundance of naturally occurring fluoride-bearing minerals. Nearly half a million people in India suffer from ailments due to excess of fluoride in drinking water. In some districts of Assam and Orissa, groundwater has high iron content. About 31% of the total area of Rajasthan comes under saline groundwater. Groundwater is saline in almost all of the Bhakra Canal in Punjab and the

**Figure A6.1: Regulatory shortcomings in urban water supply and sanitation system**



**Source:** Subodh Wagle & Pranjal Deekshit, Presentation on Regulation of Urban Water and Sanitation ;Matching Sectoral Challenges with Regulatory Opportunities Prayas, available at [http://www.urbanindia.nic.in/programme/uwss/uiww/PPT\\_8th\\_Meeting/Regulation\\_UWS\\_TISS\\_PPT.pdf](http://www.urbanindia.nic.in/programme/uwss/uiww/PPT_8th_Meeting/Regulation_UWS_TISS_PPT.pdf) accessed on 15March 2013

**Improper tariff:** In most of the cities and towns in India,

lift canal system in south-western Haryana. Similarly, high levels of arsenic in groundwater have been reported in the shallow aquifers in some districts of West Bengal. Certain

78 Gulland, Möller-, Jennifer; Katriona McGlade and Manuel Lago (2011), *Evaluating Economic Policy Instruments for Sustainable Water Management in Europe: Effluent Tax in Germany*. Report of Evaluating Economic Policy Instruments for Sustainable Water Management and European Commission, December, p. 6.

79 CGWB (2011) "Groundwater Scenario in Major Cities of India", Central Ground Water Board, Government of India; Available at <http://cgwb.gov.in/documents/GW-Senarioin%20cities-May2011.pdf> accessed on 22Mar13

places in Andhra Pradesh, Gujarat and Haryana were also found to have dangerously high levels of mercury.<sup>80</sup>

The Mid-Term Appraisal of the 11<sup>th</sup> Plan found that nearly 60% of all districts in India have problems related either to the quantitative availability or to quality of groundwater or both. It is a serious issue as more than 80 % of India's drinking water needs are serviced by groundwater resources. The regulation on groundwater in India is outdated and is characterised by several elements:

- Common law doctrine of absolute dominion gives the landowner the right to take substantially as much groundwater with virtually no limitation or liability to adjoining landowners or the environment.
- Common law rules of access to and control over groundwater:
  - are based on a now dated scientific understanding of groundwater that fails, for instance, to take into account patterns of aquifer recharge and the interconnectivity between surface and groundwater;
  - constitute an atomised regulatory framework that does not take into account the need to regulate groundwater at the aquifer level (rather than the landowner level); and
  - excludes all landless groundwater users from the regulatory regime.

The Indian Easement Act 1882 is often simplistically interpreted as linking groundwater extraction with land ownership rights. However, it does not allow unlimited extraction of groundwater if it can be proved that groundwater flows in a definite channel and is not restricted to the territory of the owner. The regulation of groundwater is similar to regulation of surface water, mainly governed by the public trust doctrine. A model bill for the conservation and protection of groundwater has been proposed in Parliament but its implementation would be contingent on acceptance by the states.<sup>81</sup>

*Securing water from politics:* An independent regulator is required to safeguard the interest of all stakeholders and ensure equitable WSS services. Public opposition against price rise is one reason why politicians, especially at the local level, are reluctant to increase tariff levels to financially sustainable levels. Lack of awareness of the broader benefits and adverse impacts on poorer households are the major reasons behind public opposition. These are legitimate concerns that need

to be addressed, but they should not preclude reliance on tariffs as the main component of sustainable cost recovery policies.<sup>82</sup>

*No regulation of informal vendors:* For achieving the objective of water to all it is important to regulate the informal vendors supplying water to the urban poor. Currently, there is no regulation, which puts a limit on the tariff charged by informal vendors. The consequence: the urban poor pay far more per unit of water than those with access to piped supply in their homes.

*Regulation on subsidy:* The UWSS system is subsidised so that the urban poor who are not able to pay for the WSS services could also get the lifeline support of water. However, the subsidy does not reach the poor. In order to make the process more efficient a few of the regulatory measures that could be introduced include:

- regulation on defining and mapping the Low Income Group (LIG) areas;
- regulation of the connection charges to these areas with the provision for subsidised connections;
- regulating subsidies to replace general subsidies with targeted subsidies for providing services in LIG areas;
- regulating the subsidy allotment process by making it output based.

*Deficiency of demand side management:* Much of the current WSS system operates on a largely supply side paradigm. As a result, water resources are coming under greater stress. Demand side management, instead, focuses on resources conservation, efficient use and reduction of wastage. It can be achieved by employing technical, political, economic or regulatory tools. Several measures could be considered, such as regulating the efficiency of:

- water supply and wastewater infrastructure (reducing leakage and amount of untreated wastewater flow);
- industrial processes involving water consumption;
- domestic fixtures in new buildings.

*Sectoral planning and review:* An independent regulatory authority that can oversee the entire UWSS system in an integrated manner is absent. The WSS system is divided between several departments, with one department responsible for domestic water supply, another responsible for industrial water supply, a third looking after wastewater treatment and so on. Thus, no single department can be held accountable for systemic failure.

80 The Energy and Resources Institute "Groundwater", available at <http://edugreen.teri.res.in/explore/water/ground.htm> accessed on 22 March 2013.

81 Planning Commission (2011), Draft Model Bill for "The Conservation, Protection and Regulation of Groundwater", Planning Commission, Government of India; available at [http://planning-commission.nic.in/aboutus/committee/wrkgrp12/wr/wg\\_back.pdf](http://planning-commission.nic.in/aboutus/committee/wrkgrp12/wr/wg_back.pdf); accessed on 5 April 2013

82 OECD(2009) Managing Water for All: An OECD Perspective on Pricing and Financing :Key Messages For Policy Makers Organisation for Economic Co-operation and Development : Available at <http://www.oecd.org/environment/resources/42350563.pdf> accessed on 5April2013.

*Assigning and review of contracts:* Regulators are also needed to review proposed contract documents thoroughly, and accordingly approve or reject the contract. But under the current mechanism the public agency assigns contracts directly, often with unrealistic or ambiguously specified targets. Many PPP projects end prematurely because the private partner bids very low prices solely to win the contract. Meanwhile, the public agency considers these projects only as means of bringing in investment rather than as a lifeline support to the citizens. Its engagement with the contract often ends with signature whereas a symbiotic and cooperative relationship between both the public and private parties is necessary during the implementation stage. Appropriate due diligence is necessary and the entire process of bidding, selection, and allocation of project ought to be done in the presence of an independent authority.

*No regulation of private participants:* Once contracts have been awarded, regulators are needed to oversee the implementation, whether by public agencies or private firms. Regulators need to have the power to rescind contracts in case the implementing agency is unable to meet the minimum technical, commercial and financial performance specified in the contract. Currently, only annual service provision targets are set rather than continuous regulation.

*Grievance redressal and dispute resolution:* Often the agencies that provide services also frame the regulations. The resulting conflict of interest serves as a disincentive for other stakeholders to engage in provision of water services. An independent regulatory agency could resolve the conflicts between the public and private partner or consumer and service provider.

*Regulating conservation and pollution control:* Despite laws regulating pollution, the quality of fresh water is deteriorating in many urban centres. The Ministry of Environment and Forest found, in 2009, that almost 70% of surface water resources and a growing percentage of India's groundwater reserves are contaminated by biological, toxic, organic and inorganic pollutants. In many cases, these sources have been rendered unsafe for human consumption as well as for other activities such as irrigation and industrial needs. In 1995, the Central Pollution Control Board identified severely polluted stretches on 18 major rivers in India (*World Bank 1999*). The majority of these stretches were found in and around large urban areas. The high incidence of severe contamination near urban areas indicates that the industrial and domestic sector's contribution to water pollution is high.<sup>83</sup> The question for regulation is whether pollution control boards need to be strengthened or whether other regulators would have a role as well.

83 MoEF (2009), "State of Environment Report of India", Ministry of Environment and Forest, Government of India.

*Formalisation of collection, conveyance, and treatment:* Standardising and formalising the collection, conveyance, and treatment system is important. Not only could it help to reduce losses and improve water quality, but it also helps to establish benchmarks against which utilities could be compared. The regulator could oversee and audit these systems for ensuring that set standards are being followed.

*Obligations and conditionality:* Finally, regulators are needed to enforce the conditionalities associated with the release of subsidies or raising tariffs. The standards could be set either by the regulator or by public authorities in consultation with the regulator. But oversight and enforcement is the regulator's role, without which there will be limited trust in existing or new contracts.

#### IV. Potential reforms for the current regulatory framework in India

**Figure A6.2** presents a framework for analysing the need for regulatory reform. The first step is to outline specific objectives. This has to be followed by evaluating whether existing regulatory frameworks are suited to deliver the chosen objectives. Based on this evaluation, specific regulatory functions have to be identified. Finally, legal instruments and institutions have to be examined for their appropriateness to embody the regulatory rules and execute the regulatory reforms, respectively.<sup>84</sup>

For better management of the UWSS, possible regulatory reforms are:<sup>85,86</sup>

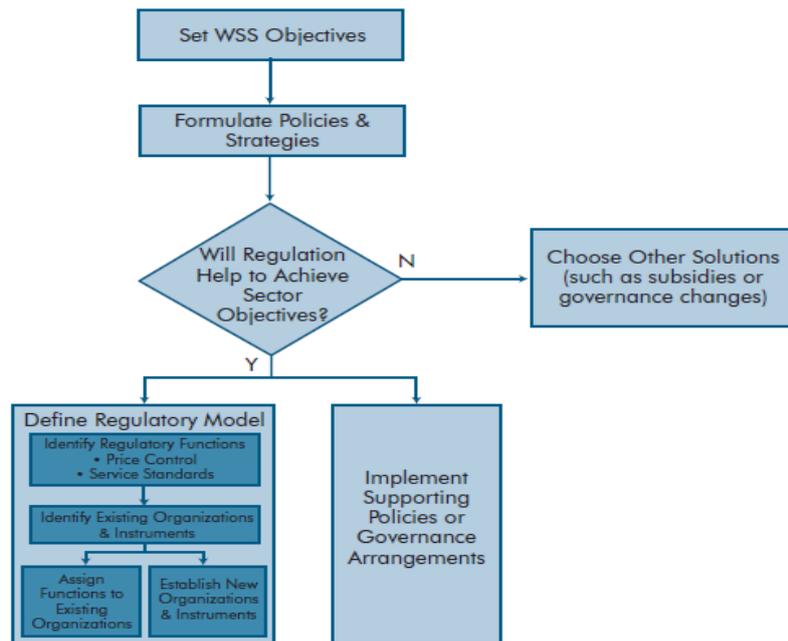
*Regulating monopolies:* In India, the public sector has a monopoly in UWSS service provision. Or there might be the case where a private entity is contracted to manage the utility. There could be situations where the service provider provides poor quality service yet charges higher prices. Under these circumstances a regulator is necessary to curb monopolistic practices.

84 Eric Groom, Jonathan Halpern, and David Ehrhardt (2006) *Explanatory notes on key topics in the regulation of water and sanitation services*, Water supply and sanitation sector board discussion paper series, June World Bank, pp i-6.

85 MouD (2012), Advisory note on "Improving urban water supply and sanitation services", Ministry of Urban Development, Government of India.

86 WB (2012) "India: Improving urban water supply and sanitation services", Lessons from Business Plans for Maharashtra, Rajasthan, Haryana and International Good Practices, World Bank in association with Ministry of Urban Development, India.

Figure A6.2: Framework for analysing the requirement of a regulatory reform



Source: Eric Groom, Jonathan Halpern, and David Ehrhardt (2006) Explanatory notes on key topics in the regulation of water and sanitation services, Water supply and sanitation sector board discussion paper series, Paper no. 6, June 2006, World Bank

*Regulating service:* An operating license/contract granted to a WSS service provider should specify:

- (i) WSS service standard/characteristics;
- (ii) procedures for adjusting and resetting tariffs;
- (iii) minimum technical, commercial and financial performance that should be achieved;
- (iv) reporting obligations

*Monitoring the quality of the WSS service:* Monitoring plays an important role as the accountability in the current WSS system is very low. The regulatory authority should:

- (i) monitor the technical, commercial and financial performance of the WSS service provider and the quality of the service provided to customers;
- (ii) investigate customer complaints;
- (iii) penalise the WSS service provider in case it is not able to comply with the terms mentioned in the contract.

*Settling disputes:* An independent regulatory authority is required for delinking water from political interference and providing a mechanism for resolving disputes between the public partner (local government body), the service provider, customers and other parties.

*Regulatory Act:* State governments could pass a Regulatory Act to:

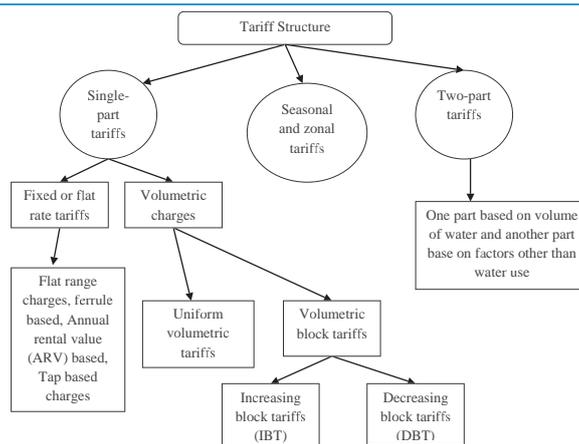
- Clarify the objectives of economic regulation;
- Set a timetable for establishing an independent Regulatory Authority and spell out:

- conditions to be met before its establishment; and
- interim arrangements to be made before the Regulatory Authority is established;
- Clarify pricing principles that can apply to the piped urban WSS service and spell out the objectives for:
  - recovering operation, maintenance and capital costs (differentiating between short and long term actions);
  - managing demand;
  - encouraging efficiency of operations; and
  - favouring access to and consumption of minimum service by low income customers
- Clarify regulations that apply to the provision of mobile (water tankers, sludge handlers) or fixed (independent networks) “substitutes” to the piped WSS service provided by operators other than the WSSSP.

## V. Regulating the pricing mechanism

Figure A6.3 shows structures and types of water tariffs. In simple terms, a tariff is the fee charged for service provided or received. A tariff structure is a set of procedural rules used to determine the conditions of service and the monthly bills for water users in various categories or classes.<sup>87</sup>

87 Folifac and Gaskin (2011) “Understanding potable water supply costs, pricing, tariffs and cost recovery in low income and developing countries: A comprehensive synthesis”, Journal of Ecology and the Natural Environment Vol. 3(13), pp. 400-409, Available online at <http://www.academicjournals.org/JENEISSN> 2006 - 9847©2011 accessed on 21 March 2013.

**Figure A6.3: Water tariffs - structure and types**

**Source:** F Follfac, S Gaskin (2011) "Understanding potable water supply costs, pricing, tariffs and cost recovery in low income and developing countries: A comprehensive synthesis," *Journal of Ecology and the Natural Environment*, 3(13), November, pp. 400-409 available on <http://www.academicjournals.org/JENE> accessed on 12 March 2013

### Types of models used in tariff setting

There are three major types of models used for tariff setting. **Table A6.3** describes these models based on their objectives, assumptions and methodologies.

**Table A6.3: Definition, Objectives, Assumptions and Methodology of Tariff setting models**

S. no.	Types of Tariff model	Definition	Objectives	Assumptions	Methodology
1	Linear uniform volumetric tariff model e.g. Ahmedabad, Raipur etc.	Consumers pay as per consumption; however the service is highly subsidised to make it affordable to all.	Ensuring cost recovery of relevant costs Incorporation of concept of water conservation Ensuring social equity Ensuring water availability for poor people irrespective of their capacity to pay for it	All elements of cost are recovered fully  Average cost of water supplied is same for all	Average cost per kl is computed based on total water supplied and total cost incurred at various levels  This average cost per kilo liter is the base tariff charged to all customer groups. The subsidies to the various groups are provided on the base cost.
2	Volumetric increasing block tariff (IBT) model e.g. Delhi, Bangalore, Chennai, Hyderabad etc.	In IBT the first block is defined usually by the minimum water consumption norms. Price rise with each successive block.	Ensuring the cost recovery for O&M operation Ensuring the economic efficiency Incorporation of the concept of water conservation Market driven tariff	All elements of cost are recovered fully  Water consumption slabs are defined based on water norms for various types of household	Average cost per kilo liter is computed based on total water supplied and total cost incurred at various levels  Weights are derived based on water consumption norms. These weights define the corresponding level of per capita water consumption and depict the ratio for the tariff in these slabs.
3	Tariff model based on cost incurred in servicing different types of consumers. This is in practise in all the cities in India.	In this model water tariff is different for different category of consumers based on cost of production and supply.	Ensure social equity  Ensuring water availability for poor people irrespective of their paying capacity	Consumers are classified as commercial, public stand post and households and the tariff charged is according to the cost of production.	In this model it is suggested that at the ULB level itself, cost will be segregated between the different categories of consumers based on data on water pumped. For all ULB's cost should be aggregated consumer category wise and cost per kilo liter will be calculated. The subsidies if any can be provided on it.

**Source:** TERI (2010) *Review of current practices in determining user charges and incorporation of economic principles of pricing a study report for Ministry of Urban Development, The Energy and Resources Institute*, available at [http://urbanindia.nic.in/programme/lsg/teri\\_uc\\_report.pdf](http://urbanindia.nic.in/programme/lsg/teri_uc_report.pdf) accessed on 9 November 2012

*Fixed tariff versus volumetric tariff.* Volumetric tariff is based on the principle of 'pay-as-you consume'. The consumer's water bill is a function of the level of their consumption, whereas in fixed rate tariff structure a fixed amount is paid monthly or for each billing period. Here, the level of consumption is often estimated on unrealistic parameters such as the property value, number of taps in the household, the diameter of pipes. The cost incurred in monitoring changes in the tariff setting parameters is high, so this tariff setting mechanism is not often updated.<sup>88</sup>

*Fixed rate volumetric versus Increased Block tariff (IBT):* In the IBT structure, the first block is highly subsidised regardless of need. Thus, people who are consuming more also benefit the most. For example, in Bangalore a household consuming 5m<sup>3</sup> of water is charged of US\$ 1.40 i.e. paying US\$ 0.28 per cubic meter, which is the same bill paid by another consumer consuming 95 m<sup>3</sup> or more. It is also inappropriate for those using shared connections and for metered public stand post where cost recovery is practiced.<sup>89</sup>

In other words, ideally the tariff should be based on the exact amount of consumption. If volumetric charges are based on IBT, then the first block should cater only to basic minimum need with higher tariffs for higher consumption levels.

### Current pricing mechanism in India

The Indian urban water supply system lacks adequate point-of-use metering. The resulting poor quality of water use data is one of the reasons why most cities apply fixed charges based either on the diameter of the connection or the assessed value or the size of plot. In some cities – Amritsar, Bengaluru, Bhopal, Chandigarh, Chennai, Coimbatore, Dehradun, Delhi, among others – a hybrid structure of fixed and volumetric tariffs for water supply is being used for non-metered and metered areas, respectively. In some of the metropolitan cities, such as Bengaluru, Chennai, and Delhi, increasing block tariffs are common.

Generally, households with metered connections pay less, but they pay for what they use, whereas fixed charges result in huge wastage because people lack the incentive to contain

their consumption. If a flat rate is adopted, the wastage remains unaccountable. Thus, from both conservation and cost efficiency point of view metered connections are better. Metering could also help to increase the utilities' revenues by increasing the number of households with a legal and registered connection, which is metered, and therefore takes full account of the actual volumes of water consumed. In a 2011 study to assess cost recovery in water supply in 19 Indian cities, the World Bank found out that fixed charges were neither cost efficient nor did they promote conservation of water resources (see **Table A6.4** below).<sup>90</sup>

Plot based charges are also ineffective in targeting the poor. In Ludhiana plots of 125 square yards or less are exempted from water and sewerage charges when a poor household occupies only 40 square yards.<sup>91</sup> In Dehradun the tariff is charged on the basis of annual rental value (ARV). But with nearly 40% of the households not registered for property tax, substantial revenue losses occur.<sup>92</sup>

Industrial tariffs are generally higher than domestic ones, sometimes six or seven times higher. For example, in Hyderabad, domestic consumption up to 15 kilolitres (kl) is available at Rs.6 per kl, while general industries pay Rs.35 per kl and water-intensive industries pay Rs.60 per kl. In the light of these charges, bulk consumers often switch to alternative water sources if they become available. Where possible, industries use groundwater but, in the process, the service provider is unable to recover its operational costs via higher bulk tariffs. Meanwhile, groundwater resources also come under additional stress.<sup>93</sup>

Another study of 20 WSS utilities in India (analysed using 13 indicators) found that for most of the utilities the operating ratio (annual O&M cost as a proportion of annual revenue) was greater than 1, implying that utilities were unable to recover running costs let alone capital investments (see **Figure A6.4**

88 Folifac and Gaskin (2011) "Understanding potable water supply costs, pricing, tariffs and cost recovery in low income and developing countries: A comprehensive synthesis", *Journal of Ecology and the Natural Environment* Vol. 3(13), pp. 405-405, Available online at <http://www.academicjournals.org/JENEISSN 2006 - 9847@2011> accessed on 14 March 2013.

89 Brocklehurst, Clarissa, Amrit Pandurangi and Itha Ramathan, (2002) *Water and sanitation program- South Asia*; Report of World Bank, World Bank Institute, PPAIF, USAID; Government of India, December. p- 11. Available at <http://www.academicjournals.org/jene/PDF/Pdf2011/Nov/12%20Nov/Folifac%20and%20Gaskin.pdf> : accessed on 5 April 2013.

90 Gupta, Anjali Sen.(2011) "Cost recovery in urban water services: select experiences in Indian cities" *Water and sanitation program*, World Bank , Technical paper: 12;- available at <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Cost-Recovery-Urban-Water-Services.pdf>; accessed 14 March 2012

91 Gupta, Anjali Sen.(2011) "Cost recovery in urban water services: select experiences in Indian cities" *Water and sanitation program*, World Bank , Technical paper: 14;- available at <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Cost-Recovery-Urban-Water-Services.pdf>; accessed 14 March 2012

92 Gupta, Anjali Sen.(2011) "Cost recovery in urban water services: select experiences in Indian cities" *Water and sanitation program*, World Bank , Technical paper: 11;- available at <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Cost-Recovery-Urban-Water-Services.pdf>; accessed 14 March 2012.

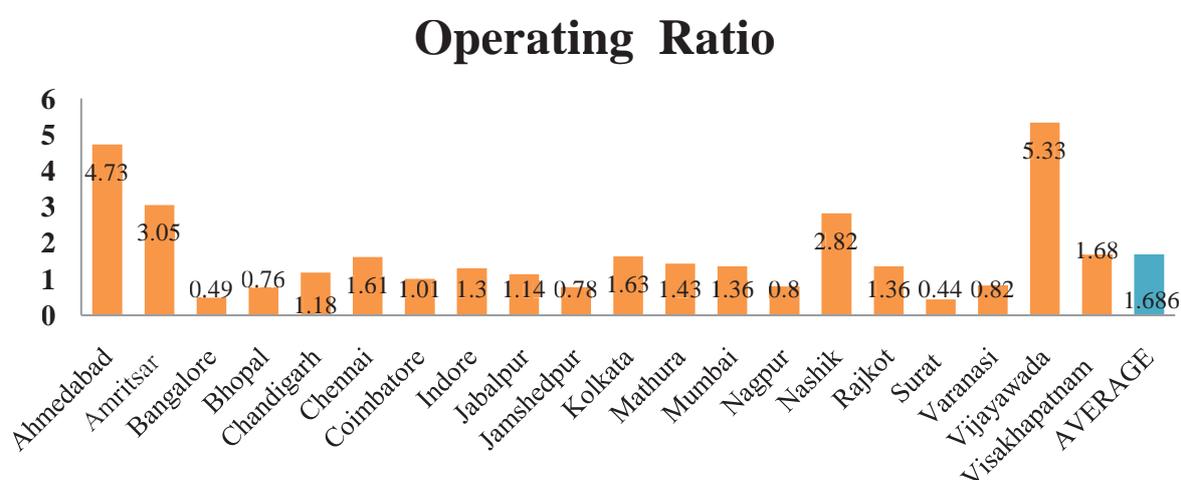
93 Gupta, Anjali Sen.(2011) "Cost recovery in urban water services: select experiences in Indian cities" *Water and sanitation program*, World Bank , Technical paper: 14;- available at <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Cost-Recovery-Urban-Water-Services.pdf>; accessed 14 March 2012

**Table A6.4: Metered vs Non-metered water supply**

City	Minimum Fixed Charge per Month (in Rupees)	Volumetric charge for 20 kl Consumption per Month (in Rupees)
Ahmedabad	73.25	60
Amritsar	60–120	64
Bengaluru	No fixed charge connections	156
Bhopal	60	70
Chandigarh	100	26.25
Chennai	50	150
Coimbatore	50/tap/month	3 kl free + 59.5
Dehradun	80.50–172.5	No volumetric charge for domestic consumers
Hyderabad	No fixed charge connections	130 + 190 minimum monthly charge
Indore	160	240
Jamshedpur	120–360	158
Kochi	Water supplied through stand posts paid by KMC	50 + 2 minimum monthly charge
Kolkata	Free for domestic consumers	Free for domestic consumers
Ludhiana	105–140	76
Mathura	12.5% of ARV	No metered connections
Mumbai	12.5% of ARV	45
Nagpur	75–350	115
Nasik	67.5–90	70
Pune	75–208	60
Rajkot	40–120	240
Varanasi	30	40
Vijayawada	80	240.25
Vishakhapatnam	80	80

**Source:** ADB (2007) *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

below).<sup>94</sup> In the absence of effective metering, the quality of data is weak, so virtually all Indian cities apply fixed charges and the cost recovery is low whereas the operating ratio is high. In the process, the entire UWSS system becomes unsustainable.

