

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 Group on Water Sector, Planning Commission

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The Working Group on Urban and Industrial Water Supply and Sanitation has met to deliberate on the critical challenges of this sector and in particular it has explored best practices to suggest the way ahead. This report focuses on one aspect of its task – urban water and sanitation.

A. The conclusions of the Working Group are as follows:

1. The public health implications of unclean water are enormous and unacceptable. The country is on a deadly spiral -- on the one hand, water scarcity is growing and on the other, water is getting increasingly polluted, which is further increasing the cost of treatment or leading to increasing deaths and illnesses. It is shocking to note that diarrhoea and other water borne diseases are one of the most common causes of death among children under age five.

2. Urban and industrial India will have huge implications on the use of water and discharge of waste. While it is well understood that the growth of cities and industries is inevitable, what is not understood is that this growth will have massive implications on the use of water and discharge of waste. In most parts of the industrialized world, water use is primarily in the industrial and urban sectors and in India this is also bound to grow.

3. The issue of allocation of water resources between rural and urban India needs to be addressed in ways that reduce intra-national tension. The growth of urban-industrial sectors will demand water. This 're-allocation' of water between areas becoming urban and those remaining rural may lead to conflict. We are already beginning to see tensions – indeed tragic deaths because of violence – against this re-allocation and appropriation of water. It is our understanding that water, as much as land, will be the biggest impediment for urban growth and this demands careful consideration of new-age policies in these sectors. In the case of water, it is clear that Indian cities and industries will have to reinvent their water trajectory. Indian cities and industries have no option but to grow with minimal water and minimal waste. This can only be done if policies drive these sectors to becoming water efficient before becoming water wasteful. This is the challenge.

4. Policy planning is happening today without any real numbers of the use of water in different economic sectors. The last estimation of water use was done in 1999, which had predicted that cities and industries would use some 15 per cent of the total water use by 2025. There is a need for re-assessment of water needs of different economic sectors.

5. The system of estimating demand and supply of water in cities is rudimentary and leads to poor accounting and poorer planning. Indian cities compute demand by simply multiplying the population (as known) by an estimate of water demand per capita (as understood). This leads to huge variations between cities in terms of how much water needs to be supplied. The guidelines provided by the Central Public Health and Environmental Engineering Organisation (CPHEEO) are used at times by city planners, but these often fail to provide clarity about how much water is needed. For instance, the guidelines differentiate between cities with and without sewerage (70 lpcd to without and 135 lpcd to cities with sewerage system). But these do not indicate how much area must be under a sewerage system before a city qualifies for higher water norms. Then the guidelines provide that cities could provide additional water if hospitals, schools, airports and institutions require 'considerable quantities'. In reality therefore, cities have poor accounts of their water need assessments. In reality therefore, they are planning for water

augmentation – which is then funded through expensive schemes – without this critical information.

Table: Norms fixed by the CPHEEO Manual

Sno	Classification of towns/cities	Recommended maximum water supply levels (lpcd)
1	Towns provided with piped water supply but without sewerage system existing/planned	70+ 15% for leakage
2	Cities provided with piped water supply where sewerage system exists/planned	135+ 15% for leakage
3	Metropolitan and Mega cities provided with piped water supply where sewerage systems existing	150+ 15% for leakage

Source: Ministry of Urban Development, Central Public Health and Environmental Engineering Organisation Manual on Water Supply and Treatment, Third Edition -Revised and Updated (May 1999), New Delhi.

6. The quantum of water that is supplied is not the problem; the problem is its management and equal supply to all. In most cities, water supply is sourced from long distances. In this system of bringing water from far and in distributing it within the city, the length of the pipeline increases, as does the cost of infrastructure and its maintenance.

In the current water supply system, there are enormous inefficiencies—losses in the distribution system because of leakages and bad management. But equally, there are huge challenges, for water is divided between poor and rich India. Even today, in all the cities there is a huge gap, not just in the demand and supply in the water. There is a huge gap in the supply within the city, which some parts getting all, others getting none. Water is needed in the city, but it must also reach everybody in the city and not just a few.

Access to drinking water: according to Planning Commission

City/town population	Average access to drinking water (%)
Class I (100,000 and above)	73
Class II (50,000-99,999)	63
Class III (20,000-49,999)	61
Other cities (<20,000)	58

Source: GOI 2007, Eleventh Five-Year Plan, Planning Commission, New Delhi

Urban water sources: NSS

Major source of drinking water	49 th round: 1993 (%)	58 th round: 1998 (%)	65 th round: 2009 (%)
Bottled water			2.7
Tap	70.4	73.6	74.3
Tubewell/handpump	18.5	19.6	17.5
All well	8.6	5.1	3.3

Source: NSS 2010, Housing Condition and Amenities in India, 2008-2009, NSS 65th Round, July 2008-June 2009, National Sample Survey office, GOI, November