**Figure A6.4: Operating ratio of 20 UWSS utilities in India**

**Source:** ADB (2007) *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

94 ADB (2007) *Benchmarking and Data Book of Water Utilities in India*: Asian Development Bank

If pricing structures in India need to be revised, what options or principles could be followed? The following approaches could be taken to set water tariffs to ensure financial viability of utilities while managing affordability concerns through other mechanisms.<sup>95</sup>

- The water tariff could be directly linked with the power tariff and hike in power tariff should be reflected in water charges.
- Prices could be also revised on the basis of the inflation index such as the Consumer Price Index or Wholesale Price Index.
- Category-wise tariffs could be charged differentially on domestic, commercial and industrial sectors with a lifeline block in the tariff structure for consumption-related tariffs.
- Explicit subsidies to the poorer sections for connection and infrastructure development expense should be provided.
- The payment for infrastructure and connection charges could be spread over time.
- Separation of water supply accounts and O&M accounts. The separation of O&M accounts would help the utilities to fix the minimum tariff at a level where they can at least recover the O&M costs.

## VI. Principles for setting tariffs

The main objectives that have to be kept in mind while setting water tariffs are as follows:<sup>96</sup>

*Revenue sufficiency:* The main purpose of the tariff is cost recovery. Revenue from water users should be sufficient to cover the O&M cost of the water utility's operations, to repay loans undertaken to replace and expand the capital stock, and to provide a return on capital to cover for risk.

*Economic efficiency:* For achieving economic efficiency the price should be such that consumers face the cost of their decisions. A tariff should create incentives that ensure that users obtain the largest possible aggregate benefits for a given cost of water supply. Volumetric water charges should be kept equal to marginal cost of supplying water.

*Equity:* This means that the water tariff treats similar customers equally, and that customers in different situations are treated differently. In other words, while tariffs have to cover for the cost of supplying water, they should be differentiated based on actual water use and combined with minimum support measures for poor households. Beyond a basic minimum quantity of water supplied, customers ought to pay for higher usage patterns.

*Poverty alleviation:* Access to a basic minimum amount of water is a basic human right and ought to be provided regardless of ability to pay.

*Resource conservation:* Prices should discourage excessive or wasteful use of water.

*Acceptability:* To mitigate political controversy, customers and interest groups should be given due opportunity to provide inputs and raise concerns in the process of price determination.

*Simplicity and transparency:* The tariff design should be easy to understand for paying consumers. Prices must also be determined in a transparent manner.<sup>97</sup>

## VII. Best national and international cases<sup>98</sup>

A recent study of good practices in water in Asia identified eight cities: Bangkok (Thailand), Colombo (Sri Lanka), Jamshedpur (India), Kuala Lumpur (Malaysia), Manila (Philippines), Phnom Penh (Cambodia), Shenzhen (People's Republic of China), and Singapore. **Table A6.5** below shows the good practices in these cities and **Table A6.6** below shows the indicators of the utility's performance in these 8 cities.

The findings suggest that, although no single model would fit all situations, seven themes form the core of an integrated and successful approach to urban water management (**figure A6.5**). Among other lessons, it is recommended that regulation of the UWSS system should be delinked from politics and made accountable to the public. Another recommendation is to adopt a corporate approach to water supply management, which need not mean private ownership but an emphasis on standards, performance, review and accountability.

95 Om Prakash Mathur and Sandeep Thakur (2003) *Urban Water Pricing ; Setting The Stage For Reforms*, National Institute of Public Finance And Policy, India.

96 Dale Whittington(2002)*Municipal Water Pricing: Getting Started on Tariff Reforms and Subsidies in South Asia*, New Delhi: National Institute of Public Finance and Policy; available at <http://www.nipfp.org.in/newweb/sites/default/files/r2.pdf>; accessed 12 March 2012

97 World Bank (2011), *Cost Recovery in Urban Water Services-Select Experiences in Indian Cities*, Water and Sanitation Program, World Bank, March ; available at: <http://www.wsp.org/sites/wsp.org/files/publications/WSP-Cost-Recovery-Urban-Water-Services.pdf>; accessed 14 March 2012.

98 Chiplunkar, Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan (2012), *Good Practices in urban water management: Decoding good practices for a successful future*, Mandaluyong City, Philippines, Asian Development Bank.

**Table A6.5: Best practices in UWSS sector in Asia**

Good Practice	City/Utility
<b>Fundamentals</b>	
Having dynamic leadership at the top	Bangkok, Phnom Penh, Singapore
Use of integrated water management policy	Shenzhen, Singapore
Corporatization of water utilities	Bangkok, Jamshedpur
Regulating private sector participation effectively	Manila, Shenzhen
<b>Service Delivery</b>	
Increasing coverage and improving water availability	Bangkok, Colombo, (Manila Water MWCI, Phnom Penh, Singapore)
Reducing nonrevenue water	Jamshedpur, MWCI, Phnom Penh, Singapore
Securing clean, safe, and reliable water supplies	Bangkok, MWCI, Phnom Penh, Singapore
Improving service to the poor	Bangkok, Jamshedpur, MWCI, Phnom Penh, Singapore
Adopting the practice of demand-side management	Singapore
Improving wastewater and sewerage systems	Jamshedpur, Singapore
Monitoring and reporting effectively	Bangkok, Jamshedpur, Singapore
<b>Financial and Human Resources Management</b>	
Improving staff productivity	Bangkok, Jamshedpur, MWCI, Phnom Penh, Singapore
Pricing water for efficiency and sustainability	Jamshedpur, MWCI, Phnom Penh, Singapore
Improving revenue collection	Bangkok, Colombo, Jamshedpur, MWCI, Phnom Penh, Shenzhen, Singapore
Setting wastewater tariffs	Colombo, Jamshedpur, Kuala Lumpur, Shenzhen, Singapore

**Source:** Chiplunkar Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan (2012), "Good Practices in urban water management: Decoding good practices for a successful future", Asian Development Bank, Mandaluyong City, Philippines

**Table A6.6. Key indicators for water management in eight Asian cities**

		Bangkok	Colombo	Jamshedpur	Kuala Lumpur	MWCI (Manila)	MWSI (Manila)	Phnom Penh	Shenzhen	Singapore
Year		2008	2008	2009	2008	2008	2008	2008	2008	2008
Area	km <sup>2</sup>	1,569	1,197	64	242	1,400	540	375	1,953	710
Population	'000	5,711	3,765	860	1,629	6,000	9,100	1,326	8,768	4,800
<b>Water Supply</b>										
Piped coverage	% of population	99	92	81	100	92	62	91	100	100
Average availability	Supply hours	24	24	7	24	24	18	24	24	24
Metered connections	% of connections	100	100	26	100	100	100	100	NA	100
UFW/NRW	% of total supply	30.2	35.7	9.9	33.9	21.0	63.8	6.2	13.5	4.4
<b>Wastewater</b>										
Sewerage coverage	% of population	54	14	67	90	6	5	63	NA	100
<b>Financial and Human Resources</b>										
Operating ratio	Op. exp./Op. rev.	0.69	0.62	0.82	0.86	0.49	0.55	0.39	0.77	0.86
Revenue collection efficiency	Collect /bill (%)	97	98	99	91	99	89	100	99	100
Staff members	Per 1,000 connections	2.2	3.9	4.0	1.9	2.27	2.42	3.3	NA	2.5

**Source:** Chiplunkar Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan (2012), "Good Practices in urban water management: Decoding good practices for a successful future", Asian Development Bank, Mandaluyong City, Philippines

Figure A6.5: Good practices - the success framework



**Source:** Chiplunkar Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan (2012), "Good Practices in urban water management: Decoding good practices for a successful future", Asian Development Bank, Mandaluyong City, Philippines

# Annex 7: Regulatory framework for urban water management in India

Proceedings of the third roundtable

India International Centre, New Delhi, 9 April 2013

**Present (in alphabetical order):** Dr Isher Judge Ahluwalia (*ICRIER*), Ms Ashufta Alam (*DFID*), Dr J K Bhasin (*NEERI*), Ms Vandana Bhatnagar (*World Bank*), Mr Subrata Barman (*IFC*), Mr Pranab Dasgupta (*CII*), Mr Vikas Goyal (*AECOM*), Dr Arunabha Ghosh (*CEEW*), Mr Ramani Iyer (*Forbes Marshall*), Ms Suneetha D. Kacker (*World Bank*), Mr Abhay Kantak (*CRISIL*), Dr Renu Khosla (*CURE India*), Mr Bastiaan Mohrmann (*IFC*), Ms Debashree Mukherjee (*DJB*), Mr S Avudai Nayakam (*Water.org*), Ms Brune Poirson (*Veolia Water India*), Ms Urvashi Sharma (*CEEW*), Mr Shawahiq

Siddiqui (*IELO*), Mr Rubinder Singh (*PDCOR Ltd.*), Mr Rudresh Sugam (*CEEW*), Prof Chetan Vaidya (*SPA*), Mr Dirk Walther (*GIZ*), Ms Marie Helene Zerah (*Centre de Sciences Humaines*)

**Absent:** Dr R. Biswas (*School of Planning and Architecture*), Dr Kapil K. Narula (*CII-Triveni Water Institute*), Mr Anil Prakash (*MCD*), Dr M Ramachandran (*Ex-Secretary MoUD*), Mr Abhijit Sankar Ray (*DFID*), Mr Nawneet Vibhaw (*NLU*)



CEEW-Veolia Water India Third Roundtable

## Background

The third CEEW-Veolia Water India Roundtable on Urban Water Management was convened on 9 April 2013. The theme of the discussion was “Regulatory Framework for Urban Water Management in India”. CEEW prepared an issue brief highlighting issues related to urban water regulation in India, with an emphasis on the roles and designs of regulatory agencies and regulatory frameworks for water and wastewater. The issue brief also underlined key regulatory bottlenecks in urban water management and potential reforms for the current regulatory framework in India. The document also showcased national and international cases, which could serve as guides for the regulatory reform process. The roundtable discussion was framed along the following five questions:

1. What are the potential reforms of the current regulatory framework that would create the conditions for better management of urban water in India?
2. What are the key regulatory bottlenecks/shortcomings that prevent efficient urban water management in India?
3. Does pricing mechanism in India need a complete change? What parameters should be used to decide the threshold value for different stakeholders/uses?
4. Are there any good examples from India or abroad that should be replicated?
5. Discussion on state-specific water policies to determine best practices in urban water management

### I. Which processes need to be regulated?

Although there were mixed opinions about whether an independent regulator was needed or not, there was consensus that a few important processes in the urban water domain required regulation.

**Reporting and data collection:** Data collection, analysis and reporting in a format that is useful for a wider audience and that can actually be negotiated in the public space should be the key function of any regulatory body regulating UWSS.

**Ensuring equitable service quality:** UWSS quality in different cities and different parts of the same city varies a lot. Regulation of UWSS services, especially in low income group areas, is a must to ensure equitable service quality.

**Public private partnership projects:** Whether the service provider is a public or a private entity, regulation is crucial for efficient utility management. Also, for settling disputes, in an impartial manner, an independent regulator is essential. The role of the regulator is not restricted only to review the allotment of projects. It is equally needed to monitor project

implementation and performance.

**Slum census:** Many service providers suffer from unrealistic estimates of the target population, because slum dwellers are often not reflected in municipal records or are understated. Regulators can ensure that slum censuses are comprehensive and correctly estimate the deficits in water supply and sanitation services in slums.

**Water tariff setting:** Ideally, an independent regulator was advocated for tariff regulation. If that were not politically feasible, in the minimum the regulator had a role in designing the pricing mechanism, if not the actual water tariff.

**Water sector reforms:** Regulation of water sector reforms is important because of the expected large investments in urban water projects, and for ensuring that reforms do not further distort markets or undermine equity considerations. For example, Maharashtra is promoting *Sujal Nirmal Abhiyan* (clean water and sanitation services to all) where all municipal bodies and urban local governments are being analysed and classified into various categories based on performance. This is a phased reform, whereby more capable utilities are urged to pursue further reforms, while allowing other utilities to reach a minimum threshold of performance before further reforms are recommended. Elsewhere, in Karnataka water services and the overall performance orientation of urban local bodies for the delivery of all the services is analysed through *TULNA (comparison)*. This, in turn, puts pressure on urban local bodies to perform better. The state is also hoping to declare well performing ULBs as creditworthy and help them to access the capital market, so that there is added incentive for ULBs to raise standards.

**Non-revenue water (NRW):** Estimates of NRW in India's cities vary. But none has the luxury of writing off 30%-50% of treated water as unaccounted losses. Regulators need to set performance benchmarks in order to reduce wastage and inefficiencies in the network infrastructure.

**Fund transactions:** When services are contracted out to several service providers, the regulator needs to oversee the transfer of public funds to the contractors.

**Groundwater abstraction:** Although the Central Ground Water Authority is the national regulator for groundwater, regulation of groundwater is necessary at the level of urban local bodies as well.

**Resource conservation and pollution control:** On a larger scale, the UWSS regulatory body could also promote the conservation of water resources by mandating efficient practices and controlling water pollution by imposing stringent regulations.

## II. Experiences with water regulators has been mixed

Notwithstanding the need for several regulatory functions, participants recognised that there was a dearth of regulators in the country. In fact, experience had been mixed thanks to lack of capacity and legal powers.

**Lack of capacity:** Regulators and auditors responsible for reviewing annual performance reports of water utilities do not have the capacity to analyse and appraise the utilities. A perverse consequence is that the utility also evaluates its performance with minimum countervailing oversight. Secondly, there is no authority which helps utilities work within the ambit of set standards and regulations.

**Limited legal powers:** The Maharashtra Water Resources Regulatory Authority (MWRRA) has been regulating the tariff for bulk water for agriculture. But as a quasi-legal body, it has no right to implement its own legal order. It has requested for a list of powers in order to implement its own orders.

**Contractual clarity as an alternative:** If there are clear contracts between the operator and the liable service provider, then there is no requirement of a regulator, as long as the roles and responsibilities are well defined.

**Parastatals:** In few states, parastatal agencies provide UWSS services. This raises the question whether they should be within the ambit of an independent regulator or they can be expected to self-regulate their activities.

## III. Priority actions

It was clear that the role of the regulator would evolve as the urban water sector developed, as new entities and stakeholders got involved in delivering services, and as consumer demands and expectations of levels of service increased. That said, the group recognised that certain reforms could be initiated with priority.

**Creating good databases:** Without timely and usable information, effective regulation is not possible. It is in the interest of regulators and water utility managers to create processes for data collection, including performance reporting, asset investments and maintenance, service quality, tariffs, etc. That said, participants recognised that in the attempt to develop comprehensive databases, there was a risk of missing out on shorter-term gains. As one participant suggested, ‘Contracts can be awarded as long as the data is of “transactable” quality.’

**Building capacity:** As with the service provider, building the

capacity of the regulatory authorities is equally necessary. The regulator should be an expert of the sector and the composition of the regulatory body should be comprehensive. Training forms an important component of capacity building. Regular training programmes detailing case studies of best practices in urban water management across the globe, available state of art technologies etc. should be conducted. Stakeholder consultations were also an integral task of the regulator. Regulators would need support from civil society organisations in order to engage with stakeholders, in order to develop a holistic picture about the challenges in service provision. They also need to learn from how certain states have attempted to develop capacity, such as the Karnataka Municipal Reform Cell. Most importantly, while regulators could initially be selected from within government, they would eventually have to be located in independent institutions. As one participant observed, ‘Having a Secretary rather than an Additional Secretary does not mean that we get capacity for regulation.’

**Strengthening the legal framework:** Regulators need a much stronger legal framework in the UWSS sector, especially if benchmarks for minimum service quality and equity in service provision have to be met and surpassed..

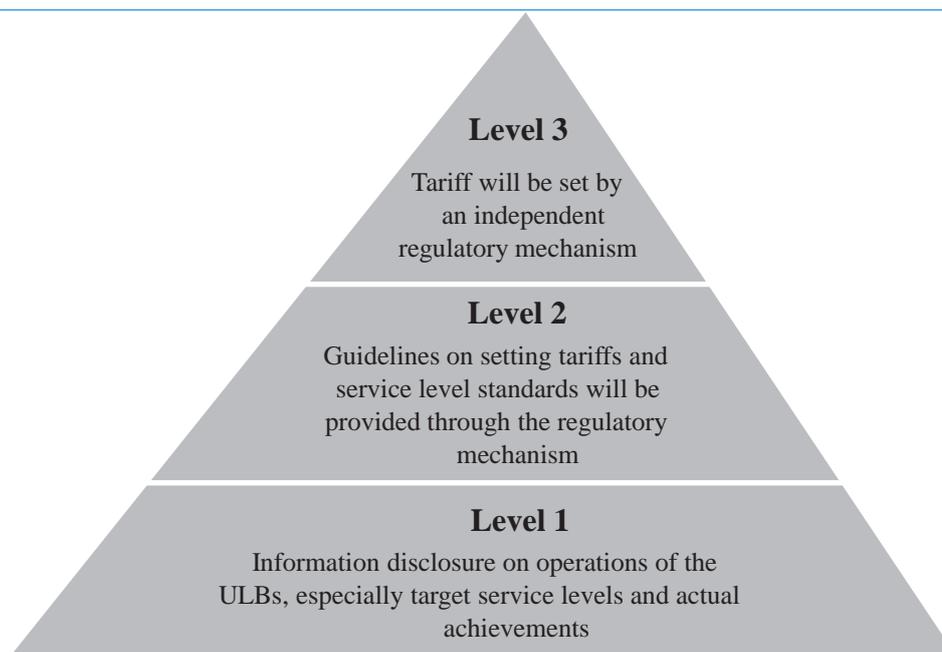
**Flexibility in regulatory approaches:** India’s urban centres host a wide variety of consumer groups for water and sanitation services, and have a range of different types of service providers. There can be no one size fits all approach to regulation. Formal regulatory measures cannot be applied to deal with informal water vendors. The group noted the example of Manila Waters, where each customer is treated as a different identity. In slums, for instance, connections were provided in public places and further supply to slum households was delivered by PVC pipes. This measure ensured that there was no tampering with the metering system. Moreover, slum dwellers were allowed to cover bills through monthly instalments.

**Integrated regulation:** Provision of safe, affordable and adequate drinking water to all should be the prime objective of the service provider. However, it is impossible to achieve complete success without integrating drinking water with services like wastewater treatment, sanitation facilities, health care facilities etc. Regulators need to oversee the full range of these services, especially in lower income group areas.

**Linking performance and incentives:** Regulators ought to set performance benchmarks and explore options for how utility performance is linked to incentives. But there was no consensus on what kinds of performance incentives could be offered.

**Proceed in phased manner:** Participants suggested that UWSS service regulation needed to develop in a phased

Figure A7.1: Maharashtra's proposed "opt-in" regulatory arrangements



**Source:** World Bank (2012) "India: Improving urban water supply and sanitation services", Lessons from Business Plans for Maharashtra, Rajasthan, Haryana and International Good Practices, World Bank in association with Ministry of Urban Development, India.

manner. One suggestion was an "opt-in" arrangement, wherein the WSS service provider could self-select the level of compliance, starting with disclosure of information as a minimum requirement and gradually edging towards higher levels of complying with service standards and tariff guidelines. **Figure A7.1** above shows the regulatory framework developed and proposed by the Maharashtra Sujal and Nirmal Abhiyan (MSNA). MSNA Level 1 (minimum regulation) of opt-in would be mandatory for all ULBs entering the programme. Those graduating to MSNA Level II are required to "opt-in" for the next level of regulation in order to qualify for additional funding support from the State. The process continues on to MSNA Level III, by when the tariffs are set by the independent regulator.<sup>99</sup>

**Categorising cities:** The process of regulatory reform could be supported by the categorisation of cities and towns based on key indicators, such as population, status of assets, non-revenue water loss, type of database, operation ratio etc. Such a coding would help cities to develop appropriate regulatory institutions and practices and chart a path for upgrading service quality and performance based on better examples from other cities. Different pilot projects could be undertaken, which could offer diverse options for scaling up UWSS services. The city categorisation would also help to identify investment requirements, especially the role of the private sector.

**Learning from other sectors:** Some participants drew parallels with other sectors, such as power, roads, oil and gas, health etc. Although water requires dedicated attention, participants pointed out that regulatory capacity takes time to establish and it was important to learn from the experience of other regulators.

#### IV. Regulation of WSS services for the poor

**Water tariffs and willingness to pay:** Participants acknowledged that while WSS services had to be provided to the poor, there remained concerns about whether they would be willing and able to pay higher water tariff. There was recognition that when service quality improved, there was also greater willingness to pay. For example, in a slum in Hooghly, a 24x7 water supply system was installed with water taps outside houses. Prior to the installations, water was being supplied by tankers and the service was irregular. But residents were paying fixed charges. The new system allowed them to pay higher but variable charges based on use.

**Regulating connection charges:** Paying water connection charge seems to be the main concern for residents of lower income group areas. While they might be willing to pay water tariffs, the connection charges can be prohibitively high. Regulators need to ensure that connection charges do not become the barrier to service provision.

**Regulating informal water vendors:** Despite willing to pay,

<sup>99</sup> World Bank (2012) "India: Improving urban water supply and sanitation services", Lessons from Business Plans for Maharashtra, Rajasthan, Haryana and International Good Practices, World Bank in association with Ministry of Urban Development, India.

there remain concerns about the quality of service poor households receive. A study of the informal water supply system in Delhi found that the water vendors charge by connection rather than the amount of water supplied. As a result, they have the incentive to increase the number of connections, while the average quality of service falls. Residents are also unwilling to complain against such vendors fearing that they would lose their connections. They were also worried that external regulators would get co-opted by the water vendors. In such cases, external regulators would have to work with resident welfare associations to develop alternative ways to check unscrupulous practices of informal water vendors.

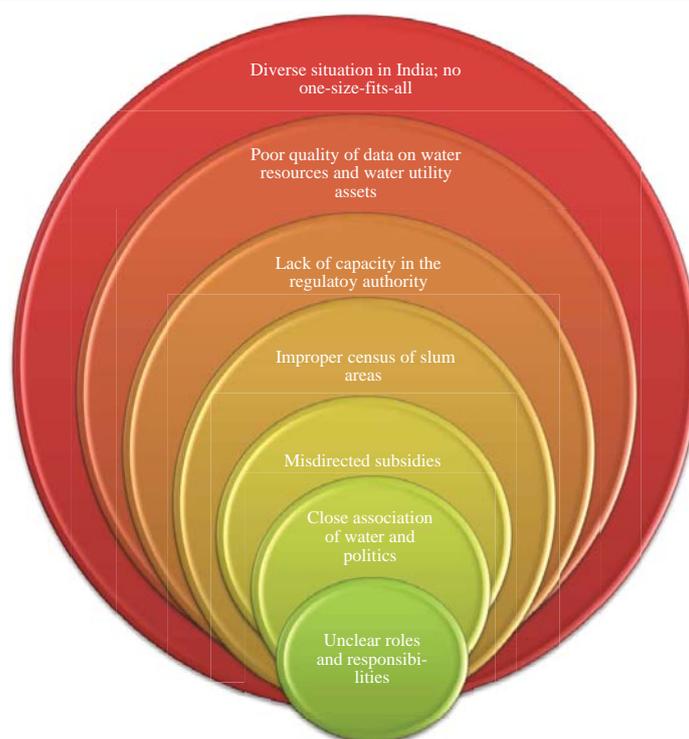
**Sharing learnings:** Participants pointed out that even if experiences were mixed in various cities, it was important to share the learnings of trying to provide quality water and sanitation services to poorer areas. One example was of slums in Hubli receiving higher pressure water, but while women were willing to pay for the service, men were not. Another example was of women managing community toilets in Trichy. Wastewater from the area reserved for the community for washing clothes was used to clean toilets. In a third example, a participant pointed out that in the Savda Ghevra slum area in Delhi, representatives of the resident welfare association collectively decided on the water tariff. As one participant summed up, ‘The informal sector need not mean irrational.’

## V. Jawaharlal Nehru National Urban Renewal Mission (JNNURM): Need for more regulation and regulators

Currently, JNNURM acts as the major source of funds for development of UWSS services in India. However, its implementation efficiency remains doubtful. The prerequisite for getting JNNURM funds is the preparation of detailed project reports (DPRs), by the ULBs or parastatals, for the projects identified in a City Development Plan (CDP). DPRs not only include the technical plan but also the financial and institutional plans for a project. Cities in quest of getting the money have been less careful in selecting the agencies/firms to implement plans. There is little deliberation on the institutional models needed to govern the execution of projects. Participants suggested that a regulator for JNNURM had a strong case. But, in order to minimise the risk of political or bureaucratic interference, the regulator would have to be given autonomy.

In the end, participants agreed that the regulator should be considered only for functional reasons, such as setting tariffs or reducing information asymmetries between service providers and consumers. In fact, the role of a regulator was ultimately to serve as a catalyst or an enabler to help develop the UWSS sector.

### Regulatory challenges in the urban water supply and sanitation sector



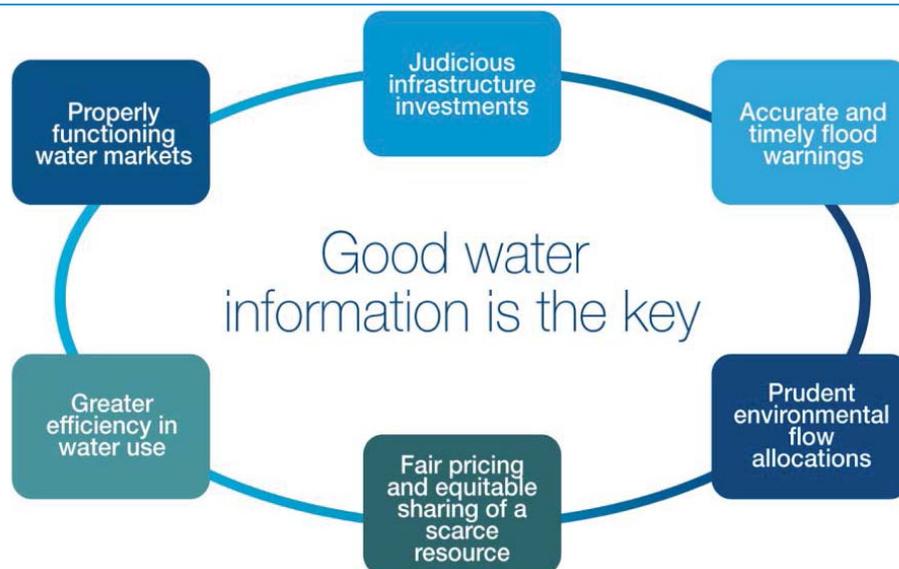
# Annex 8: Water data and measurement

## Issue brief for the fourth roundtable

One cannot manage unless one can measure. Data plays an important role in the management of water resources. The data for water resources and water resources measurement technologies in urban water services in India is inadequate.<sup>100</sup> Good water data, by contrast, allows for greater water use efficiency, appropriate infrastructure investments, fair pricing, equitable access, advance warnings of variability, and a prudent approach to environmental flows (figure A8.1).

Moreover, the accuracy of data cannot be compromised. It is very important to know the authenticity of data, which depends on the methodology of data collection and the accuracy of the measuring instruments. Nowadays, several methods, such as remote sensing, satellite imagery, real time aerial photographs etc. are being used to analyse land use and land cover, urban growth, water quality etc. These tools and techniques could complement water data collection “on the ground” from source, transmission and end-user points.

Figure A8.1: Importance of good information on water



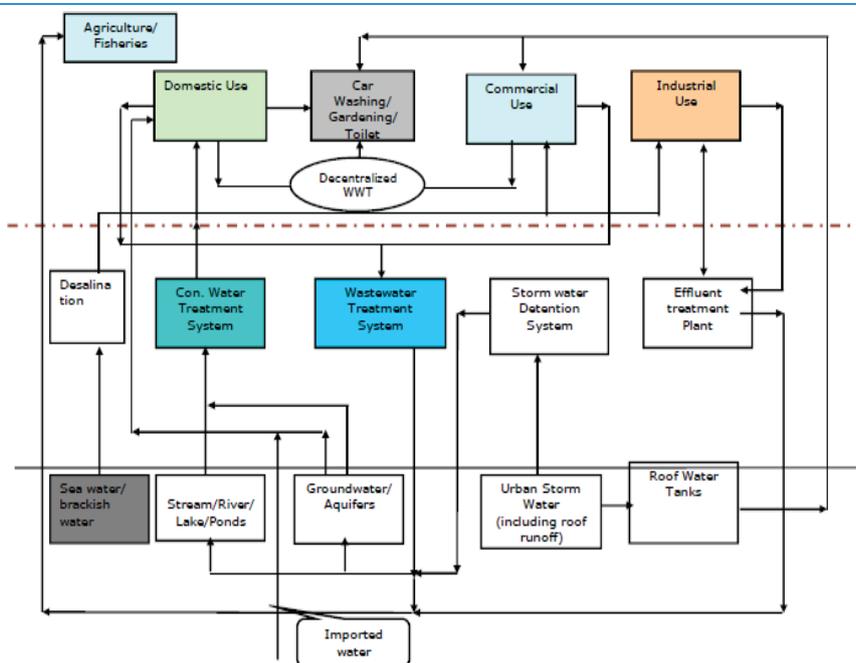
Source: Presentation on “Water Information in Australia: status and directions” by Dr Bill Young, Director, Water for a Healthy Country Flagship, Australia, 13th April 2012 during India Water Week Side Event Organised by Council on Energy, Environment and Water

100 Ramakrishna Nallathiga (2008), *Reforming urban water supply sector in India*, Centre for good governance, Hyderabad available at <http://www.cgg.gov.in/wp/Reforms%20in%20Urban%20Water%20Supply%20Sector.pdf> accessed on 13 May 2013

## I. What are the data required for urban water planning/management?

1. **Supplier:** The utility considers its responsibility merely to supply water to the consumers.
2. **Service Provider:** The utility considers its responsibility to

**Figure A8.2: Urban water framework**



**Source:** Arghyam & Institute For Resource Analysis and Policy (2010) Tool Kit for Integrated Urban Water Management, p. 17 Available at <http://irapindia.org/Tool-Kit-IUWM-IRAP-Website.pdf> accessed 13 May 2013

The urban water framework comprises three components: source, treatment systems, and consumers (figure A8.2). Much of the focus in water utility management in India is concentrated on supply sources. Instead, Integrated Urban Water Management (IUWM) seeks to develop efficient and flexible urban water systems by adopting a diversity of existing technologies, management, and institutional practices to supply and secure water for urban areas. The focus of this approach is the integration of planning, management, and stakeholder participation across institutions at each stage. Under IUWM, therefore, the urban water cycle is a holistic one, which includes water supply, sanitation, water treatment, storm water management, etc., components which are in turn integrated within the wider watershed.<sup>101</sup>

The manner in which a utility approaches its role affects how it collects and analyses data as well. A water utility could be characterised in three ways, as merely a supplier, as a service provider, or as an integrated water resources manager,

be the provision of water supply and sanitation services as well as to ensure the quality of services and efficiency of the system.

3. **Integrated Water Resources Manager:** The utility extends its horizon of responsibilities, to provide urban water and sanitation services while managing water resources in an integrated and sustainable manner.

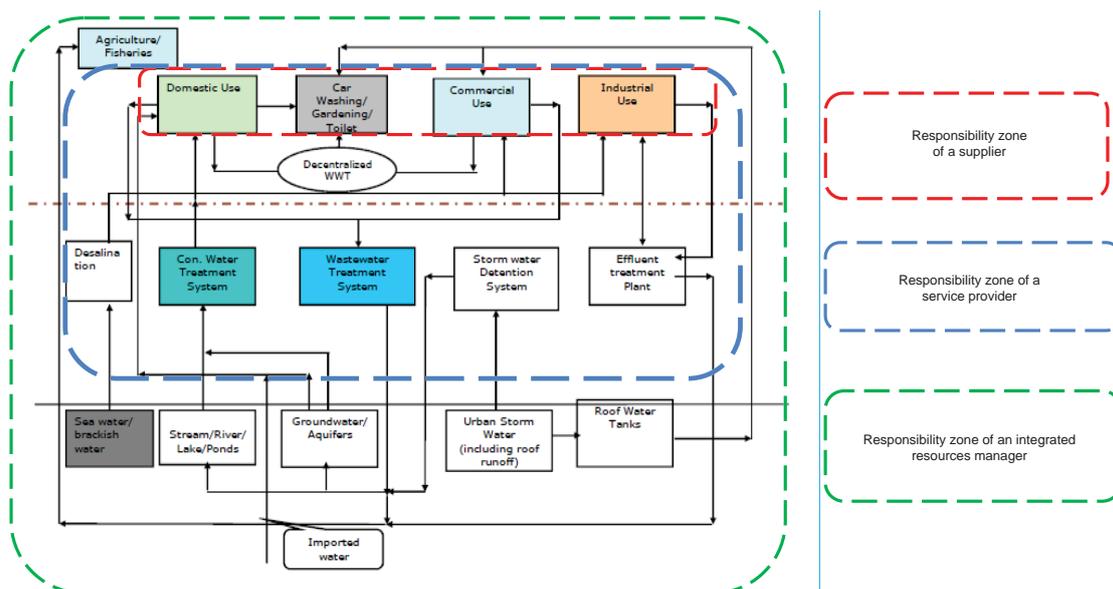
A utility that sees itself solely as a supplier will also focus attention only on collecting data at the consumer level, whether they are households, industries or commercial establishments. A utility that cares about the quality of the service would also have to consider data on wastewater and effluent treatment, managing storm water, and treatment of water at the consumer end. Finally, a utility that seeks to manage water resources in an integrated manner would have to consider the sustainability of alternative sources of water supply (surface water, groundwater, storm water and roof runoffs, tanks, ponds and other storage systems, rainwater harvesting and even sea water or brackish water) (figure A8.3).

### Basic data required by a water supplier

- **Water availability:** A water supplier needs to have data regarding the amount of water available, which could be supplied to meet consumer demand.

<sup>101</sup> Closas, Alvar; Schuring, Matthijs; Rodriguez, Diego. (2012) *Integrated urban water management: lessons and recommendations from regional experiences in Latin America, Central Asia, and Africa*. WPP case profile; no. 1. Washington D.C. - The World-bank. Available at <http://documents.worldbank.org/curated/en/2012/11/17210556/integrated-urban-water-management-lessons-recommendations-regional-experiences-latin-america-central-asia-africa> accessed on 16 May 2013

Figure A8.3: Urban water framework and roles of utility



Source: Tool Kit for Integrated Urban Water Management (2010), Arghyam, Bangalore & Institute For Resource Analysis and Policy (Irap), Hyderabad, India, pp 17 Available at <http://irapindia.org/Tool-Kit-IUWM-IRAP-Website.pdf> accessed on 13 May 2013

- **Consumer demand:** In turn, there is the need for consumer demand data, which could be further divided into hourly demand, daily demand, monthly demand and yearly demand.
- **Treatment capacity and technical limitations:** Data on capacity of the water treatment facilities is also required, because even with adequate water supply the absence of treatment capacity could impact water delivery to consumers.

#### Basic data required by a service provider

In addition to the data listed above, the following data are needed for the provision of effective water services:<sup>102</sup>

- **Water resources adequacy:** For better information on water quality and quantity, water managers need information on the type of extraction system, treatment system, energy supply, infrastructure status, delivery capacity, consumer demand fluctuations etc. These data are needed for developing emergency plans and conservation strategies for lean periods, to ensure that good service standards are maintained even during an emergency period.
- **Infrastructure information:** Data on infrastructure facilities is necessary for developing asset management plans. The operational and maintenance frequency could be decided on the available information about the status of the water infrastructure. Along with the information on present and future demand, such information could help in identifying the necessity and prospects of expansion of infrastructure. It would also help the utility in damage

prevention to increase durability of assets over the long-term at the lowest cost possible.

- **Consumer and stakeholder mix:** Data is required on the consumer mix and their demand for adopting a suitable strategy. Good data on the stakeholder mix could help in developing strong working relationship between different stakeholders, including individual households, industries and commercial establishments, as well as regulators, service providers, researchers, managers, financiers etc. This would also help to plan for equitable access to water for all categories of users.
- **Product quality:** Regular water quality monitoring data should be checked to detect any contamination in the water supply. This is also required to achieve full compliance with the quality standards and environmental standards set by the government/ health agency for water and treated wastewater.
- **Customer feedback:** Customer feedback information is required for identifying the problems in service delivery. It would also help in providing reliable and affordable services on equitable basis.
- **Staff information:** Water utility managers also need information on the available human resources within the utility. Such information would cover skill sets, training requirements, issues relating to healthy working environment, and to ensure improved employee morale.
- **Risk and vulnerabilities:** In addition to assessing existing risks with the state of the infrastructure, information is also needed on historical record in order to understand the vulnerabilities of the system. This information would help the service provider in developing a strong team to cope with adverse situations quickly. The utility would also be able to develop an alternate risk management

102 EPA (2008) *Effective Utility Management: A Primer for Water and Wastewater Utilities*: Environmental Protection Agency

plan, including legal, regulatory, and financial risks, as well as environmental, safety, security, and natural disaster-related vulnerabilities.

- **Investments and returns:** Information on required capital investments in infrastructure would allow utility managers to anticipate funding needs. Also the information on revenue generated is important in order to understand the financial viability of the system. This means recognising the full life-cycle cost of the utility and establishing and maintaining an effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenues future needs.
- **Overall efficiency:** Calculating the overall efficiency of the utility is essential to improved service delivery. It requires data on the operational ratio, the amount of non-revenue water, revenue collection efficiency, treatment efficiency etc. These data are required for identifying weak links in the utility, maintaining high operational efficiency, reducing unwanted resource losses, and ensuring cost-effective and sustainable performance.

#### Basic data required by an integrated urban water manager

In addition to the data required by the service provider, a utility that takes responsibility for water management within the catchment area needs additional information on surface and ground water, land use, ecological aspects, and climatic changes.

#### Data on surface water

- **River water level & discharge:** This data is required to estimate the amount of water present in a river at a particular amount of time.
- **Runoff and routing:** Routing is required to predict downstream flooding due to rainfall upstream. The information on flooding and extreme rainfall events is necessary for disaster management.
- **Storage structures:** Dams, ponds and other natural water bodies act as storage structures, which are helpful in supporting water supply during lean periods. It is important to estimate water levels in these structures.
- **Inter basin flow:** As the term suggests, this is the amount of water that flows from one basin to another. This flow could be real or virtual. The virtual water flow is the transport of goods, with water embedded in them during the production process, from one basin to another.
- **Abstraction rate:** Abstraction is the process of withdrawing water. It is important to estimate the number of abstraction structures, their capacity and overall withdrawal rate in order to plan for lean periods.
- **Water quality:** It refers to the chemical, physical and biological characteristics of water. Water quality is as important a parameter as river discharge and water level

data. Such data gives a more realistic estimate of the usable water available to a utility, signals pollution patterns and could help to control pollution from point sources.

- **Sediment flow** is the movement of solid particles with water current and help to estimate the sedimentation rate of water storage structures like dams.

#### Data on groundwater

- **Water level** is an important parameter for measuring groundwater availability and the abstraction rate.
- **Water quality:** Again, as in the case of surface water, the quality estimation of groundwater is important to plan its judicious use.
- **Recharge rate-** It is a hydrologic process whereby water moves downward from the surface into the ground to replenish aquifers.
- **Extraction rate:** This is the rate at which groundwater is extracted. The recharge rate and the extraction rate are used to estimate how stressed groundwater resources are in a given area.
- **Aquifer characteristics:** These include hydraulic conductivity, specific storage, transmissivity, specific yield, leakage coefficient, aquifer boundaries etc. These parameters help to understand the direction of flow of groundwater.
- **Lithology:** The type of strata present at a particular place governs the type of abstraction structure required to access groundwater.

#### Land use/land cover data

Land use and land cover data is needed to understand and manage the quality and quantity of storm water, which ultimately appears as surface water and ground water.

- **Vegetation cover:** This is defined as the percentage of soil that is covered by green vegetation.
- **Agricultural land:** This is defined as the percentage of land suited for agricultural practices and is under cultivation.
- **Concrete areas:** This is the area where land has been cemented, such as houses, offices, school, roads, etc.
- **Artificial water bodies:** These are constructed to store water. They can be overhead, underground reservoirs, or canals.
- **Natural water bodies, snow and ice:** These include all the rivers, sea, snow cover, mountains, and glaciers.
- **Wasteland:** This can be defined as the open land area, which is mainly used for dumping waste. Dumping sites pollute fresh water from precipitation and, if not designed properly, also pollute groundwater through leaching. The data is helpful in estimating the amount of pollution generated in storm water.

**Climatic data**

- **Precipitation data:** It is defined as the amount of rainfall occurring in a region annually or seasonally. It acts as the sole source of fresh water for both surface and ground water bodies.
- **Temperature:** This is required to estimate water loss due to evaporation from streams, reservoirs and other water bodies.

**Ecological data**

- **Type of vegetation:** Information on plants and vegetation in the area helps to estimate the amount of moisture that could be trapped in the soil.
- **Ecological flow requirements:** It is the amount of water required for supporting and sustaining the biodiversity of the region.

The collection, processing and dissemination of hydrological and related data in India are controlled by various government agencies under different ministries.

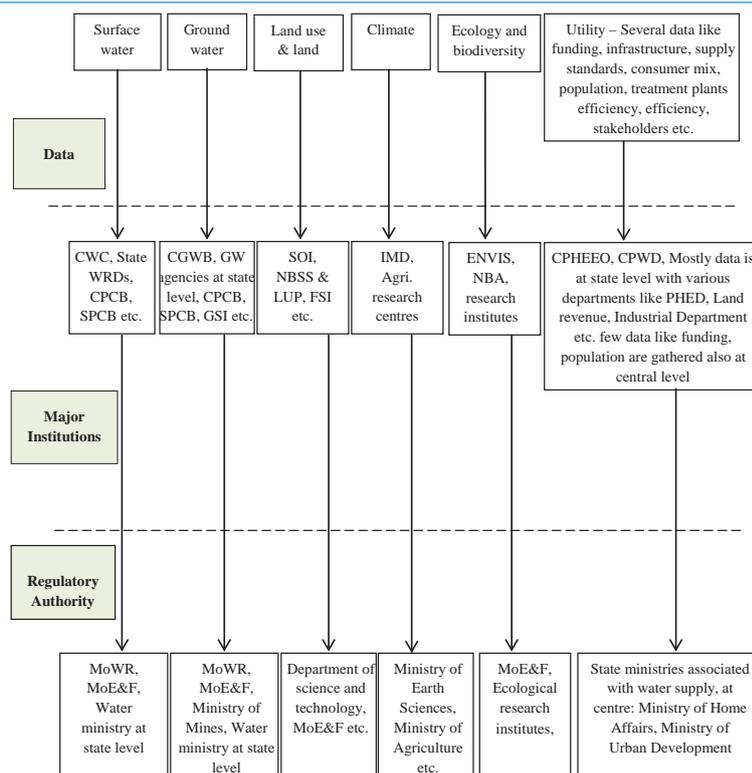
**Surface and ground water data:** The Central Water Commission (CWC) is the apex body in the country for collecting data on surface water sources. The Nation Institute of Hydrology (NIH), a research institute, within the administrative control of the CWC is responsible for developing hydrological models for various existing scenarios in India. In addition to the CWC, which works at a central level data, state level irrigation and water resources departments are also involved in data collection work on surface water resources. Data collection on ground water resources is largely the responsibility of the Central Ground Water Board (CGWB). It also gets data from state level ground water agencies. Both CWC and CGWB are working under the Ministry of Water Resources (MoWR). Water quality data, both of surface and ground water, is supplied by the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCB). These agencies work under the Ministry of Environment and Forests (MoE&F). Geological data, which is very important for groundwater estimations, is supplied by the Geological Survey of India (GSI). The GSI, which is under the Ministry of Mines (MoM), also collects data on glaciers in India.

II. What is the framework for water related data collection and dissemination in India? Is it ideal? If not, how should an ideal Hydrological Information System (HIS) look like?

Figure A8.4 below shows the HIS in India. It also illustrates the regulatory authority controlling the information available.

**Climate data:** Key climatic data associated with water resources management –temperature, precipitation, evaporation, and soil moisture –are collected by the Indian Meteorological

**Figure A8.4: Broad framework of the hydrological information system and regulatory bodies controlling information dissemination in India**



Department (IMD), under the Ministry of Earth Sciences (MoES). IMD uses its own measuring stations but also collects data from other institutions like Agriculture Universities, the Indian Institute of Tropical Meteorology (IITM), the National Centre for Medium Range Weather Forecasting (NCMRWF), and the National Institute of Ocean Technology (NIOT). It also operates seismic monitoring centres at key locations for earthquake monitoring and measurements.

**Land use & land cover data:** The National Remote Sensing Institute (NRSC) provides processed satellite data on land use and land cover in India. It is an important segment of the Indian Space Research Organisation (ISRO). The Survey of India (SOI), under the Department of Science & Technology, is India's central agency in charge of mapping and surveying. SOI prepares topographic maps with details of natural and artificial features at different scales. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) is an agency working under the Indian Council of Agricultural Research (ICAR). The chief function of the NBSS&LUP is collecting, collating and disseminating information relating to all aspects of soil survey, pedology and land use planning.

**Ecology and biodiversity:** Data collection on ecology, environmental flow requirements and biodiversity is the responsibility of several institutes under the MoE&F. For example, the National Biodiversity Authority (NBA) performs facilitative, regulatory and advisory functions for the Government of India on issues of conservation, sustainable use of biological resources and fair and equitable sharing of benefits arising out of the use of biological resources. MoE&F also has an Environmental Information System (ENVIS) programme, which works as a comprehensive network in environmental information collection, collation, storage, retrieval and dissemination to varying users.

**UWSS system level data:** Most of the information about the infrastructure of the urban water supply and sanitation system is with the water utility. However, several other data like funding, supply standards, consumer mix, population, stakeholders etc. are provided to it by other agencies. The funds are allocated by the central and state governments as well as multilateral organisations. The Jawaharlal Nehru National Urban Mission (JNNURM) is currently acting as the main programme for improving the urban WSS system. At the state level, the UWSS is usually under the Ministry of Drinking Water and Sanitation, although the name may vary from state to state. Population data is collected by the Census Department of India, which is working under the Ministry of Home Affairs (MHA).

The Central Public Health and Environmental Engineering Organisation (CPHEEO) is the technical wing of the MoUD, The Government of India and deals with matters related to UWSS including solid waste management in the country.

Though water supply and sanitation is a state subject under the Constitution, the policies, strategies and guidelines are being provided by CPHEEO to the states and union territories as well as municipal corporations / committees. The CPHEEO acts as an advisory body at the centre to advise the concerned state agencies and urban local bodies (ULBs) in the implementation, operation and maintenance of urban water supply, sanitation and solid waste management (SWM) projects. Besides, the CPHEEO also implements the centrally sponsored Accelerated Urban Water Supply Programme (AUWSP) for small towns.<sup>103</sup>

Data on industries is available with the Ministries of Industry at state level. State Industrial Development Corporations (SIDC) have been formed in several states in India, which are also responsible for supplying water to the industries.

### Is the HIS system ideal in India?

The short answer is no. A study of the hydrological information systems (HIS) found that that the existing systems in many countries, including India's, lacks reliability, accessibility and timeliness. The main causes are sub-standard observation practices, manual processing, wide gaps between the tools available and employed, and the involvement of multiple uncoordinated agencies.<sup>104</sup> Regulation of information by different agencies sitting at different levels makes the smooth flow of information across departments and levels of government difficult.

An ideal HIS in India should involve multiple agencies that collect, process and transmit water data to various government departments and users. The unit for data collection, processing and dissemination has been defined as the Data Processing Centre (DPC). DPCs should have adequate communication links for exchanging data within themselves. The observed field data is submitted to the Sub-divisional/District/Unit DPC (SDDPC/dDPC/UDPC) at the end of each month of observation. Once data have been fed to the DPC, preliminary validation is meant to be carried out within 10 days. The data should then be passed on to the Divisional/Regional DPC (DDPC/rDPC). Water quality samples should be regularly sent to designated water quality labs. At regular intervals, the laboratory would supply the data to DDPC/rDPC. Given the larger area coverage under DDPC/rDPCs, data would be organised in basin-wise databases and within 15 days the secondary validation (spatial consistency checks) would be completed. The data would be then transferred to the respective state/regional DPC (SDPC/RDPC). The main activity at the SDPC/RDPC centres is to

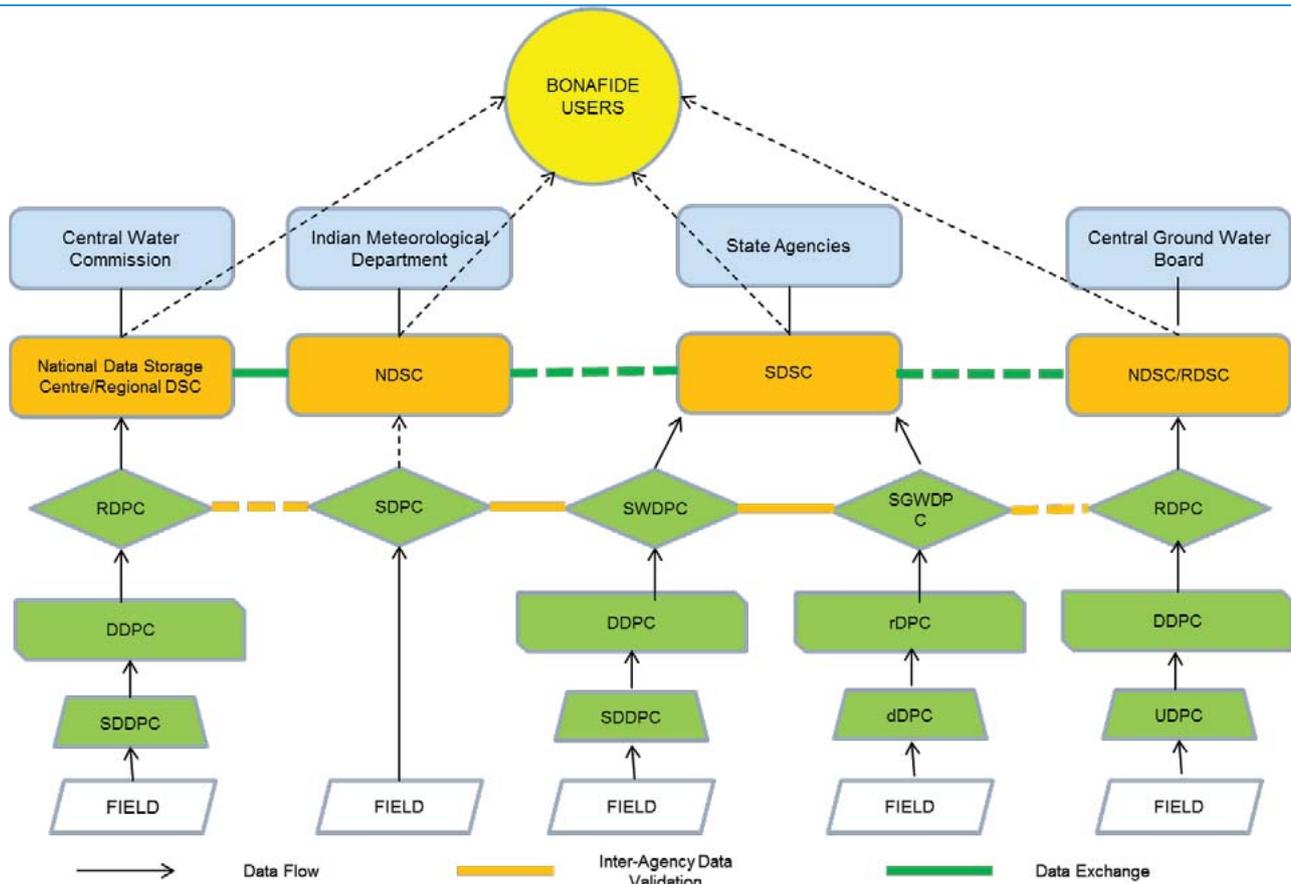
<sup>103</sup> Details of Central Public Health and Environmental Engineering Organisation (CPHEEO) available at <http://cpheeo.nic.in/> accessed on 17 May 2013

<sup>104</sup> Chowdhary, H.; Jain, S. K.; Ogink, H. J. M. (2002), regional hydrology: bridging the gap between research and practice. Fourth International Conference on FRIEND (Flow Regimes from International Network Data), Cape Town, South Africa, 18-22 March pp. 35-42

validate hydrological data, fill in gaps, analyses, and reporting. Inter-agency data validation exercises are scheduled twice a year: in February (for the data of the monsoon months) and August (for non- monsoon months). Next, the processed data should be transferred to the respective State/Regional Data Storage Centres (SDSC/RDSCs). Central agencies are expected to have separate DSCs for each region. Each central agency will also have a National DSC (NDSC) for an overall perspective of the hydrological regime at the national level. All the SDSC/RDSCs store and administer the field (or raw) and processed (or authenticated) data and

The development of a well-integrated HIS would take time, in part because observation stations are not sufficient. But, more importantly, it is also necessary to understand the type of information commonly required by different users. Often there are gaps in transmission or unwillingness to share information with other agencies. Even final users of hydrological data have to be *bona fide* users, vetted by controlling authorities (figure A8.5). Figure A8.6, instead, shows how a robust and coordinated HIS would divide the tasks for data collection, processing and storage.