7. The quantum of water that is lost in distribution is a serious problem; This must be the focus of future policy and plans in cities. Currently, cities estimate that as much as 40-50 per cent of the water is 'lost' in the distribution system. Even this is a guesstimate, as most cities do not have real accounts for the water that is actually supplied to consumers. Nagpur has prepared a water-loss balance sheet. According

to this calculation, of the 765 mld the city sources from the Pench forest and tiger reserve – some 40 kms away – it finally collects money for a mere 200 mld – or 32 per cent of what is sourced. The city loses as much as 140 mld, a quarter, in bringing water from the reserve. The revenue loss because of this leakage wipes out its entire budget. This is the scenario in all cities of the country. (SEE TABLE)

Nagpur's water highway: losing as it travels

Nagpur	Losses	Balance
Journey begins: water is sourced		765 mld
Losses in canal	140 mld	625 mld
Measurement losses in raw water purchase	125 mld	500 mld
Treatment	20 mld	480 mld
Distribution/commercial losses in theft/meter error	235 mld	245 mld
Collection losses	45 mld	200 mld

Source: S S Hastak, 24x7 Water supply project of Nagpur, NESL, presentation made to Ministry of Urban Development, New Delhi, April, mimeo

8. The length of the pipeline adds to distribution losses and financial costs.

This cost is not computed or understood when cities map out the current and future water scenario. In most cases (as evident from the city development plans submitted to JNNURM for funding), cities emphasize the need to augment supply, without estimating what it will cost, in physical and financial terms. Data suggests that most cities spend anywhere between 30-50 per cent of their water supply accounts for electricity to pump water. As the distance increases, the cost of building and then maintaining the water pipeline and its distribution network as increases.

Worse, if the network is not maintained then water losses also increase. All this means that there is less to supply and more to pay. The end result is that the cost of water increases and the state is not able to subsidize the supply of water to all. The situation is worse in the case of the poor who often have to spend a great deal of time money to obtain water since they do not have house connections. Worse, as the city municipal water system collapses under the weight of under-recoveries, the rich move to private water sources like bottled water. The poor suffer the cost of poor health.

9. The challenge is to supply water to all – the inequity in water supply within a city must be understood and removed. In all the presentations made to the Working Group, it was evident that cities do not keep a record of the distribution of water within the city. As per the NSS 65th round, only 47 per cent urban households have individual water connections. The rest have shared or common water supply. In the next five years, this must be the focus of policy and practice.

10. Groundwater remains the missing link in city water accounts. City water agencies only provide estimates of the groundwater that they 'officially' source and 'officially' supply. They have no records of the amount of groundwater, which is privately extracted in the city, through private wells or supplied through tankers. The Central Groundwater Board's network of observation wells is marginal in cities. The state groundwater board's monitoring data, if available, is not factored into the city water agencies own assessment of water supply and usage in the city. The Working

Group in its many meetings struggled to make an assessment of this source, but found that data was weak and inadequate.

This missing link leads to critical flaws in policy. Firstly, it covers over the inequity in official water supply. It is clear that parts of the city that remain un-served by official water supply will depend increasingly on groundwater. This issue has already reached crisis levels in many parts of Delhi, where the pipeline does not reach and there is no alternative but to dig for water, at whatever depth it is found. In this case, the water inequity of a city can be understood through the data on the decline in groundwater levels. (SEE MAP)

Secondly without this assessment of groundwater usage, any policy of increased tariff, will lead to even greater dependence on this source and its over-exploitation. It is therefore clear that when cities increase tariffs of water, they should plan simultaneously for strategies that work to recharge aquifers.

Thirdly, without an assessment of groundwater usage, a city cannot estimate its wastewater discharge accurately. This then leads to flawed planning in terms of sewage and results in pollution.

11. The lack of recognition of the existing role of groundwater in city water supply leads cities to discount the need to provide for recharge. Today no city values its local water bodies as the function of its water supply – instead, these water bodies are seen as lucrative options for land – the hole in the ground is first filled with garbage and then taken over as real estate for housing and other developments. The catchment is encroached – by the poor, who are thrown out of the city and then by the rich who need it for everything from housing to airports. The essential role of water bodies as sources of local water supply and even potential spaces for sewage water treatment is never considered. This is an important area of intervention.

12. Cities worry about water but not the waste this water will generate. Sewage, once generated has to go somewhere and it invariably does go -- into streams, ponds, lakes and rivers of the town, polluting the waterworks so that health is compromised. Alternatively, it goes into ground, contaminating the same water, which will be used by people for drinking. It is no surprise then that surveys of groundwater are finding higher and higher levels of microbiological contamination – a sign of sewage contamination. This compounds the deadly and costly spiral. As surface water or groundwater gets contaminated, the city has no option but to hunt for newer sources of its supply. Its search becomes more extensive and as the distance increases, the cost of pumping and supply increases.

13. We have no national accounts for the excreta we generate or the excreta we treat or do not treat. The fact is that we have no way of really estimating the load of sewage in our cities, because of the different ways in which people source water and the different ways in which people dispose sewage. Currently, we measure sewage in the most rudimentary of ways: we assume that 80 per cent of the water officially supplied by municipalities is returned as sewage.