Figure A8.5: Gaps in information flow in India's HIS

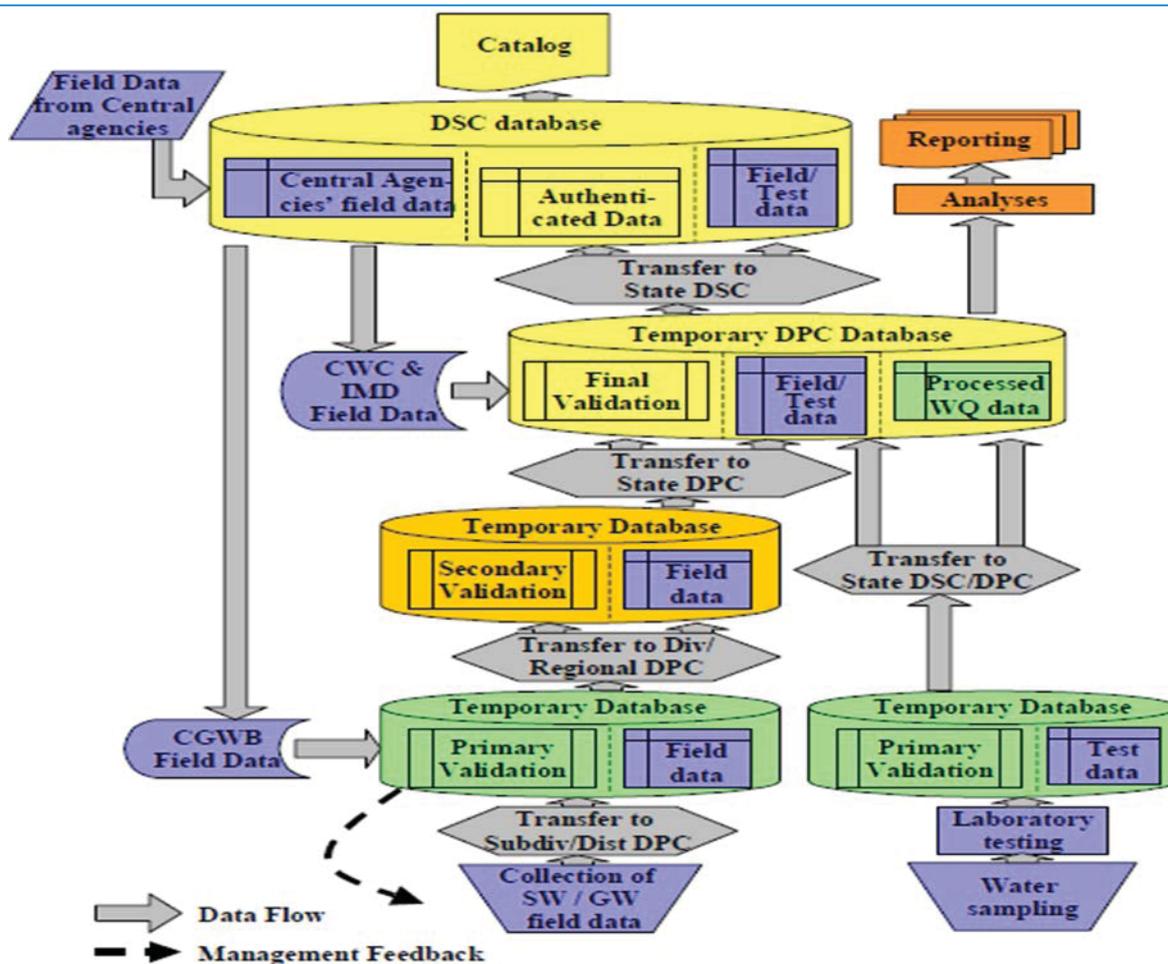


Source: Adapted from Chowdhary, H.; Jain, S. K.; Ogink, H. J. M. (2002), regional hydrology: bridging the gap between research and practice. Fourth International Conference on FRIEND (Flow Regimes from International Network Data), Cape Town, South Africa, 18-22 March pp. 35-42

are expected to ensure smooth dissemination to users. DSCs would, in effect, function purely as hydrological data libraries equipped with a catalogue of stored data. A strict distinction between the DPCs and the DSCs is emphasised for ensuring sustainability and maintenance of finalised databases for all future reference and use.<sup>105</sup>

105 Chowdhary, H.; Jain, S. K.; Ogink, H. J. M. (2002), regional hydrology: bridging the gap between research and practice. Fourth International Conference on FRIEND (Flow Regimes from International Network Data), Cape Town, South Africa, 18-22 March pp. 35-42

Figure A8.6: Activities in data collection processing and storage



Source: Design Manual for Hydrological Information System (2003), Volume 1, page number 8, prepared by DHV Consultants & DELFT HYDRAULICS with HALCROW, TAHAL, CES, ORG & JPS

### III. Which problem do households, industries and utilities face due to lack of data?

Table A8.1 below shows the common problems that households and industries face due to lack of water data.

As far as water utilities are concerned, a few main challenges stemming from lack of adequate data are listed below.

- i. Due to lack of information about precise water availability throughout the year, utilities usually end up providing poor water supply or no water supply for some days during high demand periods. This creates mistrust among consumers. The utilities are also not prepared for

Table A8.1. Data gaps in water sector and problems of different water user type

Consumer type	Data gap	Problem
Household (using their independent water sources)	Water Quality	<p>Water quality data is not available to consumers. This leads to consumption of contaminated water by the consumers resulting in illnesses. Example: In West Bengal consumption of arsenic contaminated water has resulted in various dermal diseases, bladder cancer and cardiovascular diseases.</p> <p>Due to lack of water quality data, people are unable to decide the kind of water treatment required. This either leads to under-treatment or people end up using high end technologies which might be costlier.</p> <p>Surface water bodies are usually unfit for direct consumption or even unusable for bathing purposes. Due to lack of information people continue to use these sources, making themselves more vulnerable to disease.</p>

Consumer type	Data gap	Problem
	Water Quantity and Aquifer characteristics	<p>People not knowing the exact status of groundwater usually overuse it. This results in unsustainable rate of groundwater development.</p> <p>Due to lack of data about precipitation people usually cannot plan for extreme events.</p> <p>Improper underground water extraction systems are used due to lack of data about soil strata. This leads to high investments but low water availability.</p>
Household (using water supplied by utilities)	Reliability	<p>Consumers are not very sure about water supply duration and timings, resulting in wasted time and effort, especially for women.</p> <p>Inadequate data about frequency of water supply also results in more water storage than might be necessary and greater waste.</p>
	Water Quality	<p>Consumers do not know the kind of treatment and technologies being used by the utility. Therefore sometimes they end up consuming undertreated water.</p> <p>Concerned consumers have to treat municipal water again at the household level. The growing use of reverse osmosis results in wastage of energy and water.</p> <p>Consumers are not very sure about whom to complain to regarding leakages or poor quality of water supply in their locality. This reduces the efficiency of the entire system with delays in notifying leaks and problems in identifying where leaks have occurred.</p> <p>Consumers are also unaware about the frequency for cleaning overhead or underground reservoirs, and end up using water from contaminated reservoirs.</p>
Industry (using their independent water resource)	Available resources	<p>While setting up a production unit information about the water resource availability in the area is not known. Higher rates of water extraction by industries have often resulted in public outrage.</p> <p>Lack of information on source vulnerabilities – information about water availability, recharge rate and maximum extraction – puts industrial investments at risk.</p>
Industry(using public water resource)	Reliability	<p>Data relating to the total water available for supply to industries in a particular catchment area is needed for investment planning. Uncertainties could result in over-investment or become a limiting factor to industrial expansion.</p> <p>Due to irregular water supply, overall industrial productivity is reduced as time and materials are wasted and production costs increase.</p>
	Recycle and reuse	<p>If industries are not aware of the potential to recycle and reuse wastewater, their water footprint remains unnecessarily high. This leads high water footprint of the industry.</p> <p>Example: treated wastewater can be used to replace cooling and boiler feed water. Industries having high reuse potential of wastewater are pulp and paper, cotton textiles, glass, and steel.</p>

emergency periods and lack conservation strategies for lean periods.

- ii. The most important information that is not present with the utilities is the information regarding their assets. Most of the utilities are managing infrastructure that is three or four decades old if not older. Information about these systems (designs, maps) is not available, so utilities are unable to prepare adequate operation and maintenance plans.
- iii. Water consumption data is generally not available with utilities as metering at the consumer end is not in place. Although it is widely acknowledged that non-revenue water levels in developing countries are very high, in fact, very few data are available in the literature regarding the actual figures, largely because most water utilities in the developing world do not have adequate monitoring systems for assessing water losses and many countries lack national reporting systems that collect and consolidate information on water utility performance. The result is that NRW data are usually not readily available, and when they are, they are not always reliable because it is common

for the management of poorly performing utilities to practice “window dressing” in an attempt to conceal the extent of their own inefficiency.<sup>106</sup> Also, old water pipelines add to the problem because the wastewater from various sources enters into the water supply pipelines (wherever water supply pipelines cross through wastewater drains).

- iv. Data on the mix of consumers is not always available with the utilities and they usually adopt a single service provision strategy for all types of consumers. However, the type of infrastructure and tariff should ideally be planned according to consumer demand, paying capacity etc. This leads to over delivery of water in some area and under-served consumers elsewhere. Without information regarding various stakeholders, an integrated urban water management plan cannot be executed.
- v. Customer feedback regarding UWSS services is not conducted on a regular basis. Lack of information about

<sup>106</sup> Bill Kingdom, Roland Liemberger, Philippe Marin (2006), *The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help: A Look at Performance-Based Service Contracting* Water Supply And Sanitation Sector Board Discussion Paper Series, Paper No. 8, World Bank

customer satisfaction would make it difficult for a water utility to transition from a water supplier to an effective service provider.

- vi. Poor data on slums is a point of major concern for the utilities. Often, service providers struggle to perform efficiently because utilities make investments on unrealistically low estimates of the target population. When slum dwellers and other informal settlements are counted, the task of providing safe, affordable and adequate water and sanitation facilities to all segments of the population becomes a more daunting challenge.

and management purposes. Paucity of reliable data on water quantity and quality as well as on water use, wastewater recycling and reuse, economics of operations, environmental impact, is often considered to be a limiting factor in successful implementation of water management plans (Biswas and Seetharam, 2008). Adequacy of number of monitoring stations is a prerequisite for reliable data collection.<sup>107</sup> It is clear from **table A8.2** that the number of existing monitoring stations is not sufficient.

As far as type of instruments for data collection is concerned India has a mix of old and new technologies. Although in

**Table A8.2: Gap analysis of water monitoring stations in India**

Parameter / Instrument	Agency	No. of Installations	No. of instruments required and recommended	Gap
Rain Gauges <sup>a</sup>	IMD and Other organizations	9138	16324	44.02%
Hydromet Observatories <sup>a</sup>	IMD	2500	5985	58.23%
Agro-met Observatories <sup>b</sup>		264	975	72.92%
Lysimeters <sup>a</sup>		42	130	67.69%
Hydrological stations (discharge, stage, sediment, water quality) <sup>a</sup>	CWC	878	1917	54.20%
Groundwater Level Recording stations <sup>a</sup>	CGWB	Digital Water Level Recorder - 1200	32270	96.28%
		GWO wells- 15000	50000	70.00%
Water Quality stations	CWC <sup>a</sup>	371	810	54.20%
	CPCB <sup>c</sup>	River-302	1485	79.66%
		Tributaries of rivers-678	1510	55.10%
		Closed water bodies-170	681	75.04%
		Creeks/sea water-60	0	N/A
		Ground water identified wells- 490	500	2.00%
		Total - 1700	4167	59.20%

**Sources:** (a) Dr V C Goyal (2012), India needs innovation in hydrological measurements and instrumentation: a case for ppp, India Water Week 2012 – Water, Energy and Food Security : Call for Solutions, 10-14 April 2012, New Delhi

(b) MCIT (2012): Presentation on Providing Information on forecasted weather & agro-met advisories, National Informatics Centre Services Inc. Department of Information Technology, Ministry of Communications & Information Technology, Government of India, available at <https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CC0QFJAA&url=http%3A%2F%2Fwww.dahd.nic.in%2Fdahd%2FWriteReadData%2FProviding%2520Information%2520on%2520Forecasted%2520Weather%2520and%2520Agro-Met%2520Advisory%2520-%2520SRS%2520Presentation.ppt&ei=AjafJZeVNoP5rQeL6lCgCg&usg=AFQjCNHtHtOOKyWzWRnV2K9ueHF-PhcQQw&sig2=-wcvFjG9X4Cln-r339ou-g&bvm=bv.47008514,d.bmk> accessed on 23 May 13

(c) CPCB (2011): Environment Information System on GIS Platform, Ministry of Environment and Forest, March Available at: [www.cpcb.nic.in/EIS\\_on\\_GIS.pdf](http://www.cpcb.nic.in/EIS_on_GIS.pdf), accessed on 23 May 13

#### IV. Which technologies are being used for water related data retrieval in India? What are the best practices available at the national and international levels?

Data collection, processing, storage and analysis are dependent on the instrumentation and skillsets available with water management institutions. Continuous supply of reliable and timely data is basic requirement for planning

phases I and II of the Hydrology Project, the instruments and software used for data collection, processing etc. are advanced, in many other stations old instruments continue to be used. Essential activities such as station calibration are neglected because of lack of funds. Also there are very few stations areas like mountainous, desert, polar and forested areas due to difficulties in access.

<sup>107</sup> Dr V C Goyal (2012), India needs innovation in hydrological measurements and instrumentation: a case for ppp, India Water Week 2012 – Water, Energy and Food Security : Call for Solutions, 10-14 April 2012, New Delhi

Under the given situation, newer technologies like remote sensing are proving to be very useful in gathering data from inaccessible locations. The resolution, accuracy and frequency of measurement have greatly improved with new-generation instruments. Automation of stations is already the norm in many other countries. In India information on wastewater and storm water is hardly available and current estimations are based on assumptions. For instance, it is assumed that 80% of water supplied in a city is converted into wastewater. Data on quality of wastewater, solid waste, storm water etc. is missing. Without having the information about all the components of urban water cycle as shown in figure A8.2, it is not feasible to prepare an integrated plan.

**National best practices**

**Pimpri-chinchwad:** Pimpri-Chinchwad is a district sharing a boundary with Pune, Maharashtra. In the Pimpri-Chinchwad utility, supervisory control and data acquisition (SCADA) system has been set up to have remote control over the water utility system. The SCADA system display is linked with various sensors like pressure, height/depth, quality etc. These parameters can be continuously monitored and has had a positive impact on utility management:

- Efficient management of resources.
- Fault/defect identification in real time
- Equitable distribution of water
- Continuous quality checks of the source water and the treated water
- Proper billing as the whole system is metered
- Reduction in non-revenue water as water leakage can be immediately identified and rectified

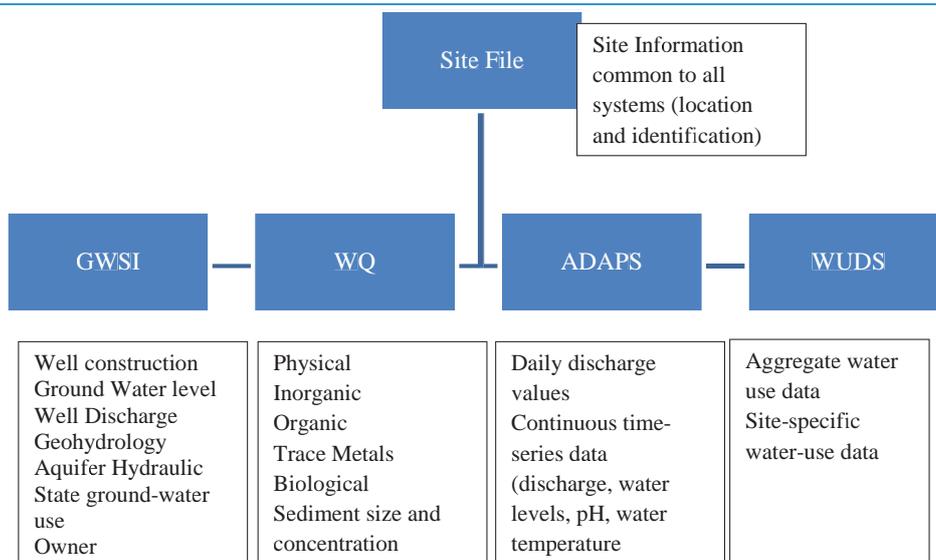
The system is also dynamic and is able to show urban growth in recent years and predict expected growth in other areas. This helps the utility to be well prepared for growth in demand and to plan for sustainable use of limited water resources.

**Rajasthan WRIS:** At a state level, the Rajasthan government has developed water resources information system (WRIS) for integrated water resources management. WRIS is a repository of data and processed information of a wide spectrum of water resources in the state. It allows users and stakeholders to maintain up-to-date information on projects, dams, reservoirs, canals, anicuts, weirs, surface and ground water resources including recharge, chemical analysis and water quality of available water, crops, water user associations, etc. WRIS serves as Decision Support System (DSS) for planning, storage, distribution and management of the water for the irrigation, drinking and other purposes. The WRIS application integrates Management Information Systems (MIS) with Geographical Information Systems (GIS). There are separate modules for dam and irrigation projects, surface water hydrology, groundwater hydrology, meteorology, geology, agriculture, environment, and socio-economic conditions.<sup>108</sup>

**International best practices**

**United States:** The U.S. Geological Survey (USGS) is the main water-data agency at the federal level, which then disseminates data to state and local governments, public and private utilities, and other federal agencies. The USGS’s Water Resources Division (WRD) maintains a network of computers and file servers to store and retrieve water data at

**Figure A8.7: The NWIS structure and the types of data available in the four subsystems**



Source: <http://pubs.usgs.gov/fs/FS-027-98/fs-027-98.pdf>

108 Available at : <http://wriss.rajasthan.gov.in/AboutUs.aspx> accessed on 22 May 2013

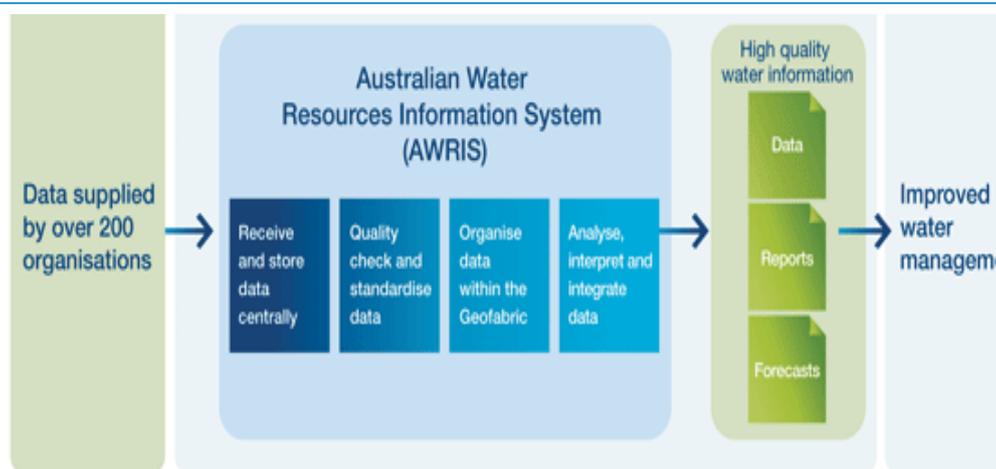
about 1.5 million sites, which together constitute the National Water Information System (NWIS). Many data like surface flow and level etc. are recorded at 15-60-minute intervals, stored onsite, and then transmitted to USGS offices every 1-4 hours, depending on the data relay technique used. Recording and transmission times may be more frequent during critical events. Data from current sites are relayed to USGS offices via satellite, telephone, and/or radio telemetry and are available for viewing within minutes of arrival.<sup>109</sup> The NWIS structure and the types of data available in the four subsystems are shown in figure A8.7 above.

**Singapore** is a classic example of efficient urban water management under water stress conditions. The country receives about 2,400 mm of rainfall annually, with rainy days accounting for about 50% of a calendar year. However, due to limited land for catchments to collect and store sufficient rainwater and lack of groundwater, it faced water scarcity and vulnerability few decades ago. But with integrated plans Singapore is now supplying 24x7 water of good quality to all users. It has robust wastewater and storm water management plans. It is the first country to sell reclaimed water (treated wastewater) in bulk. Singapore's entire water cycle is managed by the Public Utilities Board (PUB), a public sector agency previously responsible for managing potable water, electricity and gas. In 2001, responsibilities for sewerage and drainage were transferred to PUB from the Ministry of the Environment, allowing PUB to develop and implement a holistic policy, including protection and expansion of water sources; catchment, demand, storm water and wastewater management; desalination; and public education and awareness programmes. At present, PUB also has an in-house Centre for Advanced Water Technology, with about 50 expert staff members who provide it with the

of effluents that industries discharge into public sewers. Source control at the industries ensures that the used water received at the Water Reclamation Plant (WRPs) can be being treated and reused (this is called NEWater production).<sup>110</sup>

**Australia:** Since 2008, the Water Information Research and Development Alliance (WIRADA), an alliance between Australia's Bureau of Meteorology and the Commonwealth Scientific and Industrial Research Organisation (CSIRO), has been delivering the scientific and research innovation required by the Bureau to fulfil its national water information mandate. WIRADA is working on information architectures, earth observation, hydrological modelling, water accounting, water resource assessment and water forecasting. In addition to the research work by WIRADA, the Bureau has been receiving data from across 200 institutions all across Australia. Researchers have been developing an integrated continental water balance modelling system for detailed water balance analysis from the continental to the sub-catchment scale. The system will form an integral part of the Bureau's National Water Accounts and Australian Water Resources Assessment reports. The system will contain models to estimate: water balance of agricultural and forestry land, residential land, water bodies and natural vegetation generation and movement of river flows, groundwater balance and its connection to surface waters. Different institutions use different data format, which makes storage and analysis of the data problematic. Therefore, WIRADA has developed the Water Data Transfer Format (WDTF). This standard allows water data providers, including government agencies, water suppliers, catchment management agencies and municipal councils to efficiently deliver water observation data to the Bureau in a format that is easily processed without the need for manual intervention. A standard format allows automatic

**Figure A8.8: Role of Australia Water Resources Information System**



Source: <http://www.bom.gov.au/water/about/wip/awris.shtml> accessed on 22 May 2013

necessary research and development support. It imposes stringent limits on the physical and chemical characteristics

109 <http://pubs.usgs.gov/fs/FS-027-98/fs-027-98.pdf>

110 Chiplunkar Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan (2012), "Good Practices in urban water management: Decoding good practices for a successful future", Asian Development Bank, Mandaluyong City, Philippines

validation of the data against a set of rules and constraints that ensure the data is fit for purpose.<sup>111</sup> Figure A8.8 above shows the role of the Australia Water Resources Information System (AWRIS).

## V. What could be the role of private and civil society institutions in developing an information system for integrated urban water management?

- i. **Scientific research:** IUWM requires a lot of scientific input for addressing complex problems. In order to be able to address the intricacies of the challenges continuous research is required. For example, cities are currently facing the problem of waste water and solid waste disposal. Independent research institutions could help the government by conducting research on appropriate sanitation and waste disposal technologies for low income and high density settlements. They could also undertake R&D on low-cost water supply and sanitation technologies.
- ii. **Technology providers:** Information gathering has become lot easier these days thanks to innovative technologies. The private sector in India could develop cheaper technologies for collecting information about water resources. For example, Punjab Agricultural University has developed a tensiometer costing only Rs.400 as compared to a conventional tensiometer, which costs between Rs.2000 and Rs.10000. Such innovations could be further commercialised through private enterprise.
- iii. **Capacity building:** In addition to developing or adapting new technologies and instruments for water measurement, the private institutions could provide training services to managers and technicians in water utilities.
- iv. **Community awareness:** Information sharing should be bi-directional. Civil society organisations could facilitate the active participation of women, youth, indigenous people and local communities by informing them about real challenges existing in IUWM. They could also train ground level institutions like water user associations or resident welfare associations about the importance of data collection in water management. Special education and training programmes about water quality testing and poor hygiene health issues for slum dwellers could also be conducted.
- v. **Asset management:** For a utility, information about its assets is very important. Private institutions could work with utilities to develop databases of assets, set

performance benchmarks, and also guide utilities in developing asset management plans.

- vi. **Industrial water disclosure:** Industrial water consumption accounts for a large component of water usage in urban areas. It is the corporate responsibility of industry to disclose their water usage data to the government. Benchmarks for industry-wide water use could help to promote industrial water use efficiency.
- vii. **Private water vendors:** Slum areas often receive water from informal water vendors. These private water vendors also ought to be reporting about their water sources, treatment system and total supply to an independent regulatory body.
- viii. **Data managers:** Data collection will not serve the purpose if it is not analysed and processed in a judicious manner. Therefore, there is a need of good modellers, IT experts policy experts etc. to analyse the data, check its accuracy, make it available for a wider public process according to the user needs, and suggest policy measures with the help of available data.
- ix. **Solid waste and wastewater information:** Currently, solid waste and wastewater is mostly handled by private entities in India. For IUWM it is very important to know about the quality and quantity of solid waste and wastewater generated in a city. These institutions could serve as a source of information to the utility.
- x. **Environmental consultancies:** There are several private institutions that are working as environment consultants in India and have a good database on many environmental parameters like water quality, air quality, wastewater etc. for some regions. However, there is no platform where these private institutes could share their information.

## VI. What could be a roadmap for integrated urban water management (IUWM) and what are the cost implications?

The IUWM plan adoption process may be divided into three phases. In each phase, five activities are repeated<sup>112</sup>

- **Phase 1:** This phase is for finding out strategic directions for urban water management, such as recycling, storm water reuse and desalination. During Phase 1, the analysis is appropriate to understand the whole-of-city water and contaminant balances and identify opportunities for integrated management of the urban water system.
- **Phase 2:** In this phase, a shortlist of initiatives is prepared based on the strategic directions agreed in Phase 1.

111 WIRADA Annual report 2011-12 available at [http://www.bom.gov.au/water/about/publications/document/wirada\\_annual\\_report\\_2011-12.pdf](http://www.bom.gov.au/water/about/publications/document/wirada_annual_report_2011-12.pdf) accessed on 22 May 2013

112 Maheepala, S., J. Blackmore, C. Diaper, M. Moglia, A. Sharma and S. Kenway (2010) Integrated Urban Water Management Planning Manual, CSIRO Australia and Water Research Foundation (Project 4008), Denver, Australia

- **Phase 3:** In this phase a preferred and feasible portfolio of initiatives is finalised, which can proceed to detailed engineering design and implementation. Phase 3 provides sufficient detail to compare the performance of all the shortlisted portfolios.

The five main activities recommended in the IUWM planning process are as follows:

1. **Convening a key stakeholder group:** Formation of a Key Stakeholder Group (KSG) is the first step in moving towards IUWM. It would consist of representatives from various institutions involved in management of one or the other component of IUWM and also other private institutions. The KSG would be responsible for overseeing the IUWM planning process and in activities like setting of targets, deadlines etc.
2. **Agreeing on objectives, measures, criteria and methods:** Agreement on IUWM objectives in terms of qualitative or quantitative parameters provides robust measures of the success of the project. Measures alone are insufficient; however, methods of analysis, and minimum standards of compliance, need to be articulated to ensure that any proposed system meets all needs and expectations.
3. **Understanding the current system:** Information on the physical set up of the system alone is not sufficient. Understanding all aspects of the system, including all elements of the water cycle, legislation, climate, demographics, social, economic and environmental considerations is essential in identifying potential strategies and developing viable alternative configurations.
4. **Assessing system performance and select portfolios:** Coherence and compatibility of strategies and the function of preferred components in future is essential for the transition to an IUWM future. Social, environmental and economic analyses have to be drawn together to provide an understanding of how the proposed systems might function, and to assist decision makers in selecting the best option.
5. **Planning implementation:** Purely supply side management strategies have not proven sufficient for sustaining urban water infrastructure or adequate service delivery standards. For IUWM to become a reality, robust plans have to be made and implementation has to be regularly monitored and verified against benchmarks to ensure that the selected interventions are efficient and sustainable.

The UWSS sector in India needs huge investments to meet consumer demand and resource sustainability needs. The High Powered Expert Committee (HPEC) Report on Indian Urban Infrastructure and Services estimates (at 2009-10 prices) that the per capita investment needed for capital infrastructure in the water, sewerage and storm-water sector would be Rs.13,329 and another Rs.840 annually for operation

and maintenance. The total investment needed during 2012-2031, according to this estimation, is Rs.7,54,627 crore for capital and Rs.8,17,671 crore for O&M respectively. Thus, the water supply, sewerage and storm water drainage investments amount to about 24% of all urban sector requirements for capital and 41% for O&M respectively.<sup>113</sup>

The capital requirements would increase further if the Hydrological Information System were also strengthened. In India, Hydrology Project-I (HP-I) was taken up by the Ministry of Water Resources from year 1995-2003 to develop a Hydrological Information System (HIS) by creating facilities and standardised procedures for data collection, data compilation, processing and data storage for future use. The cost of project implementation was Rs.605.28 crore, much of it in the form of World Bank support. As reported, activities accomplished during HP-I in nine states were the establishment and improvement of a data collection network; data entry, validation and storage systems; computerised data banks; and availability of metadata. During implementation of HP-I, 916 river gauge stations, 7889 observation wells and 436 hydro-meteorological stations for collecting data on qualitative and quantitative aspects of both surface and ground water, 390 Data Centres and 28 Data Storage Centres were equipped with specialised hardware and software for data processing, storage and reliable data communication. Software for surface water and ground water modelling was also developed. In the Hydrology Project Phase-II, which started in April 2006 (and is expected to run until May 2014), the objectives are to extend and promote the sustained and effective use of HIS by all implementing agencies concerned with water resources planning and management, both public and private entities. The expectation is that it would improve productivity and cost effectiveness of water-related investments in 13 participating states and 8 central agencies. The total estimated cost of the project is Rs.631.83 crore, again largely funded by World Bank.

These investments, however, are a fraction of the total capital and O&M expenses expected in the urban water sector. Recently, the government has also proposed a new data sharing policy to make water resources information available to a wider array of users. Another venture of the MoWR is the development of Water Resources Information System (WRIS) in collaboration with the Indian Space Research Organisation (ISRO). This interface would integrate various types of information on land use and land cover, water quality, soil type, aquifer type etc. and could serve as a decision support system. The promise of timely and salient information on all aspects of urban water management should justify the costs.

**Present(in alphabetical order):** Mr Anshuman (TERI

<sup>113</sup> MoUD (2012): Advisory Note on Improving Urban Water Supply & Sanitation Service: Ministry of Urban Development, Government of India

# Annex 9: Water data and measurement

Proceedings of the fourth roundtable

WWF Auditorium New Delhi, 27 May 2013

University), Mr SVK Babu (Veolia Water India), Mr Subrata Barman (IFC), Mr Ashish Bhardwaj (FICCI), Mr Neville Bhasin (Forbes Marshall), Dr J K Bhasin (NEERI), Mr Manu Bhatnagar (INTACH), Ms Vanadana Bhatnagar (World Bank), Dr Arunabha Ghosh (CEEW), Mr Vikas Goyal (Aecom), Mr A K Jain (Architect- Town planner), Dr Renu Khosla (CURE India), Ms Anjali Pancholi (Town and country planning), Ms Brune Poirson (Veolia Water India), Mr Patrick Rousseau (Veolia Water India), Ms Urvashi Sharma (CEEW),

Mr Rudresh Sugam (CEEW), Prof. Chetan Vaidya (SPA), Mr Mukund Vasudevan (Pentair), Dirk Walther (GIZ)

**Absent:** Dr J R Sharma (Indian Space Research Organisation), Dr Jyoti Parikh (Integrated Research and Action for Development (IRADe)), Ms Naini Jayaseelan (National Capital Region Planning Board).



CEEW-Veolia Water India Fifth Roundtable

## Background

The CEEW-Veolia Water India Roundtable series has been divided into several themes to break down the problem of urban water management and address each issue in greater detail. Various representatives of different stakeholders group have participated in the discussions. The fourth CEEW-Veolia Water India Roundtable on Urban Water Management was convened on 27 May 2013. The theme of the discussion was “Water Data and Measurement”. CEEW prepared an issue brief highlighting the situation of urban water data and measurement in India, with an emphasis on the roles that utilities play as water suppliers, service providers and as integrated resource managers. According to these roles, the issue brief outlined the data requirements and challenges in urban water management. The brief also suggested key roles that could be played by the private sector in developing and managing databases and information systems on urban water. The issue brief offered some examples and cases from within and outside India, which could serve as a guide for the development of a robust water database. The roundtable discussion was framed along the following five questions:

- What are the data required for urban water planning/management?
- What is the framework for water related data collection and dissemination in India? Is it ideal? If not, how should an ideal Hydrological Information System (HIS) look like?
- Which problem do households, industries and utilities face due to lack of data?
- Which technologies are being used for water related data retrieval in India? What are the best practices available at national and international level?
- What could be the role of different institutions in promoting information system and integrated urban water management?
- What could be the mile stone steps in planning for Integrated Urban Water Management (IUWM) and what are the cost implications?

## I. Quality of data

### No institutionalised reporting

The quality of data is questionable because there is no system for monitoring the quality of data. There is also the lack of a reporting system, which would make the supplier accountable to report the data on water supply, consumption, UFW etc. For example in Brazil, the funds allotted to the utility are based on reporting of performance data. Further, in addition to improved data quality, the data have to be processed and

made available in a format that is usable for stakeholders interested in increasing the accountability of water utilities.

### Information on the consumer mix

Understanding the consumer mix and related demand is very important. The major demands of a consumer are affordable, good quality and 24x7 water supply services. However, parameters like affordability changes from one place to another. For example, earning patterns of the consumers is important to understand because there could be a case where the consumer could pay the water tariff if it is distributed over a few days or weeks but might not be able to pay it at one time. Other parameters such as the pattern of water use, ecology of the area, peak demand time etc. are important to understand for improved water service delivery.

### Data on water consumption

Although of poor quality, utilities have data on water supply. But data on the amount of water consumption is hardly available with water utilities. Utilities often work on assumptions about the volume of water that finally reaches consumers. The absence of more exact and timely information on consumption patterns results in a large share of Unaccounted Flow Water (UFW). In some cases this could be as high as 50%-60%. Therefore, for the purposes of both understanding end-user delivery as well as accounting for the supply-demand gap, it is very important to establish meters at the consumer end to estimate the delivery efficiency of the utility.

### Poor data on groundwater

Groundwater is the worst sufferer due to lack of information. Household consumers as well as industries can withdraw groundwater without having to report to any authority or be accountable for misuse. The Central Ground Water Board (CGWB) data is not reliable and, to the extent it is available, suffers from low resolution of water abstraction across a defined geographical area. The data cannot be used to understand groundwater withdrawals and use in small scale urban localities. Weak or inadequate regulation on groundwater extraction is also one of the causes of excessive withdrawals and misuse. Some practices, such as the licencing system for groundwater introduced in Dhaka, could be adopted to build a more robust information base and prevent misuse.

### Poor data on distributed water supply

In slum areas, which form a large component of the urban population, water is often delivered via from private vendors. Even households connected to the water mains have to often rely on private vendors. These distributed water suppliers

should be brought within the ambit of the water supply network. Otherwise estimates of water consumption in the city would always be lower than actual consumption, making it harder to plan for upgrading the infrastructure or targeting all sections of the city's population.

## II. Proposed interventions

### Understanding the role of consumers as co-creators of water data

Several participants underscored that consumers should not be treated as passive recipients of (poorly managed) water services. Instead, they could participate as suppliers, resource managers and data providers to government agencies responsible for supplying water. Consumers' feedback on the quality of services is the ultimate water audit possible. Therefore, it is important to develop a good network with the consumers to understand the type of services they are getting and the areas needing improvement. For instance, there is a dearth of information about water use and conservation practices in slum areas. It is important to know how slum dwellers are managing their limited resources, the health impacts due to their water use practices, and the best water management practices that could be adopted in other areas.

### Uninformed planning, lack of information on assets and hesitancy in contracts

Information about existing assets and their current state helps utilities to budget for future investment requirements and regular maintenance. But in India there is little information on utility assets, which tend to be decades old. Some utilities do not have complete maps of the pipe and drainage networks, resulting in even poorer operation and maintenance of the assets.

In many cases city planning occurs without inputs from water utilities. As a result, it is unclear whether the current infrastructure can meet the demands of a growing population and changing patterns of economic activity.

Due to the lack of data regarding the assets of utilities and water resources availability, private sector entities are hesitant to bid for water supply contracts. Those who do succeed in winning the contracts often struggle to meet targets when the actual target population turns out to be much higher than assumed or if the quality of the infrastructure is worse than had been previously estimated. In order to attract private investment, better estimations of existing infrastructure and coordinated planning for urban expansion are essential.

### Comparing cost of UFW loss versus estimating cost of infrastructure requirements for database development

Developing improved water database requires investments in various technologies ranging from meters and digital water level recorders at a small scale to Supervisory Control and Data Acquisition (SCADA) system on much larger scales. It is, therefore, important to estimate the losses that a utility suffers from because of not having proper measurement infrastructure against the costs of putting measurement devices and information systems in place. Utilities also need to account for the inflation in costs for delayed or defrayed decisions as well as the cumulative losses from poorly managed water resources, adverse public health outcomes, lower incomes, etc.

### Cost efficient ways to develop the database

The ideal situation is that there should be meters at both the supplier and the consumer end. However, if this is difficult to achieve in a short span of time, it is important to understand the minimum number of meters required to serve the purpose of at least achieving some improvement in water supply. One participant also suggested that Investments could be encouraged via cost-recovery formulae, whereby initial investments are covered and only when surpluses are generated could a tariff increase be discussed. Another also suggested that the cost of installing meters should be included in the project cost and meters should be installed at least at the zonal level. A third suggestion was to use overhead tanks as proxies to measure water demand and consumption and to use metering to first get improved estimates of non-revenue water.

### Incentivising the process of developing and sharing water data

Participants discussed how to target or provide incentives for officials keen on promoting reforms and to support data sharing across different levels of government. While utilities are supposed to deliver good urban water services, several governance decisions could be within the authority of state-level institutions. One participant noted that the 74<sup>th</sup> Amendment to the Constitution applies differently in different cases. In some instances, participants noted that although the actions were undertaken by utilities, the state capital controlled the funds. Others found that the ULBs remained the main entity with whom to enter into contractual negotiations.

**Table A9.1** offers four scenarios where state-level officials and ULB officials support or oppose data sharing reforms. It is important to achieve coherence and willingness to reform at both the levels, but this is seldom the case. Therefore, incentives, such as financial support through the Jawaharlal Nehru Urban Renewal Mission, could be targeted accordingly. If funds are needed for infrastructure investment, they could

be made contingent on improved water databases being prepared and the data being shared with other stakeholders. Where officials support reform, several new sources of data and information could become available, by legitimising distributed water supply services, customer-driven feedback, etc.

**Table A9.1: Different scenarios existing in urban water system in India**

	States support reform	States oppose reform
ULBs support reform	Legitimise distributed water supply services Consumers provide data as well	Incentives target state governments
ULBs oppose reform	Incentives target ULB managers	

### III. Ways ahead

Among the suggestions that the group made were:

- Capacity building of the utility and state level organisations underscore the importance of data and information system
- Allowing utilities some time (say, three years) to develop the database before initiating the PPP contracting process
- Some of the data that could be collected more easily, such as supply coverage, quality of water supply etc. should be prioritised
- Encouraging various institutions, involved in work related to one or the other component of the water sector, to share information on water
- Providing incentives to develop water data and information systems
- Identifying low-cost technologies for collecting reliable information on water
- Acting urgently to develop improved and higher resolution databases on GW
- Urban planning should not be done without sufficient information on water resources

## Essay 8: Role of data, technology and training in improving urban water utility performance

Neville Bhasin



Neville Bhasin

*"Give me a little data and I'll tell you a little. Give me a lot of Data and I'll save the world"-Darrell Smith, Director of Facilities and Energy, Microsoft*

### Why data?

The greatest human migration – urbanisation – is underway. In order to have cities working effectively and contributing to economic growth, it is essential to have reliable water supply services. This is only possible through the use of technology which not only generates data from suitable sensor devices but data which is then transmitted and formatted through relevant software. This massive exercise of data collation is part of a wider effort at managing 'Smart Cities' through suitable business models / Public Private Partnerships. Capacity building through training ensures that such data is effectively used. Finally, the present trends in the growth of cities are a continuation of early civilisations, which all depended on management of water resources to fuel economic sustainability.

### Urbanisation

India, as is the case globally, is rapidly urbanising. There are around six to eight thousand cities and towns where migration from rural areas is happening on an unprecedented scale. Urbanisation and per capita GDP tend to move in close synch as countries develop. As per a recent McKinsey Report (July 2012),<sup>114</sup> city growth and increased income will boost municipal water demand by 40% by 2025 from existing levels. In India, they have identified 12 urban clusters – with two or more big cities closely connected to their surrounding towns – which

account for 55% of the country's entire urban population. The role of water in economic growth is further underscored by a report from the U.S Environmental Protection Agency, which examined the impact of this resource on production of goods and services in many sectors.<sup>115</sup>

### Data generation and analytics

As stated above, data can be generated from a variety of sensor devices, such as flow, level and water quality analysers. A suitable architecture commencing from raw water sourcing, water treatment and distribution networks, which incorporate sensors, will achieve objectives of initial data flows. Accurate measurement through suitable technology such as electromagnetic flow meters is one example compared to earlier technologies, which suffered from many deficiencies.<sup>116</sup> Accuracy in data generation is founded on certain principles such as linearity, hysteresis, and repeatability. However, there has to be a strategy in place for data collection as consumption in urban centres is skewed.<sup>117</sup> Twenty percent of consumers account for approximately 80% of the water consumption. This pattern is also observed in many U.S cities.<sup>118</sup>

<sup>114</sup> Richard Dobbs, Jaana Remes, James Manyika, Charles Roxburgh, Sven Smit and Fabian Schaer (2012), *Urban World: Cities and the Rise of The Consuming Class*, a report by McKinsey Global Institute

<sup>115</sup> EPA (2012), The Importance of Water to the U.S. Economy Part 1: Background Report, Public Review Draft Office of Water, U.S. Environmental Protection Agency

<sup>116</sup> M. Fantozzi, A. Criminisi, C. M. Fontanazza, G. Freni, A. Lambert (2009), Investigations into under-registration of customer meters in Palermo (Italy) and the effect of introducing Unmeasured Flow Reducers; Available at <http://www.studiomarcofantozzi.it/Aprile09/Fantozzi%20et%20Al%20Palermo%20case%20study%20V4%20030309.pdf>, accessed on 11 November 2013

<sup>117</sup> IMC (2011), *Towards Sustainable Practices and Strategies for Efficient Water Resources Management for Mumbai*, Indian Merchants' Chamber, Mumbai

<sup>118</sup> Ed Ritchie (2013), *The Data Difference*, July-August edition of Water Efficiency Journal; Available at [http://www.waterefficiency.net/WE/Articles/The\\_Data\\_Difference\\_22206.aspx?page=3](http://www.waterefficiency.net/WE/Articles/The_Data_Difference_22206.aspx?page=3) accessed on 11 November 2013 -

Having generated and transmitted the data to a central server, the next step is to make sense of this large volume of data. The science of data analytics is rapidly emerging as one tool to extract relevant information for decision making. Companies such as IBM,<sup>119,120</sup> Oracle,<sup>121</sup> EA Consulting,<sup>122</sup> and Intel<sup>123</sup> have developed solutions around this huge volume of data generation. The “cloud” as a tool to store data and lower legacy upfront costs in IT infrastructure has attracted the attention of other companies as well.<sup>124,125,126</sup>

### Smart cities

Having collected the data and subjected the same to rigorous analysis, this information is now available to improve water supply services. Benefits include new service paradigms, water conservation and energy efficiency.

This combination of hardware and software has fuelled the concept of “convergence”, comprising information technology and communication protocols. Data from water resources is combined with data from energy, transportation and disaster management to facilitate overall management of “Smart Cities”. In fact, pilots are underway all across the globe with companies

creating ecosystems to deliver effective results.<sup>127,128,129,130,131</sup> In India, too, improvements in water supply service can be supported with readily available technologies (see box 3).

### Capacity building

In order to make a successful transition to managing “smartness”, it is essential to embrace technology with the appropriate skill sets. Big data is driving the emergence of the “super analyst”, one who is highly skilled, highly empowered, and as a result highly productive.<sup>132</sup> The example of the Pimpri Chinchwad Municipal Corporation shows that this is possible with existing human resources, although training is an integral part of the exercise. There are adequate institutional mechanisms available in India to impart the requisite training.

### Conclusions

In order to take up the challenge of urbanisation with its attendant economic growth, water supply services have to be arranged 24x7. Singapore is a prime example of a vibrant economy and society, despite constrained resources.<sup>133</sup> There is no reason why this goal of 24x7 cannot be prioritised in government policy. In fact the 12<sup>th</sup> Five Year document on water includes water database development and management (21) as one element of a paradigm shift.<sup>134</sup> The Harappa civilisation was passionate about water management and sanitation.<sup>135</sup> We should continue this tradition as we are after all custodians of their culture!

119 IBM (2009), *The Journey along an Information-Led Transformation*, International Business Machines Corporation, New York, United States; Available at <http://www-935.ibm.com/services/no/cto/pdf/liw14011usen.pdf> accessed on 11 Nov. 13

120 IBM (2012), *Analytics: The real-world use of big data*, International Business Machines Corporation, New York, United States; Available at <http://public.dhe.ibm.com/common/ssi/ecm/en/gbe03519usen/GBE03519USEN.PDF> accessed on 11 Nov. 13

121 Oracle Utilities Meter Data Management User Guide (2010), Oracle, United States; Available at [http://docs.oracle.com/cd/E18729\\_01/pdf/E18186\\_01.pdf](http://docs.oracle.com/cd/E18729_01/pdf/E18186_01.pdf) accessed on 11 Nov. 13

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123 Intel IT Center (2012), *Big Data 101: Unstructured Data Analytics*, A Crash Course on the IT Landscape for Big Data and Emerging Technologies; Available at <http://www.intel.in/content/dam/www/public/us/en/documents/solution-briefs/big-data-101-brief.pdf> accessed on 11 November 2013

124 Service-Now.com, *A Brief History of SaaS – Modernizing Enterprise Software*; Available at <http://www.computerworld.com/pdfs/Service-Now-BriefhistoryofSaaS.pdf> accessed on 11 November 2013

125 CISCO (2011), *Collaboration and the Cloud: Harness Both to Accelerate Your Business*; Available at [http://www.cisco.com/en/US/solutions/collateral/ns151/ns1086/solution\\_overview\\_c22-693241.pdf](http://www.cisco.com/en/US/solutions/collateral/ns151/ns1086/solution_overview_c22-693241.pdf) accessed on 11 November 2013

126 EMC2-Cloud Computing Step by Step-2010

127 Ashley Lapin (2013), With IBM, Montpellier asks citizens to ‘author’ a smart city; Available at <http://www.greenbiz.com/blog/2013/06/27/montpellier-france-invites-citizens-author-smart-city> accessed on 11 November 2013

128 Heather Clancy (2013), Cisco and Nice say bonjour to a smarter city; Available at <http://www.greenbiz.com/blog/2013/06/23/cisco-nice-smarter-city> accessed on 11 November 2013

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130 Linda Hardesty (2013), *Siemens Creates Futuristic ‘Smart City’ in Austria*; Available at <http://www.energymanagertoday.com/siemens-creates-futuristic-smart-city-in-austria-093467/> accessed on 11 November 2013

131 Heather Clancy (2013), *Schneider Electric takes a bottoms-up approach to smart cities*; Available at <http://www.greenbiz.com/blog/2013/06/18/schneider-electrics-bottoms-approach-smart-cities> accessed on 11 November 2013

132 DELL and Excellent Management Systems Inc.-John Weatherton

133 Shannon Bouton, David Cis, Lenny Mendonca, Herbert Pohl, Jaana Remes, Henry Ritchie, Jonathan Woetzel (2013), *How To Make A City Great*, McKinsey & Company

134 Mihir Shah (2013), Water: Towards a Paradigm Shift in the Twelfth Plan, Economic & Political Weekly, Vol.XLVIII no. 3, January 19, 2013; Available at [http://www.indiawaterportal.org/sites/indiawaterportal.org/files/water\\_towards\\_a\\_paradigm\\_shift\\_in\\_the\\_twelfth\\_plan\\_dr\\_mihir\\_shah\\_planning\\_commission.pdf](http://www.indiawaterportal.org/sites/indiawaterportal.org/files/water_towards_a_paradigm_shift_in_the_twelfth_plan_dr_mihir_shah_planning_commission.pdf) accessed on 11 November 2013

135 Michel Danino (2010), *The Lost River: On The Trail Of The Sarasvati*, Publisher Penguin, 2010,ISBN-13 9780143068648, ISBN-10 0143068644

# Annex 10: Building capacity in urban water sector

## Issue brief for the fifth roundtable

### I. Introduction

“Capacity can be defined as the ability of individuals and organizations or organizational units to perform functions effectively, efficiently and sustainably.”<sup>136</sup> This definition has three important aspects: (i) it indicates that capacity is not a passive state but is part of a continuing process; (ii) it ensures that human resources and the way in which they are utilized are central to capacity development; and (iii) it requires that the overall context within which organizations undertake their functions will also be a key consideration in strategies for capacity development.<sup>137</sup>

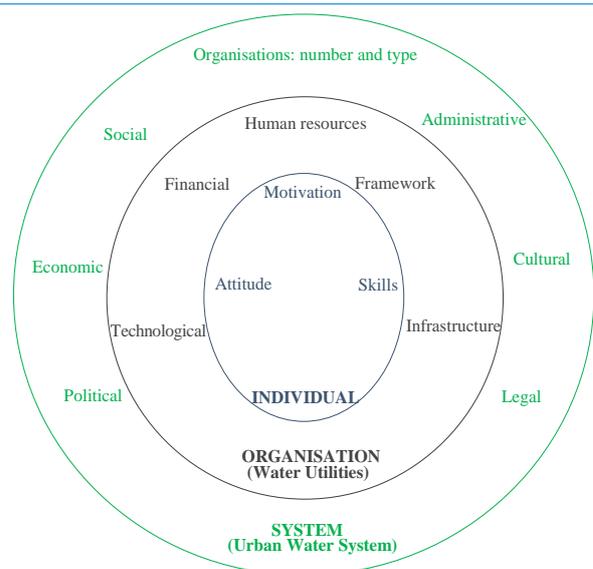
It is clear from the definition that capacity building could occur at three levels:<sup>138</sup>

- (i) Individual level
- (ii) Organisational level
- (iii) Environment/Network/System level

An organisation is a composite of human resources, technical resources, and financial resources. However, an organisation is not the complete system; rather it is part of the system. A system is formed of different organisations working in the same environment for broadly common goals. An urban water system consists of organisations dealing with water supply, wastewater treatment, pollution control, land use planning, infrastructure development, health and sanitation,

city planning etc. This issue brief focuses on water utilities that are mainly responsible for urban water supply and sanitation (UWSS) services in a city. The performance of the urban water is dependent on various social, political, economic and administrative factors, and it is important that capacity building should be viewed from a holistic perspective and not limiting it to an individual department/institution. **Figure A10.1** below illustrates the different levels at which capacity development has to occur in a typical urban water system. **Figure A10.2** represents a schematic illustration of knowledge and capacity development at these different levels, indicating inputs and outcomes, and means for measurement.

**Figure A10.1. Levels of capacity development in a system**



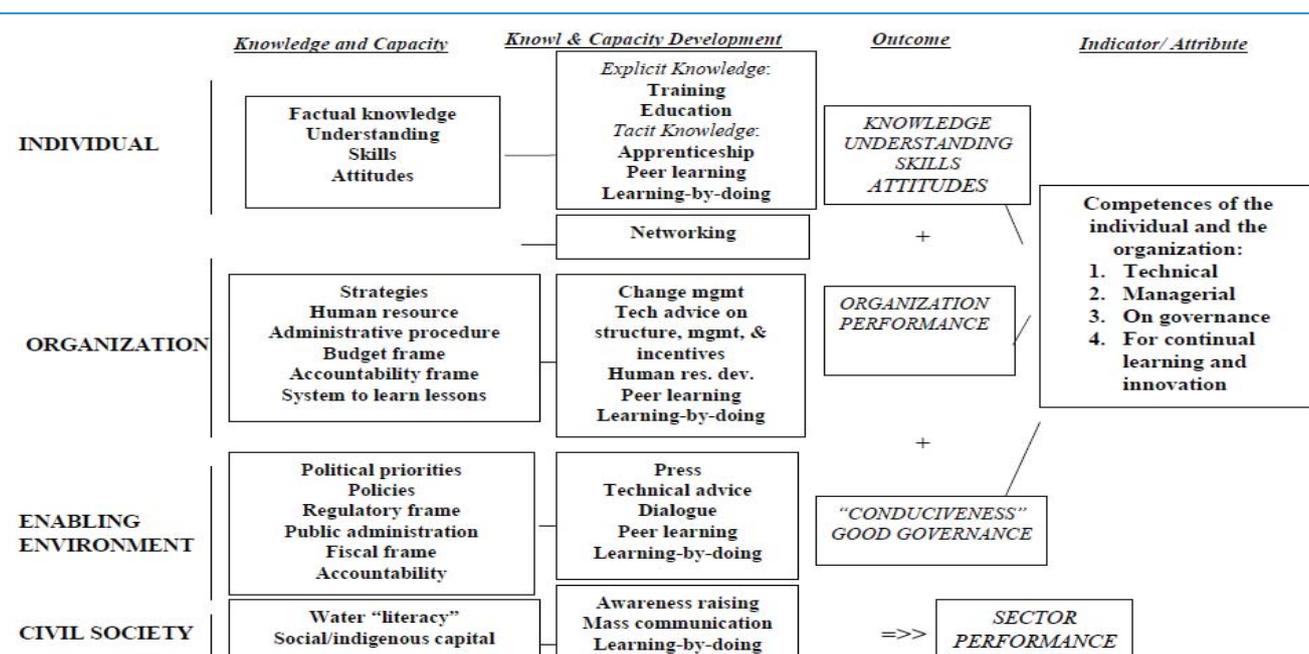
**Source:** Adapted from Atsushi Matachi (2006), *Capacity Building Framework*, UNESCO-IICBA, published by United Nations Economic Commission for Africa, Addis Ababa, Ethiopia

136 UNDP (1998), *Capacity Assessment and Development*, Technical Advisory Paper No.3 available at <http://mirror.undp.org/magnet/Docs/cap/Ch2.pdf> accessed on 05 June 2013

137 Abbas Rajabifard and Ian P. Williamson (2004): *SDI Development and Capacity Building*, Centre for Spatial Data Infrastructures and Land Administration, Department of Geomatics, The University of Melbourne, Australia; paper presented at GSDI 7 Conference, Bangalore, India

138 Atsushi Matachi (2006), *Capacity Building Framework*, UNESCO-IICBA, published by United Nations Economic Commission for Africa, Addis Ababa, Ethiopia

Figure A10.2 : Schematic of knowledge and capacity development at different levels



Source: Guy Alaerts & Judith Kaspersma (2009): Progresses and challenges in knowledge and capacity development, chapter 1, page no. 17, Capacity development for improved water management, UNESCO-IHE and UN-DPC, Delft

### Capacity development at the individual level

Human resources form the most important component of the system. The three main attributes of human resources, which need to be developed, are skills, motivation and attitude. The aim would be to make the workforce deliver results efficiently and with an empathetic understanding of the needs and expectations of the customers/citizens that public utility managers and staff are expected to service. Incentives (in the form of adequate and reasonable salaries and other facilities), technical training programmes, orientation programmes, field training, etc., are various ways to build capacity. It would not be sufficient to simply teach engineering skills without paying attention to water-related problems stemming from social, political, and financial or economic factors.<sup>139</sup>

### Capacity development at the organisational level

An organisation's development would depend on its capacity to use available resources. The organisational structure plays an important role in determining the growth of an institution. CEEW's research and discussions with a diverse group of stakeholders have suggested that the following challenges

persist in water institutions:<sup>140,141</sup>

- insufficient human resources;
- mismatch between qualification and responsibility assigned;
- lack of asset databases;
- poor operation and maintenance activities;
- unused instruments and devices;
- inadequate incentives;
- missing significant skillsets;
- unrealistic targets;
- departmental or individual achievements are determined by investment outlays, rather than outcomes achieved;
- weak linkages between different units of an institution;
- training programmes are absent or ill-designed.

Therefore, for holistic capacity development of an institution it is important that all these challenges are addressed.

### Capacity development at the system level

An organisation could not function efficiently unless it has a

139 Annette Bos (2006), *Capacity Building in the Water and Sanitation Sector at times of the MDGs*, discussion paper prepared for the Round Table Meeting organised by Water Links and PSO, January 2006, UNESCO-IHE

140 Rudresh Sugam and Arunabha Ghosh (2012) *Institutional Reform for Improved Service Delivery in Bihar: Economic Growth, Agricultural Productivity, and a Plan for Reorganising the Minor Water Resources Department*, Report to the Minor Water Resources Department, Government of Bihar, pp 1-81, New Delhi: Council on Energy, Environment and Water

141 CEEW-Veolia Water India (2013), *Private Sector Participation in Water Management and Water for All*, Roundtable on Urban Water Management, 11 February at India International Centre, Delhi.

supporting environment. Among the main external factors, which determine the performance of an organisation are:

- **Political:** Politics and water are strongly intertwined in India with significant political influence and interference in the management of the water system in a given urban local context.
- **Administrative:** ensuring equitable distribution of water resources, assigning appropriate water tariff and monitoring efficiency of the whole system are important functions in an urban water system which are determined by the type of administrative set up. For example, the presence or absence of an independent regulator could have an impact on how WSS is monitored, whether tariffs are rational, fair and equitable, and whether utility managers are held accountable for their performance.
- **Legal:** policies and laws are driving factors for shaping any sector, therefore in the absence of correct policy measures the organisation would struggle to achieve its targets;
- **Economic:** funding gaps, both for capital investment and operations and maintenance, is the prime constraint in the development of the urban water sector;
- **Social:** water, although being a utility service, is a subject of social concern and is affected by a range of social factors;
- **Cultural:** water use and management practices are, in part, affected by local cultural practices. Many traditional water bodies have been preserved by local communities because it forms an integral part of their culture and

tradition but in other areas, similar infrastructure might have fallen into disrepair;

- Multiplicity of institutions and inter-institutional coordination is another decisive factor in the development of the urban water sector.

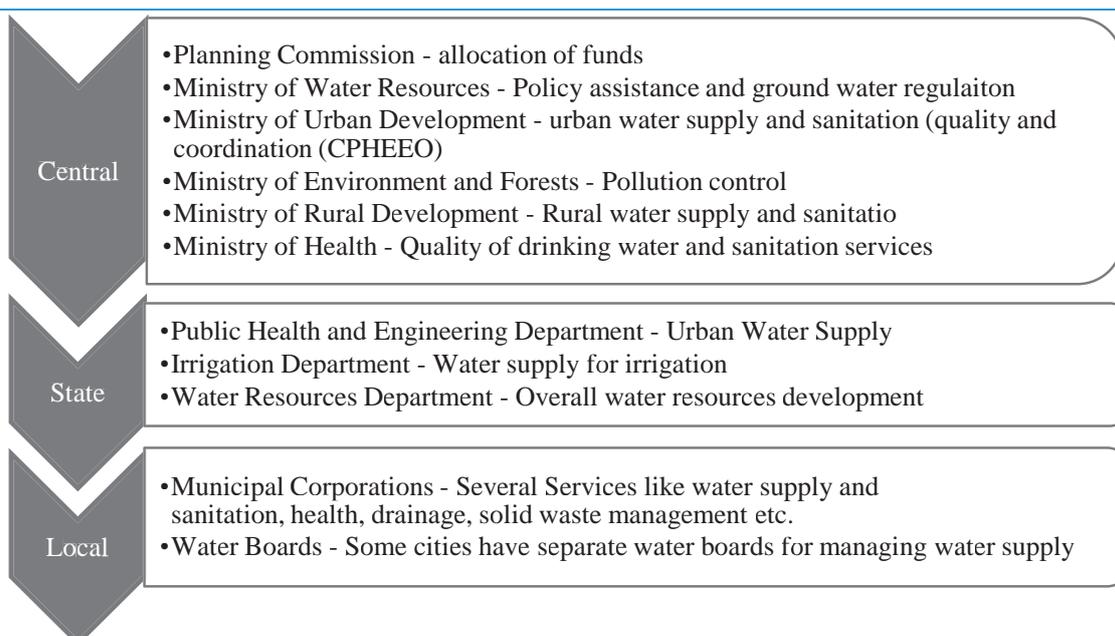
In short, the system is only as strong as its weakest link. It is very important for the entire system to perform in cohesion. But to achieve such a result, it is important to understand the challenges at various levels. Capacity development initiatives would have to be designed in response to these multi-level challenges.

II. What is the human resource structure in urban water utilities in India? What are the key skills and training provided to them? Where do the knowledge gaps lie?

#### Human resources composition of an urban water utility

India has a federal structure and the Indian constitution empowers the states to govern water resources. However, with the introduction of the 74th constitutional amendment in 1992, devolution of authority towards the urban local bodies/ municipalities was preferred. The Urban Local Bodies (ULBs) have since been vested with the constitutional

Figure A10.3: Water institutions at various levels in India



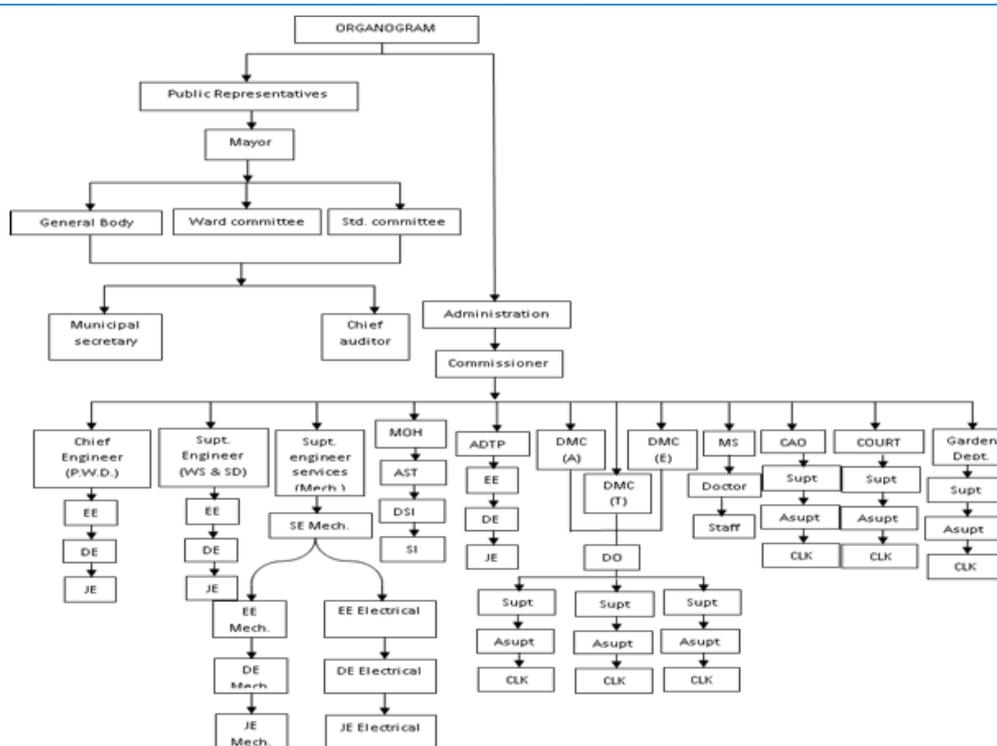
Source: Amit Garg & Tirthankar Nag (2013) : Strategies to Improve Urban Water Delivery in West Bengal, India: An Analysis of Water Institutions and Benchmarking of Water Delivery Organizations, Working paper No. 2013-04-02, Indian Institute of Management Ahmedabad, India

authority to plan, design, implement, operate and maintain water and sanitation projects.<sup>142</sup> National and state water policies influence urban local bodies in decision making and development of water-related infrastructure and services. **Figure A10.3** above shows a broad set up of water institutions at different levels in India.

**Figure A10.4** below shows the typical organisational structure of a municipal corporation in India. Although capacity has to increase at all levels, it is clear from **figure A10.4** that municipal corporations are responsible for several services at the local level. According to The Constitution (seventy-fourth amendment) Act, 1992, municipal bodies are assigned the following eighteen responsibilities:<sup>143</sup>

1. Urban planning including town planning
2. Regulation of land-use and construction of buildings
3. Planning for economic and social development
4. Roads and bridges
5. Water supply for domestic, industrial and commercial purposes
6. Public health, sanitation conservancy and solid waste management
7. Fire services
8. Urban forestry, protection of the environment and promotion of ecological aspects
9. Safeguarding the interests of weaker sections of society, including the handicapped and mentally retarded
10. Slum improvement and upgradation
11. Urban poverty alleviation
12. Provision of urban amenities and facilities such as parks, gardens, playgrounds
13. Promotion of cultural, educational and aesthetic aspects
14. Burials and burial grounds; cremations, cremation grounds and electric crematoriums.
15. Cattle pounds; prevention of cruelty to animals.

**Figure A10.4: Organisational structure of a typical municipal corporation in India**



Abbreviations STD. - Standing ENGG. - Engineer, MOH- Medical officer health, ADTP – Assistant Director Town Planning, DMC - Deputy Municipal Commissioner, MS-Medical Superintendent, CAO- Chief Accounts Officer, DEPT. – Department, PWD- Public Work Department, WS & SD-Water Supply and sanitation department, MECH. - Mechanical, EE-Executive engineer, DE- Deputy engineer, JE- Junior engineer, SUPT. – Superintendent, DSI-Divisional Sanitary Inspectors, SI – Sanitary Inspector, CLK- Clerk, DO- Duty Officer, ASUPT. – Assistant Superintendent

**Source:** Nashik Municipal Corporation Organogram, available at [http://nashikcorporation.gov.in/doc/16\\_Orgnogram%20New%20Changes.pdf](http://nashikcorporation.gov.in/doc/16_Orgnogram%20New%20Changes.pdf), accessed on 17 June 2013

142 Amit Garg & Tirthankar Nag (2013) : Strategies to Improve Urban Water Delivery in West Bengal, India: An Analysis of Water Institutions and Benchmarking of Water Delivery Organizations, Working paper No. 2013-04-02, Indian Institute of Management Ahmedabad, India cited from: Nallathiga, R. (2008) : Reforming Urban Water Supply Sector in India, Journal of Infrastructure, Vol. VI, No. 2, The ICFAI University.

143 The Constitution (seventy-fourth amendment) Act, 1992 available at <http://indiacode.nic.in/coiweb/amend/amend74.htm>, accessed on 20 June 2013

16. Vital statistics including registration of births and deaths.
17. Public amenities including street lighting, parking lots, bus stops and public conveniences
18. Regulation of slaughter houses and tanneries

Water supply is the responsibility of the water supply department (which could have different names in different states), which functions under the municipal corporation. Some of the cities and states have created a dedicated board for UWSS services. For instance, the Gujarat Water Supply and Sewerage Board, the Delhi Jal Board (only for water supply), the Punjab Water Supply and Sewerage Board, the Bangalore Water Supply and Sewerage Board etc. However, the human resources composition of the water supply departments/boards is more or less the same. The urban water supply departments are almost entirely staffed by engineers at all the levels, most of whom are civil engineers. The general hierarchy of the departments is as follows:<sup>144</sup>; <sup>145</sup>

**Chief Engineer or Superintending Engineer:** This is the highest level of the department in terms of project monitoring and execution, and just below the commissioner. The CE/SE is responsible for efficient working of the department and controls all water supply schemes, sewerage schemes, projects and other affairs.

**Executive Engineer:** As the name suggests, this position is responsible for project execution. The EE is also involved in planning water supply schemes, sewerage schemes, projects and other affairs, which fall under his/her Division. The Executive Engineer is responsible for inspecting each Sub-Division and submit reports to the Superintending Engineer.

**Assistant or Deputy Engineer:** This position is responsible for the management and execution of work within a Sub-Division. The AE/DE also supervises the actual execution of all works in the Sub-Division in accordance with sanctioned estimates, specifications and drawings. Responsibilities include inspection of water treatment plants and timely maintenance and repairs. The official is also expected to maintain all initial accounts for expenditure in respect of works within her/his charge.

**Junior Engineer:** The JE is responsible for preparing minor requisitions and plans and estimates for special repairs and additions and alterations of works/ schemes in water treatment units. He/she supervises contractors, operators and labourers and maintains the register of progress and instructions on all major works for reporting to the AE.

**Operators:** These officials work on site and operate valves, pumps, motors etc. They are largely unskilled and seldom receive any training.

### Key capacity development programmes and skill gaps

CEEW's interactions with several urban water sector experts<sup>146</sup> and utility managers revealed that, in general, there is no defined training calendar or programmes within utilities. However, some training is provided, mostly on project design and planning, to higher officials. These trainings are limited to city-scale utilities with little or no training for officials managing utilities in smaller towns.

According to urban water experts, the following are among the major skill gaps and training requirements in urban local bodies (ULBs):

- **Water management skills:** Utilities have generally followed a supply side management approach to meet growing water demand. With resources becoming scarcer, it is important to shift to efficient demand management practices. Precise water budgeting is essential for planning for lean supply periods, but this is rarely done. Training for measuring water supply, detecting leaks and estimating the non-revenue component, followed by verification, is essential. So are developing databases on quantity and quality of supply and for asset management purposes. Moreover, training is needed to understand consumer demand patterns, anticipate sudden shifts in demand pressures, to develop incentives that could promote conservation, monitoring water use at consumer end points, and appropriate pricing strategies that could encourage water use efficiency while staying true to principles of equity. These are not easy solutions and it is unlikely that one-off training programmes would be sufficient. But structured training on these concerns could be one step towards shifting water utility managers and officials away from a supply-side, engineering-focused approach.
- **Skills to deal with adverse situation:** During the summer months, due to less availability of water resources, there is usually water shortage at the consumer end. Likewise, during heavy floods, the threat of contamination of the water supply increases, raising concerns about water quality and adverse public health consequences. Such events occur regularly in India, which necessitates the development of alternative plans and skills to handle crisis situations.
- **Induction training:** New employees are often unaware about the organisations structure, precise functions of various officials, and the overall goals for the department. This undermines cohesion among team members

144 Himachal Pradesh Public works departments: Job profile, duties and responsibilities available at <http://hppwd.gov.in/Download/Job%20Profile%20pwd.pdf> accessed on 20 June 2013

145 Manual-II Work and duties of officials and employees of Mumbai Mahanagar palika, available at [http://www.mcgm.gov.in/irj/go/km/docs/documents/MCGM%20Department%20List/Wards/Assistant%20Commissioner%20\(P-North\)/RTI%20Manuals/PNorth\\_RTI\\_E03.pdf](http://www.mcgm.gov.in/irj/go/km/docs/documents/MCGM%20Department%20List/Wards/Assistant%20Commissioner%20(P-North)/RTI%20Manuals/PNorth_RTI_E03.pdf) accessed on 20 June 2013

146 Telephonic interviews with: Pimpri Chinchwad water utility official, Pimpri-Chinchwad, 11 June 2013; Krohne Marshall official, Pimpri Chinchwad, 12 June 2013; Professor at College of Engineering, Pune, 13 June 2013; urban expert at National Institute of Urban Affairs, New Delhi, 17 June 2013; senior researcher at Institute for Resource Analysis and Policy (IRAP), New Delhi, 17 June 2013; senior academic at School of Planning and Architecture, New Delhi, 18 June 2013.

and coordination across divisions in the organisation. Induction programmes are also necessary to increase confidence among employees that their needs and challenges are well understood.

- **Use of advanced instruments:** Some utilities have already chosen to upgrade their technologies, such as by installing SCADA systems, automated valves, leakage detectors etc. But it is equally important that employees receive training to handle the instruments and process the software. Such training also needs to be repeated on a regular basis to ensure that skills remain up-to-date and in line with technological improvements.
- **Knowledge of information technology enabled systems:** Basic knowledge of computers, GIS mapping data processing and other ITES is no longer an option but a necessity for water resources management. Yet, many utilities continue to suffer from a lack of adequately skilled staff for these basic functions.
- **Water quality testing trainings:** Drinking water quality is one of the most important characteristics to be tested on a regular basis. It is important to understand that simply adding chlorine to the drinking water supply system cannot remove all types of contaminating matter. As per the Bureau of Indian Standards (BIS) revised drinking water specification, drinking water should be tested for 43 physical and general parameters.<sup>147</sup> In addition, drinking water should also comply with bacteriological requirements, virological requirements and biological requirements.<sup>148</sup> Considering the vast testing requirements, in addition to setting up adequate number of water testing laboratories, the utility staff should be trained, to use instruments for measuring turbidity, pH, TDS, E.coli contamination etc. Also, advanced training such as use of digital water testing meters, which automatically detects and displays the value of water quality parameters linked with the SCADA system, should also be provided. However, the most important requirement is making officials realise the importance of water quality testing. Otherwise, even if the equipment were available, there is no guarantee of use either because utility officials are unskilled to use them or unaware of their importance.
- **Communication skills:** It is very important for any service provider to develop good communications with consumers. Due to lack of training and communication skill development programme, utility managers and

officials are unable to communicate policy changes or investment strategies to consumers, thereby failing to gain their trust and support for necessary reforms.

- **Training for field level officers:** It is very important to train field level officers, especially for essential functions such as data collection, operation and maintenance, public communication, reporting etc.. Without such training, the entire chain of command and information flow (from operators all the way up to the Superintending Engineer) is broken.
- **Inadequate skills to analyse market situations:** Water is a complex subject and merely measuring volumetric supply is no longer sufficient for water management. There is now the need to understand the economics of water services, including improved knowledge of the target market, demand patterns, supply disruptions and alternative sources, consumer behaviour, competitors and pricing etc.. Again, these skills have to be regularly imparted and upgraded within water utilities.

Although utilities are beginning to recognise these training and skill requirements, only a few have been progressive enough to establish training centres within their organisation. For example, the Gujarat Water Supply and Sewerage Board has a well-established training centre called the Gujarat Training Institute (GTI) with a well-defined training calendar (see **figure A10.5**). The courses are multidisciplinary in nature, including courses on communication, environmental impact etc., and even advanced courses such as GIS, remote sensing and hydraulic modelling etc. are included in the coursework. The utility employees and stakeholders are grouped as shown in **table A10.1** below:

**Table A10.1: Grouping of various employees in GWSSB and stakeholders for training**

Engineers:	1. Engineers: Civil, 2. Engineers: Mechanical/electrical
Class I & II Officers	3. Geologists, 4. Scientists and 5. District level officers and Municipal Officers
Administrative Staff:	6. All administrative staff of GWSSB, GWIL and WASMO
Technical Staff:	7. Work assistant/mistries, 8. Draftsmen 9. Faculties of technical institutes
Grass Root Workers:	10. Linemen 11. Pump operators 12. Fitters & operators 13. Wiremen and electricians 14. Drivers
PRI members & Stakeholders:	15. Members of PRI's 16. WWSB Members 17. NGOs 18. Health workers and 19. Nagarpalika WTP staff 20. Outsourcing Staff- laboratory 21. Rural Women 22. Students 23. E-tender Bidders of GWSSB

**Source:** Gujarat Water Supply and Sewerage Board Website available at <http://www.gwssb.org/ShowDocument.aspx?TrainingInstituted=29> accessed on 17 June 2013

<sup>147</sup> Colour, odour, pH, turbidity, taste, total dissolved solids, aluminium, ammonia, anionic detergents, barium, boron, calcium, chloramines, chloride, copper, fluoride, free residual chlorine, iron, magnesium, manganese, mineral oil, nitrate, phenolic compounds, selenium, silver, sulphate, sulphide, total alkalinity, total hardness, zinc, cadmium, cyanide, lead, mercury, molybdenum, nickel, pesticides, polychlorinated biphenyl, polynuclear aromatic hydrocarbons, total arsenic, total chromium, trihalomethanes & radioactive materials.

<sup>148</sup> BIS (2012): Indian Standard - Drinking water - specification (Second Revision), Bureau of Indian Standards, New Delhi

Figure A10.5: Annual Training Calendar (April 2013 – March 2014) of Gujarat Jalseva Training Institute (GTI)

Sr No	Course Title	Intake Capacity	Eligibility *	In-house or Field	April	May	Program dates for the Year:2013-14																
							Year:2013						Year:2014										
							June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March							
<b>KRC Training Sponsored by GOI</b>																							
1	Desalination	20	1,2,3,4														9-10						
2	Water Quality Management (Monitoring & Surveillance)	20	1,2																		25-26		
3	Sustainable Sources	30	1,2,3,4														27-29						
<b>CPHEEO (GOI) SUPPORTED IN-HOUSE TRAINING PROGRAMME</b>																							
4	Scientific Source Finding	25	1,2,3,4,5	In-house													17-21						
<b>NRDWP (GOI) SUPPORTED IN-HOUSE TRAINING PROGRAMMES FOR ENGINEERS</b>																							
5	AUTOCAD	20	1,2	In-house		28-1															27-31		
6	Automation & SCADA Orientation	25	1,2	In-house									10-11										
7	Benchmarking of Water Services	25	1,2	In-house																	20		
8	Data-base Management through MS Access	15	1,2	In-house																	11-12		
9	Electro-Mechanical Elements of Water Supply	30	1,2	In-house		10															10		
10	Energy Management through Re-engineering of Electro-Mechanical Components	20	1,2	In-house																	28-29		
11	Environmental Impact on Drinking Water	20	1,2	In-house																	26		
12	E-tendering Procedures, Documentation and Selection Process	20	1,2	In-house																	18		
13	Hydraulic Design of Water Mains	20	1,2	In-house		17-18															27-28		
14	Online IMIS	25	1,2	In-house																	7		
15	Selection of Electrical & Electronic Components of Pumping Systems	20	1,2	In-house																	7-8		
16	Selection of Pumping Machinery	20	1,2	In-house																	11-12		
17	Water Quality Management (Monitoring & Surveillance)	20	1,2	In-house																	17		
<b>NRDWP (GOI) SUPPORTED Compulsory Training for Class - I &amp; II Officers</b>																							
18	Innovations in Water Supply	25	1,2,3,4	In-house	16-18																13-15		
<b>NRDWP (GOI) SUPPORTED Training for Class - I &amp; II Officers</b>																							
19	Communication Skills & Personality Development	20	1,2,3,4	In-house																	19-20		
20	Disaster Management and Water	20	1,2,3,4	In-house																	22-23		
21	Environmental Impact on Drinking Water	25	1,2,3,4,5	In-house																	17		
22	Ethics & Professionalism	20	1,2,3,4	In-house																	19-20		
23	Fluoride Mitigation	50	1,2,3,4,5	In-house																	24		
24	Project Management through Software Tools	15	1,2,3,4	In-house																	16-17		
25	Stress Management	20	1,2,3,4	In-house		8-9															25-26		
<b>NRDWP (GOI) SUPPORTED TRAINING PROGRAMMES FOR TECHNICAL STAFF</b>																							
26	Geomorphologic Maps and their Utility in Water Sector	40	1,2,3,4	In-house																	29		
27	Geophysical Techniques for Mapping of Potential Sites	25	1,2,3,4	In-house																	8-9		
28	GIS/ GPS Development in Water Sector	25	1,2,3,4	In-house																	26-28		
29	Water Budgeting and Costing (in context of new water connection)	25	1,2,3,4	In-house																	12-14		
30	Maintenance Management of Pumping Systems	20	1,2,9,11	In-house																	12-13		
31	Orientation Training for Drivers	20	12,14	In-house																	20-21		
32	Planning and Designing of Recharge Structures	25	1,2,3,4	In-house																	4-5		
<b>NRDWP (GOI) SUPPORTED TRAINING PROGRAMMES FOR ADMINISTRATIVE STAFF</b>																							
33	Departmental Examination for Junior Clerk (PWD)	25	6	In-house																	15-19, 22-25		
34	Departmental Training (PWD)	25	6	In-house																	1-29		
35	Office Management & Administration	25	6	In-house																	8-10		
36	Office Management & Administration	25	6	Field	16-18	21-23															6-8		
<b>NRDWP (GOI) (GOG) SUPPORTED TRAINING PROGRAMMES FOR GRASSROOT WORKERS</b>																							
37	Advance Water Testing Techniques	25	4,7,15,17,18,19,20	In-house																	22		
38	Awareness Drive for Drinking Water	50	21	In-house																	12		
39	O&M Techniques at Field Level (Asper GTI Circular No. Jalseva/Field Training/222/2013/Dt:05/02/2013)	27	7,10,11,12,13,15,16,17,21	Field	15																13		
40	Water Supply Sources - Understanding Development Status & Protection	40	15,16,17,20,21,22	Field																	27		
41	O&M of Hand Pumps	30	15,16,17,21	Field																	30		
42	People's Participation in Hand Pump-based Water Management	35	15,16,17,21	Field	25	30															29-30		
43	Rooftop Rainwater Harvesting	40	15,16,17,20,21,22	Field																	6-7		
44	Sanitary Survey & Water Safety Plan	45	4,9,17,18,19,22	Field																	7		
45	Water Harvesting, Conservation and Recharge-Issues and Remedies	40	15,16,17,20,21,22	Field	30	28															9		
46	Water Quality Monitoring & Surveillance	45	4,9,17,18,19,22	Field																	16		
47	Water, Health & Hygiene	50	4,9,17,18,19,22	Field																	8		
<b>NRDWP (GOI) SUPPORTED IEC PROGRAMMES</b>																							
48	IEC Programmes for School Students	30	9,22	Field																	20		

Source: Gujarat Water Supply and Sewerage Board Website available at <http://www.gwssb.org/ShowDocument.aspx?TraningInstituted=29> accessed on 17 June 2013

### III. Who could be the potential partners to provide training and fill the knowledge gaps?

There are several organisations that are currently involved in providing training in the urban water sector in India.

**The Central Public Health and Environmental Engineering Organisation (CPHEEO):**<sup>149</sup> The CPHEEO is the Technical Wing of the Ministry of Urban Development, and deals with UWSS matters, including solid waste management. Public Health Engineering (PHE) training was launched in 1956

<sup>149</sup> Central Public Health and Environmental Engineering Organisation <http://cpheeo.nic.in/> accessed on 28 June 2013

as a Plan Programme to provide training to in-service Public Health Engineers. Currently, it sponsors post-graduate courses in Public Health Engineering and Environmental Engineering through 12 recognised academic institutions. These are the All India Institute of Hygiene and Public Health, Kolkata; Veermata Jeejabai Technological Institute Mumbai; Anna University, Chennai; Visvesvaraya National Institute of Technology, Nagpur; Motilal Nehru National Institute of Technology, Allahabad; Shri Jayachamarajendra College of Engineering, Mysore; G.S. Institute of Technology & Science, Indore; I.I.T., Mumbai; Malviya National Institute of Technology, Jaipur; I.I.T., Kharagpur, West Bengal; I.I.T., Delhi; Jawaharlal Nehru Technological University, Hyderabad.<sup>150</sup> More than 60 short term and refresher courses are also offered through 21 academic institutions and training institutes under field departments. In collaboration with the United Nations Development Programme, CPHEEO has published computer software for designing water supply distribution networks and sewerage networks. This software has been distributed to all the states and ULBs for extensive use. To its credit, it has also prepared and published the following Manuals, which are technical guide books for the help of field engineers:

- Manual on Water Supply & Treatment, Third Edition, Revised-updated, May 1999
- Manual on Sewerage & Sewage Treatment, Second Edition, 1993
- Manual on Municipal Solid Waste Management, 2000
- Manual on Operation and Maintenance of Water Supply systems, 2005

**National Water Academy (NWA), Pune:** The NWA is envisaged to function as a 'Centre of Excellence' in training water resources personnel. Its aim is to address the wider training needs of water resources engineers of states and central agencies in the fields of planning, design, evaluation, construction, operation and monitoring of water resources projects. In its national role, the NWA concentrates on conducting training courses for all water sector personnel, in the specialised and emerging areas, for which the existing state-affiliated or other institutes are not adequately equipped to meet the needs. Apart from this, in regard to the Central Water Commission, other offices of the Ministry of Water Resources, and for states not having adequate training facilities, NWA conducts induction and refresher courses in relevant areas of the water sector. NWA conducts training programmes that cover all aspects of water resources development and management at basin scale.<sup>151</sup> Although it does not offer any training specifically for urban water

utilities, it has several training programmes on GIS and remote sensing, which could be of relevance for managing urban water resources as well.

**National Institute of Hydrology, Roorkee:** This is the premier institute in the area of hydrology and water resources in India. Its main functions are to undertake, aid, promote and coordinate systematic and scientific work on all aspects of hydrology and to cooperate and collaborate with other national, foreign and international organisations in the field of hydrology. NIH organises several workshops, training and mass awareness programmes on very important issues like hydrological modelling, artificial groundwater recharge and aquifer management, rainfall runoff and river basin modelling, water quality, new water modelling software like SWEDES & HYMOS, coastal hydrology, flood management, climate change, water conservation etc.<sup>152</sup> Again there is no focussed training on urban water aspects but broadly several NIH training programmes would be salient for urban water management as well.

**Centre for Science and Environment (CSE), New Delhi:** The Ministry of Urban Development (MoUD) has designated CSE as a Centre of Excellence, whereby it undertakes capacity building programmes on rain water harvesting (RWH) and decentralised waste water treatment (DWWT). The training programmes are designed to cater to the requirements of various groups. Engineers, planners, architects and other municipal functionaries involved in water management form a key target group for training and capacity building. In addition to these specialised staff, separate trainings are also organised for general participants.<sup>153</sup>

**Administrative Staff College of India (ASCI), Hyderabad:** ASCI has also been designated as CoE for municipal service delivery, urban reforms and public private partnerships. ASCI provides training to policymakers, water utility managers, and other associated departments on the following topics: change management for achieving continuous water supply (24/7) for all in urban areas, urban poverty alleviation and social housing, integrated solid waste management, formulation of inclusive and participatory city development plans, capacity building for operationalising urban governance reforms, public private partnerships in urban infrastructure and service delivery, project preparation and management in urban infrastructure & service delivery, achieving universal sanitation in urban India, benchmarking urban services etc.<sup>154</sup>

**The Energy and Resources Institute (TERI), New Delhi:** TERI

150 MoUD, Revised Capacity Building Scheme for Urban Local Bodies, Ministry of Urban Development Government of India, Available at <http://urbanindia.nic.in/programme/lsg/CBULB.pdf> accessed on 01 July 2013

151 Home page of National Water Academy <http://nwa.mah.nic.in/> accessed on 28 June 2013

152 Available at [http://www.nih.ernet.in/Docs/NIH\\_Profile\\_English.pdf](http://www.nih.ernet.in/Docs/NIH_Profile_English.pdf) accessed on 28 June 2013

153 Available at <http://www.cseindia.org/node/2035> accessed on 28 June 2013

154 Available at <http://www.asci.org.in/Programmes2012E-Invite/index.html> accessed on 28 June 2013

has a MoUD CoE for Urban Development and Management. TERI has been organising training programmes supported by the Indian Technical and Economic Cooperation (ITEC) (part of the Ministry of External Affairs) since 2007 in several sectors including water governance, climate change impacts, sustainable urban planning, water use efficiency, integrated water resources management etc.<sup>155</sup>

**Indian Institute of Technology (IIT):** Various IITs are involved in the capacity development of engineers, technicians, utility managers, decision makers etc. IIT Madras has a CoE for decentralised waste water treatment and PPPs. Also, IITs are involved in developing new technologies in the UWSS sector, applying those technologies through pilot projects.

**National Institute of Urban Affairs (NIUA), New Delhi:** NIUA is a premier institute for research, training and information dissemination in urban development and management. It was established in 1976 as a registered society. The institute provides policy prescriptions, innovations for better local governance, information and training inputs to all those concerned with improving the living conditions and quality of life of urban residents. The important assignments taken up by NIUA during the last four years include monitoring the reform agenda under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the Financial Institutions Reform and Expansion project, National Strategy for the Urban Poor, and tracking State Finance Commission (SFC) and Central Finance Commission (CFC) grants in certain states.<sup>156</sup>

There are a few more institutes, which also provide training and skill development programmes for employees in the urban water sector. However, all the above mentioned institutions and other institutes are located only in major cities, which limit the extent of capacity development for utility managers in distant and smaller towns and cities.

The working group of Planning Commission on capacity building concluded that the on-going capacity building interventions have been wide ranging and comprehensive in terms of the components addressed and, to a large extent, have focused on technical assistance, training and knowledge support to support programme implementation. However, the absorptive capacity of ULBs remains limited and beset with inherent demand side constraints. This limitation underscores the inability of states and cities to implement capacity building programmes at a scale and pace that will make a significant difference to the way in which utilities are managed and services delivered.<sup>157</sup>

It is essential, therefore, for institutions like the CPHEEO at the central level and PHEDs, WRDs, utilities at the state and city levels to partner with local training partners to deepen the capacity building and training infrastructure in the country. Moreover, utilities could follow the lead of the GWSSB to establish in-house training centres for regular capacity development of staff.

Finally, district level training centres could be developed on the lines of the Krishi Vigyan Kendras (KVKs) or Farm Science Centres which have been established at district level for providing vocational trainings for farmers, farm women, school dropouts and extension functionaries of the line departments/voluntary organisations connected with departmental activities in agriculture and allied subjects. Similar institutions focusing on water management in urban and peri-urban areas could be designed.

#### IV. Is there a case for a PPP for skill development and training? How can skills development in the urban water sector be linked to on-going skilling initiatives in India?

##### Role of the private sector in capacity building in the water sector

The private sector is working in various countries for providing WSS services at small and large scales. The top 30 private companies providing WSS services, based on population served, are shown in **figure A10.6** below. Also, there are many informal vendors, which serve large sections of the population residing in slums.

Companies such as Veolia and Suez have been involved in WSS service provision for more than 100 years and have teams of experts across the globe. Veolia Water Solutions & Technologies specialises in the engineering, design and construction of turnkey plants and technological solutions for municipal and industrial clients. It has a portfolio of over 250 water-related technologies, 9,655 employees and a decentralised organisation of 130 operations worldwide.<sup>158</sup> The firm also focusses on capacity building of its employees and has established 20 campuses and training centres in 11 countries.<sup>159</sup>

155 Available at [http://www.teriin.org/index.php?option=com\\_events&task=level](http://www.teriin.org/index.php?option=com_events&task=level) accessed on 28 June 2013

156 Available at [http://www.niua.org/about\\_us.asp](http://www.niua.org/about_us.asp) accessed on 01 July 2013

157 Planning commission (2011) : *Urban Development Management for the formulation of the Twelfth Five Year Plan (2012 – 2017)*,

Report of the Working Group on Capacity Building, chairman Dr. M. Ramachandran, Ex - Secretary Ministry of Urban Development

158 Available at <http://www.veoliawater.com/about/history/> accessed on 01 July 2013

159 Available at <http://campus.veolia.com/en/training/> accessed on 01 July 2013

Figure A10.6: Leading 30 private WSS companies in 2010 (by population served)

Company	Latest water turnover (m)	No. of people served	% home	Y-0-Y change
Veolia Environnement <sup>[1] [7]</sup>	€12,556	124,480,000	20%	2,106,000
Suez Environnement <sup>[2] [4]</sup>	€6,985	117,409,000	10%	4,679,884
Agbar	€1,734	29,525,000	52%	-165,476
FCC <sup>[4]</sup>	€872	27,372,000	48%	28,000
Sabesp	BRL6,731	26,200,000	100%	0
RWE <sup>[7]</sup>	-	18,265,500	72%	0
American Water Works	US\$2,441	16,800,000	98%	-200,000
NWS Holdings <sup>[4]</sup>	-	16,120,000	100%	0
China Water Industry	HK\$211	15,610,000	100%	0
Sound Global <sup>[8]</sup>	RMB1,494	15,360,000	100%	New Entry
Chongqing Water Group	RMB2,714	15,000,000	100%	New Entry
Acea	-	14,945,000	65%	0
Saur	€1,200	14,579,000	38%	2,350,000
Shanghai Industrial Holdings	HK\$587	13,900,000	100%	0
Beijing Capital	RMB 1,236	13,250,000	100%	2,500,000
Thames Water <sup>[3]</sup>	£1,624	13,000,000	100%	-2,600,000
COPASA	BRL2,202	12,800,000	100%	600,000
Tianjin Capital Environmental	RMB1,160	12,350,000	100%	0
Beijing Enterprises Water	HK\$1,730	12,350,000	100%	3,300,000
Severn Trent	£1,385	11,680,000	71%	505,000
Bouygues	€280	9,800,000	0%	0
Andrade Gutierrez	BRL1,395	9,018,000	100%	882,000
Grupo ACS	-	8,700,000	76%	0
Manila Water	PHP9,533	8,700,000	69%	3,100,000
Gelsenwasser	€212	7,511,800	77%	0
United Utilities <sup>[3]</sup>	£1,549	7,250,000	100%	-16,783,000
Puncak Niaga	MYR 1,887	7,100,000	100%	0
Anglian Water	£1,100	7,042,000	82%	0
China Water Affairs	HK\$ 739	6,850,000	100%	0
Aguas Andinas <sup>[5]</sup>	CLP327,255	6,591,000	100%	0

Source: David Lloyd (2010): The new crowd at private water's top table, Vol 11, Issue 11 November 2010, Global water intelligence

Discussions with the training director at Veolia Water France revealed several insights, which could be relevant for utilities in India as well:

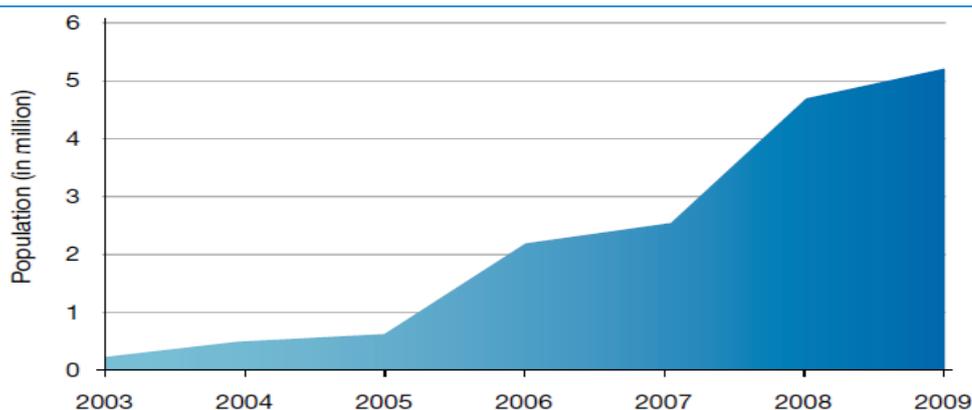
- Veolia does not have a defined training programme, which are instead designed on the basis of the existing local conditions;
- The skillset of existing human resources is analysed for understanding the level of training requirement;
- There is an orientation programme for engineers to make them understand the institution and new technologies;
- Each country centre has a team of experts who are involved in the capacity development of local employees; and
- The focus is more to understand the market and consumer behaviour and preferences; the instruments used in the utility are not very difficult to operate.

Similarly other global private operators are expected to bring in expertise to the water sector in areas where they get contracts to operate. India has witnessed the entry of private players in the urban water sector since the 1990s. Several projects have been attempted with varying roles and

extent of participation envisaged for the private sector with mixed outcomes. There is a growing trend of PPPs in the urban water sector, with similar expectations that additional expertise would improve the performance of the sector. By 2009, more than five million people were covered within the ambit of PPP contracts (Figure A10.7).

Although the private sector is not currently contracted for capacity building, some of the increase in skills and capacity is implicit in the process. Local employees develop technical expertise and are exposed to efficient work cultures and improved management practices.

Further, NGOs, private educational institutes, and independent training centres could also play an important role in skill development. Management skills are among the most desired skills in utility management and advanced courses in utility management, irrigation management, water resources management etc. are being offered at several universities.

**Figure A10.7: Increase in the population of cities with active water PPP contracts in India**

Source: WSP (2011): Trends in Private Sector Participation in the Indian Water Sector: A Critical Review: Water and Sanitation Program. Available at [http://urbanindia.nic.in/programme/uwss/PSP\\_IWS\\_Detailed.pdf](http://urbanindia.nic.in/programme/uwss/PSP_IWS_Detailed.pdf); accessed on 26 January 2013

### On-going skilling initiatives/capacity development programmes in urban water sector in India

**Jawaharlal Nehru National Urban Renewal Mission (JNNURM)<sup>160</sup>:** Under the JNNURM, a capacity building toolkit has been prepared by the MoUD for the development of ULBs. There is also a provision that a total of 5% of the total central grant for the project could be spent in capacity development, preparation of detailed project reports, city development plans etc. **Figure A10.8** shows the approach of the MoUD for capacity development of ULBs.

The objectives of the Comprehensive Capacity Building Programme (CCBP) are as follows:

- Develop institutional capacity for urban governance at state and ULB levels to promote urban planning and inclusive city development;
- Improve human resource capacity to enhance efficiency

in civic administration for planned and inclusive spatial and socio-economic development of cities;

- Create financially improved and self-sustaining Urban Local Bodies;
- Implement effectively projects and reforms under JNNURM;
- Facilitate institutional arrangements and networking of training and research institutions;
- Develop improved procedures and systems to enhance service delivery.

The capacity building module for municipal and para-statal functionaries includes:

- Governance, Development Planning and Urban Management
- Financial Management- Accounts, Finance (Costing and Pricing), Project Financial Analysis

**Figure A10.8. Approach for comprehensive capacity building framework**

Source: Jawaharlal Nehru National Urban Renewal Mission (2012), Comprehensive Capacity Building Toolkit, Ministry of Urban Development, Government of India available at <http://jnnurm.nic.in/wp-content/uploads/2012/03/CBToolKit.pdf> accessed on 28 June 2013

<sup>160</sup> Jawaharlal Nehru National Urban Renewal Mission (2012), Comprehensive Capacity Building Toolkit, Ministry of Urban Development, Government of India available at <http://jnnurm.nic.in/wp-content/uploads/2012/03/CBToolKit.pdf> accessed on 28 June 2013

- Infrastructure (Water, Sanitation, Waste Management and Transportation)
  - Project Development

- Project Management
  - Procurement procedures and standards
  - Public Private Partnership for infrastructure development
  - Utility Management
  - Asset management
  - Urban Transport Planning and Management
  - Public Health issues
  - Urban Planning: Preparation of City Development plans/Structure plans, Socio-economic and environmental planning
  - Preparation and implementation of ISIPs( Information System Improvement Plans)
  - Energy and water audit
- iv. Development of process manuals, procedures, advisories, tools, budget & financial rules
- v. Human Resources
- Development of comprehensive human resource development plan
  - Personality Development/Life Skills
  - Management and Leadership
- vi. Urban Governance Profile: mapping of roles and responsibilities
- vii. Identification and finalisation of service level bench marking
- viii. IT Applications on the job, E-governance and GIS and its use
- ix. Strengthening networks of associations
- x. Strengthen gender equality in service delivery system

As is evident, the capacity building agenda for municipal bodies is quite comprehensive under JNNURM. The question is whether the objectives will be met. It is, therefore, imperative to analyse the training programmes available at different institutions and the requirements of the JNNURM capacity building programme. Also, there is a need to create the adequate number of new institutions required at different levels and for urban local bodies of various sizes.

The CCBP not only targets municipal staff but also elected representatives/decision makers. It is unlikely that the public sector alone would be able to support the capacity building programmes for various actors and their varied skill requirements. The private sector would also have to step in with skill development programmes, modules and techniques. Towards this end, PPP arrangements are needed to support the CCBP.

## V. What kind of framework can be developed to enable successful technology transfer?

Technology is often associated with a tangible element such as a device or machine to carry out certain jobs. In essence, however, it implies knowledge that can be used to produce a good or a service.<sup>161</sup> 'An ingenuous way to understand technology is to consider it as a question of tools (equipment) and aptitudes and knowledge (programmes).'<sup>162, 163</sup>

Technology transfer has a component of capacity building for the host institution. It cannot be viewed merely as equipment transfer. Capacity building is essential *before* procuring costly equipment and investing in infrastructure. Technology could be transferred in three forms: knowledge, skills, and equipment. **Figure A10.9** below shows the mechanisms of technology transfer.

Knowledge is developed by working in the sector, studying, research, discussion, attending specialised training, etc. This is more of a conceptual learning rather than application. However, it is very important to be aware of global technological developments, in order to incorporate improved practices and save resources on obsolete techniques or in duplicating effort. Attending specialised courses helps one to easily grasp difficult phenomenon. Transfer of knowledge is possible by creating documents, conducting courses, organising research etc. Most of the general concepts of water have been documented in articles, research papers or books but specialised and localised knowledge and expertise gained through years of working experience in a field/department is often lost, due to lack of knowledge transfer mechanisms in existing institutions. For example officials who retire after working in the urban water sector for 25-30 years have in-depth knowledge of the sector but there is no institutionalised process to transfer of knowledge to new staff. For successful knowledge transfer, experienced employees, research institutions, training institutions, and research publication houses need to be involved.

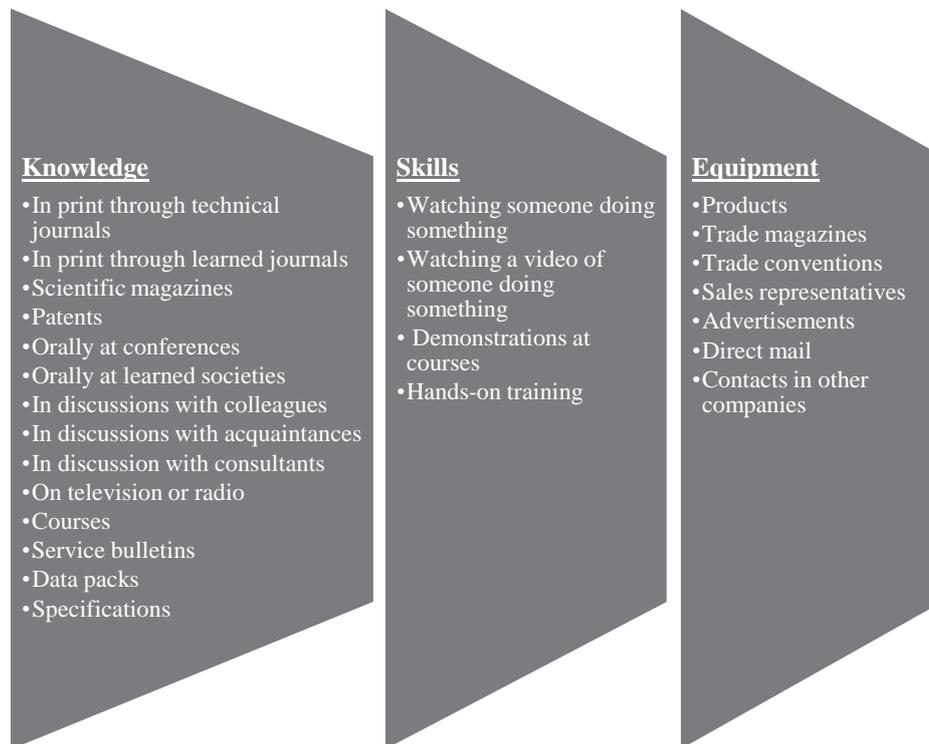
Skills have more to do with application. The UWSS sector needs skilled operators, technicians, managers, decision makers etc. For each of them a different skillset is required. For an operator skills are required to operate valves, pumps,

161 Chatterji, M. (1991): *Innovation, management and diffusion of technology: a survey of literature*. In : Chatterji, M. (ed.). Technology transfer in the developing countries, Macmillan publishers, London,

162 Galtung, J. (1978): *Towards a new international technological order*, In : *Alternatives: Global, Local, Political*, vol. 4 no. 3, pp. 277-300

163 Technology Transfer in the Water Supply and Sanitation Sector: A Learning Experience from Colombia / IRC. - The Hague, The Netherlands; IRC International Water and Sanitation Centre, 1997, 102 p. fig., tab. - (TP Series: no 32). - Includes references, ISBN 90-6687-026-5.

Figure A10.9: Technology transfer mechanisms



**Source:** L.I. le Grange and A.J. Buys (2002) : A Review of Technology Transfer Mechanisms Institute for Technological Innovation , Vol. 13, No. 1, University of Pretoria, Pretoria, South Africa

motors etc. A technician needs to know how to operate advanced software, machines, treatment plants etc. Managers should be able to handle adverse situations, procure and secure physical assets, and build appropriate teams with the available human resources. And decision-makers need skills to identify the right alternative and policies for developing the sector, improving service delivery and securing consumer satisfaction. Regular skill development programmes, management courses, on-field research are essential for continuous skill development.

Finally, advanced equipment is essential for efficient performance. Service providers are dependent on technology developers for finding technical solutions to specific problems. In addition to this ongoing interaction between the demands of service providers and technology developers, continuous research is also needed for developing advanced technologies. However, with the transfer of equipment, skills and knowledge to use them are an imperative.

# Annex 11: Building capacity in the urban water sector

## Proceedings of the fifth roundtable

Seminar Hall II, India International Centre (IIC) Main Building New Delhi, 5 July 2013

**Present (in alphabetical order):** Mr Nitin Bassi (IRAP), Mr Manu Bhatnagar (INTACH), Mr S Burman (IFC), Dr Nirmalya Choudhury (CEEW), Dr Arunabha Ghosh (CEEW), Ms Prachi Gupta (CEEW), Mr Ramani Iyer (Forbes Marshall), Mr A K Jain (Architect-town planner), Mr R Johri (TERI), Dr Renu Khosla (CURE India), Dr Suresh Kumar Rohilla (CSE), Mr Shriman Narayan (Veolia Water India), Dr Usha P Raghupathi (SPA), Mr Patrick Rousseau (Veolia Water India), Mr Rudresh Sugam (CEEW)

**Absent:** Dr Isher Judge Ahluwalia (ICRIER), Dr J K Bhasin (NEERI), Dr Dinesh Mehta (CEPT University), Dr Meera Mehta (CEPT University), Mr John Thomas (Ramky), Prof. Chetan Vaidya (SPA)



CEEW-Veolia Water India Fifth Roundtable

## Background

The fifth and last CEEW-Veolia Water India Roundtable on Urban Water Management was convened on 5 July 2013. The theme of the discussion was “Building Capacity in the Urban Water Sector”. CEEW prepared an issue brief highlighting the structure and composition of human resources of urban water utilities in India, with an emphasis on the existing gaps in capacity. The issue brief highlighted three levels in the urban water system at which capacity could be developed: individual, organisation, and system. The brief also suggested key roles that could be played by various research and training institutions as well as the private sector in developing capacity within the urban water system. The issue brief offered some options through which technology transfer could be facilitated as well. The roundtable discussion was framed along the following four questions:

- What is the human resource structure in urban water utilities in India? What are the key skills and training provided to them? Where do the knowledge gaps lie?
- Who could be the potential partners to provide training and fill the knowledge gaps?
- Is there a case for a PPP for skill development and training? How can skills development in the urban water sector be linked to on-going skilling initiatives in India?
- What kind of framework can be developed to enable successful technology transfer?

### I. Levels at which capacity building is required

Capacity building is essential at all the levels as a basic requirement for improving the performance of any system. However, it is essential to outline capacity requirements at different levels:

1. **Political community:** Although capacity gaps are experienced at all the levels, there is a particular challenge within the political community. This is because while political representatives have a strong role in the water sector, they could be uninformed or misinformed, which affects the policymaking and implementation processes. Tariffs, according to one participant, were ‘connected to the political bosses’.
2. **Top level (Governance):** While making decisions or allocating funds it is essential to know the imperatives for reforms. Simply dedicating 5% of funds for capacity building cannot automatically improve the situation. Senior policymakers need to have the capacity to set realistic and evidence-based targets, water tariffs, and determine subsidy levels to ensure efficient management of urban water system. This means they need to have sound knowledge of on-the-ground conditions. The capacity

of the utility, which has to undertake reform actions, is seldom analysed. Top level officials tend to evaluate the project structure but they do not consider the capacity of human resources needed to implement the project. Also, several important components such as inclusion of wastewater treatment, solid waste management, sanitation issues etc., are often missing or ignored when water sector reform programmes are designed. This makes the overall reform process ineffective from the inception.

3. **Middle and lower levels (Governance):** One of the most important shortcomings in many capacity building programmes is the top down approach. Participants felt that, during the process of designing water service reforms, there was little interaction between the top level staff and the executives and operators at the middle and lower levels in the utilities. Personnel at the lower levels are often technically sound but lack management skills. Also, due to lack of regular training programmes and access to advanced technologies, such as GIS, MIS, SCADA etc., they struggle to manage the growing complexity of challenges in the urban water system. But little feedback is sought from field staff before determining the kind of training they need.
4. **Consumer level:** Capacity development at the consumer level is also very important. Participants agreed that for customers, the issues that mattered were affordability, quality of service and the monitoring of the system as a whole. In turn, as water users, they are at the frontline of promoting efficient water use. No regulation or policy would be effective without involving the consumers. They should have an understanding of the water resources situation in their area, the cost incurred in the operation and management of the UWSS system and the benefits of efficient water use practices. Only then they would be able to understand the imperatives of applying or raising water tariffs or of the investments required (both hardware as well as the “softer” management skills and consumer awareness programmes) in order to conserve water resources and manage them better.

### II. What are the hurdles in the capacity development?

- **Inadequate importance:** Capacity building has not been given due importance, even under the JNNURM. This has resulted in programmes petering out over time or being eventually excluded from the annual budgeting exercises of water departments. Also, in general, there are no dedicated wings within departments for training staff.
- **Capacity building different from training:** Participants recognised that training and capacity building were not

the same thing. While the JNNURM insisted on short duration training programmes, it did not encourage or build the capacity to conceptualise, design and implement reforms.

- **Insufficient funding:** lack of adequate dedicated funds for capacity building is one of the main bottlenecks. Capacity is needed not only to upgrade skills (such as GIS), it is also needed for system design, policy formulation, water conservation, etc. These are broader than micro-managing specific parts of the UWSS and, therefore, require adequate financial resources.
- **Dependence on external experts:** Water departments often sub-contract tasks to external experts or consultants, which limits the internal capacity of the department's personnel.
- **Non-availability of trainers/training institutions:** There are only a few institutions providing training to ULBs and related departments and, among them, hardly any focus on urban water resources. As one participant bluntly asked, 'Is our capacity sufficient to build capacity?'
- **Centralised institutes:** The limited availability of institutions is a bigger challenge when these institutes are not distributed uniformly. Currently, most of the reputed institutions are located in major cities. This makes the capacity development of ULBs located in small towns and remote areas very difficult.

### III. Adopting a one-size-fits-all approach is unrealistic

Whether utility managers are concerned over drinking water requirement per capita per day or by the water required by livestock or in industrial use, it is very important to understand the local situation before planning projects. Two cities with different water availability, topography, land use & land cover, livestock composition etc., will have completely different water requirements and would require different technical interventions for maintaining or upgrading the infrastructure. However, the CPHEEO manual has oversimplified the situation by not including the dimension of local condition analysis, which has resulted in poor project planning.

Although central government support is needed, without better local knowledge it would be impractical to design and fund city infrastructure projects. For example, although Jaisalmer and Cheerapunji differ completely in annual rainfall, livestock population, topography, weather conditions etc., according to the CPHEEO manual both cities have to be designed to deliver 135 litres per person per day (lpcd). Such guidelines and manuals restrict the flexibility for utilities to choose infrastructure design and technical options suited to their conditions. The city level planning/operating

body should be involved in contributing evidence of local conditions before projects are planned.

### IV. Lack of consultation, negotiation and networking disconnects service providers from the consumers

Consumers are not merely water users but they are the actual water managers. It is very important to engage with consumers extensively before adopting any development plan. However, there is often a lack of consultations with the consumers in regard to any plan or project that a utility adopts. Consumers have little knowledge of why a certain plan is adopted or why another programme is suddenly halted. In turn, the service providers seldom negotiate with consumers on project development plans.

### V. 'Nudge, simplify and think'

Under the JNNURM, a toolkit has been prepared to help cities design their infrastructure needs and plans. However, participants felt that the toolkit was so complex that officials would need an additional guide to understand it. The National Institute of Urban Affairs is preparing one currently.

While it is important to develop formal mechanisms, which follow standard procedures, they need to remain simply and open to customisation. For example, the formal mechanism for addressing urban water challenges is not going to work in the informal sector, such as in slum areas. JNNURM guidelines did not distinguish between big and small cities and failed to recognise the needs of peri urban areas. It is important for research institutes, experts and consultants to suggest how the formal sector could adopt a more flexible approach. Institutions like the Centre for Science and Environment have developed their own curriculum for training. Participants emphasised that the content for any training programme has to be developed by the ULBs rather than imposed in a top down manner.

By corollary, the informal sector also needs special attention with simplified methodologies that would allow for the most appropriate technologies and service delivery designs to the selected. For instance, research suggests that *in situ* UWSS development could take place in 96% of the slum areas without changing the landscape and layout. Here, the purpose of capacity building should be to merely nudge communities towards better practices. Further, there is a need for simplified solutions. One participant felt that the converse was happening, i.e. the 'engineerisation of development' whereby engineering solutions were being imposed on communities with very different needs. For

a different approach, urban water managers would have to re-think what types of solutions would be appropriate for informal settlements and build capacity in that regard. Another participant concurred that there was the need to encourage the ‘developmentisation of engineers’.

## VI. Decentralisation offers a solution

Given the situation, putting extra pressure on already underperforming ULBs is unlikely to help in building capacity. The approach should be two-pronged, namely increasing the efficiency of existing ULBs *and* developing capacity at the local level. Decentralisation provides various incentives in the following ways:

- Reducing pressure on the central system;
- Use of local resources could make the system more efficient as it would reduce leakages, which occur in long distance supply;
- Reduce the cost of developing infrastructure for connecting to the mains;
- Even if the central system fails, decentralised units could support with backup supply;
- Recycle and reuse of water seems more feasible at a local level rather than developing two sets of pipelines across the city;
- It adds more accountability to the operator as the problems and their causes can be isolated within a smaller area of operation.

## VII. River basin management should be the ultimate aim

It is important to first measure and accordingly manage the system within the available resources. The National Water Policy calls for river basin management approaches. However, currently no river basin has a detailed water allocation plan. Several definitions such as livelihoods, environmental flows

etc., are not clear. Wetlands, which are very important to preserve the ecosystem, are never mentioned in any urban development plan.

## VIII. Ways ahead

- **Understand demand:** at centre, state, ULBs and consumers level, and including technology, design and also soft skills
- **Integrate:** water and sewerage systems, operations and maintenance, conservation measures, developing water efficient buildings etc.
- **Build capacity at all levels:** but senior officials have to be targeted first
- Provision of adequate **funding and mandating capacity building** programmes is necessary
- **Modify existing institutions and developing new ones:** to understand the complex challenges, modify the existing modules, analyse the local situation in detail and for building capacity among a new generation of water managers; engage city-based engineering associations but only in conjunction with communities
- **Include climate change:** essential for future development plans, as urban water managers are currently not factoring in the impacts on available water
- **Adopt river basin management approach:** it could start at a sub-basin level to demonstrate proof of concept
- **Decentralise:** systems should be designed to complement, not completely replace, the centralised systems.
- **Recognise** well performing utilities and cities and reward them
- Overall, **simplifying** complex methodologies, bringing in **local knowledge**, seeking **expertise** from various sector experts, acting according to the **local situation** and involving all the **stakeholders** should be the path to appropriate urban water management.

## Essay 9: Governance reforms for improving performance of urban water sector

*Ramani Iyer*



Ramani Iyer

### Definition of urban water

Today's public policy debate on urban water immediately conjures up a vision for safe, clean drinking water from a municipal source. Newspapers are full of public complaints about water supply vagaries. Citizens from fringe areas lament the fact that they get sporadic water supply through tankers, whilst their brethren in the city centre get 24X7 (hydraulic) water supplies! The urban middle class in today's vibrant democratic India with its access to the globalised world, is indeed critical of the deficiencies in state owned public utilities in the urban environment. They are impatient with lack of progress in the urban infrastructure. But there is lack of serious debate on the genesis of issues at large and contribution to solutions. Rarely the political and cultural implications are understood.

### Contemporary scenario and drivers of the urban water imbroglio

Today's water problems were not something that was thrust in our midst suddenly. That cities offer better livelihood opportunities and urbanisation is galloping all over India is a major driver for water demand along with other infrastructure issues like transportation, housing, roads, power etc. Migration from rural areas to mega-cities and Tier I & Tier II cities is phenomenal. Mega-cities with its educated urban middle class with affluent lifestyle and mobility has spawned city landscapes with multi-storied high amenity mini-townships but the water & waste water infrastructure in these cities is woefully inadequate. This urbanization explosion has pushed up the demand for better roads, transportation and power supply which have received priority over water and waste water needs. Except in pockets, augmentation of water resources or setting up a modern 24X7 water distribution system is missing. Urban water availability has not gone up but pressures from other stakeholders like

Industry and agriculture whose needs have also gone up has compounded the imbroglio. In short the demand for water has gone up but supply has remained same. Thus any talk of policy reforms in urban water sector actually begs the question.

### Institutions and institutional mechanisms for urban water

Under the circumstances, what are the institutional mechanisms and institutions to address urban water sector? At the central government level we have a path breaking JNNURM and UIGSST mechanism to support urban infrastructure programmes in roads, transportation and water/waste water sectors. At state levels there are PSUs like Tamilnadu Water Infrastructure Investment Corporation, Maharashtra Jeevan Pradhikaran, and Kerala State Water Authority etc. But most function as government departments and "in-a-silo" approach and are not in "mission mode". Recently following the example of policy making at central level there is awareness to think "holistically" for the entire water scenario. The Planning Commission has led this change process by revisiting the basic issues in water. Dr Mihir Shah's (Member, Planning Commission) paper 'Water: Towards a Paradigm Shift in the XII Plan' is an epochal document addressing water issues in India. The JnNRUM programmes are also undergoing policy shifts from a project evaluation and funding mode to capacity building and other enabling factors to build urban water infrastructure. Recent initiatives of the Water Resources Ministry are to build a more congenial centre/state water intercourse. This is a vital step in our federal governmental setup. The current JNNURM programmes are slated to end by 2014. The funding requirements for water sector will continue to burgeon as more and more ULBs embark on building their water distribution infrastructure.

There are some inevitable comparisons between the water

sector and power sector. But there is a clear recognition of the fact that water is a state subject. There are models of urban infrastructure governance like 'JUSCO' in Jamshedpur which covers not only water but also roads, street lighting and sewerage. There are also progressive city administrations like Surat, Navi Mumbai or Pimpri-Chinchwad who are citizen-centric. There is also this iconic 'Malkapur Municipal Council' (Satara, Maharashtra) with its 26000 households with 'safe, clean & 24x7 'water supply.

### Thrust for governance reforms and pressure points in the federal structure

In the hierarchical pyramid between the state and the citizen, the governmental entity closest to the citizen or consumer is the urban local body be it the Panchayat, the municipal council or the municipal corporation. The water infrastructure and delivery system must be structured and positioned in these bodies of administration. All governance reforms must begin in this constituency of urban local bodies. In this context it is important that we revisit the The Constitution (Seventy Fourth Amendment) Act, 1992.

The Act was specifically enacted since in many States local bodies have become weak because of inadequate devolution of power and functions. As a result, urban local bodies are unable to perform effectively as vibrant democratic units of self government. It enjoins devolution by the State legislature of powers and responsibilities upon the Municipalities with respect to preparation of plans for economic development and social justice, and for the implementation of development schemes as may be required to enable them to function as institutions of self-government. There shall be constituted in every State at the district level a District Planning Committee to consolidate the plans prepared by the *Panchayats* and the Municipalities in the district and to prepare a draft development plan for the district as a whole. And every District Planning Committee shall, in preparing the draft development plan, have regard to matters of common interest between the Panchayats and the Municipalities including spatial planning, *sharing of water and other physical and natural resources*, the integrated development of infrastructure and environmental conservation. And the Twelfth Schedule (Article 243W) specifically refers to *Water supply for domestic, industrial and commercial purposes*.

With a prescient forethought, the 74<sup>th</sup> Amendment significantly addresses the water issues in particular the relations between the State Government and the urban local Body. The District Level Planning Committee has the mandate for planning In the governance thrust for delivering 'safe, clean delivery of water for drinking and domestic needs' the accountability of the ULB cannot but be reiterated. Every ULB must fulfill its constitutional responsibility to the citizens and all other state/ private / public entities must enable and support this activity.

### Capacity building: sensitisation, training & development at two levels (state governments and ULBs)

As a natural corollary, there is need for close collaboration between the state governments, which have control over the water resources and other management/ financial resources and the ULBs, which have to build, maintain and administer the water supply. Although the 74<sup>th</sup> Amendment is specific for water, it is worthwhile to establish basic directive principles for ULBs to address this issue.

1. Estimate the current water consumption based on existing water availability (from sources –river, lake, ground water) Vis-a Vis per capita norms. Though the 'Millennium Development Goals' (2002) specified 225 lpcd realistic iterations have varied between 50 lpcd to 130 lpcd. Review existing infrastructure.
2. Estimate current sewage generation and sewerage infrastructure
3. Estimate projected needs in relation to the local geo-political/ socio-cultural / industrial environment for the next two decades.
4. Prepare Detailed Project Reports (DPRs) through qualified consultants. The Ministry of Urban Development has recently empanelled 56 agencies to prepare DPRs. Qualify and empanel contractors. Establish the modes of contracts BOT, BOOT, with or without AMCs. Define PPP norms and get all agencies to sign on their commitment to stick to the norms. Define performance guarantee norms for consistent long term quality parameters. Establish international / national quality parameters and appoint auditing firms to certify year on year performance. Do not get embroiled on public vs. private agency for contract work. Judge agencies on past records.
5. Build the latest and best technologies for all components of water supply/ sewerage systems for pumps, pipes, valves, storage tank construction, automation and IT tools like Bulk Flow Meters, on-line Water quality parameters for pH, Conductivity, Turbidity, TDS, Residual Chlorine ,remote monitoring and supervisory control and data acquisition ( SCADA) systems. Build software tools for on line 'Non-revenue water' (NRW) calculations.
6. Equip consumer level domestic water metering system with remote monitoring and on –line billing system. Use IT tools for all consumer related billing/ payment administration. Establish 'Consumer grievance redressal systems' and auditing of such systems to establish quality performance.
7. Establish full-fledged consumer service administration with latest call centre facilities with supervisory control management
8. At the state level establishment of a water/ city infrastructure cadre would be a useful

9. Each state must drive the holistic water issue on a 'Water Mission' mode headed by a State level Water Commissioner and work closely with an independent Water Resources Regulatory Authority.

In the final saying until we create confidence for any urban dweller

in India, that he can safely drink water from his domestic tap, 24X7, we should consider our democracy to be incomplete. Similarly we must aim to eliminate the scourge of women walking for water in any part of India. Till that is achieved any talk of social equity should be considered empty rhetoric.

# CEEW Publications

## Books/Reports

- Arunabha Ghosh et al. (2012) *Concentrated Solar Power: Heating Up India's Solar Thermal Market under the National Solar Mission*, Report (Addendum to Laying the Foundation for a Bright Future: Assessing Progress under Phase I of India's National Solar Mission), September, New Delhi, Council on Energy, Environment and Water; and Natural Resources Defense Council 
- Arunabha Ghosh, with Himani Gangania (2012) *Governing Clean Energy Subsidies: What, Why and How Legal?*, August, Geneva: International Centre for Trade and Sustainable Development 
- Rudresh K. Sugam, and Arunabha Ghosh (2012) *Institutional Reform for Improved Service Delivery in Bihar: Economic Growth, Agricultural Productivity, and a Plan for Reorganising the Minor Water Resources Department*, Research Report submitted to the Government of Bihar, July, New Delhi: Council on Energy, Environment and Water, and International Growth Centre, Patna  
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