14. The imperative is to provide sanitation to all, but equally to ensure that this facility is hygienic and that it does not add to pollution. Currently all cities are on a sanitation trajectory – at the lowest are those with no access to sanitation facilities and at the top are those connected to a flush toilet, which in turn is connected to the official underground sewage network. It is important to note that currently data on the availability of sanitation facilities and their disposal system is lacking. The 2001 Census found 74 per cent of urban India had access to sanitation; 46 per cent urban

Indians had water closets. But it did not specify whether these flush toilets were connected to septic tanks or underground networks or open drains. The 2011 Census should correct this anomaly as its data sheet differentiates between toilets and disposal systems. The only available data is from the National Family Health Survey (NFHS-3), 2005-06, which puts the toilets connected to piped sewer systems as 18.8 per cent (SEE TABLE).

But providing hygienic, safe and convenient sanitation to all in urban India is the primary goal. According to NSS 65th round, 11 per cent of urban households have no option by open defecation – this adds up to 41 million people every day. This is clearly unacceptable.

Census 2001 and Census 2011: Categories for latrine

Census 2001	Census 2011	National Family Health Survey (NFHS-3): 2005-06 (urban %)*
No latrine	Flush/pour toilet latrine connected to	52.8
Service latrine	a. Piped sewer system	18.8
Pit latrine	b. Septic system	27.6
Water closet	c. Other system	4.7
	Pit latrine	
	With slab/ventilated improved pit	1.4
	Without slab/open pit	0.7
	Night soil disposed into open drain	
	Service latrine	
	Night soil removed by human	
	Night soil serviced by animals	
	No latrine within premises	
	Public latrine	24.2
	Open	16.8

Source: Census of India 2011, Provisional Population Totals, India Series 1, Office of the Registrar General and Census Commissioner, India

Source: Ministry of Health and Family Welfare 2007, National Family Health Survey (NFHS-3) 2005-06, Volume 1, International Institute of Population Sciences, Deonar, Mumbai 400 088, September

Counting toilets in urban houses (NSS 54th Round, NSS 64th Round) and why comparison is difficult over the years

	No toilet	Service latrine ^a	Septic tank ^b	Pour flush ^c	Sewage system ^d	Others
54 th Round (1998)	25.5	5.9	35.2	8.4	22.5	2.5
58 th Round (2002)	17.9	4.1	70 ^e	6.3 ^f	--	
65 th Round (2008-09)	11.3	1.6	77.3	8	--	1

^a Non-sanitary latrine where excreta is accumulated at the excretion spot and physically removed.

^b Connected to underground septic chamber

^c Flush toilet and soak pit where liquid is leached out from the pit to be dispersed in the soil system.

^d Off-site sanitation system and connected to underground pipelines

^e By this survey definition changed, toilets connected to septic tanks/flush are combined and pit latrines introduced

^f All other systems combined, including shared latrines

15. The challenge of sewage collection and treatment has not received adequate attention. It is assumed that cities will eventually have sewage systems, which will connect all toilets – by then converted to the flush variety. It is also assumed that this system will connect the waste to the treatment plant, which will then treat it and dispose it in the river or the neighbouring water body. As yet investment in creating these facilities has been ad hoc and piece-meal.

16. No Indian city is in a position to boast of a complete sewerage system, which can keep up with the sanitation and pollution challenge. In fact, most Indian cities have a massive backlog of incomplete sewage systems or systems in serious need for refurbishment and repair. Even Bengaluru, has a problem. The city has 3610 km of sewage lines, 14 sewage treatment plants – all variations of treatment technologies have been installed in this high-tech city. The rough estimation is that the city generates some 800-1000 mld of sewage, the installed capacity to treat is roughly equivalent – some 721 mld. In other words, on paper, it would be an ideal city. It has high tariff; 100 per cent metered supply, high recovery of its dues; 100 per cent water supply and substantial investment in sewage infrastructure. However, there is significant underutilization of treatment capacity. But there is a missing link – a fatal link. As per the data provided to the Committee by city engineers, Bengaluru's sewage treatment plants only receive some 300 mld of sewage. In other words, less than half the sewage is trapped and half is treated. The city now estimates that it will have to double its current network – build over 4000 km of underground sewage to complete the missing links. This is when the city is also expanding – growing at its seams where more investment is needed to supply water and to take back sewage. It is no wonder then that its waterways – rivers and lakes remain polluted. Worse, nitrate levels in groundwater are increasing, which is dangerous for health.

Many cities do not even have the beginnings of a sewage network, let alone systems of taking back the waste. In this situation, it is critical, we invest in sewage systems, but it is equally and even more critical that we invest in building affordable and scalable sewage networks and fast. This will require relooking at the current technology for sewage and its treatment.

17. The capital intensity of the current waste system results in the fact that cities can only provide for a few and not for all. It is also a fact that smaller cities cannot afford a sewage drainage system, let alone a sewage treatment system. The waste system needs capital investment in infrastructure, but more importantly it needs funds for operation, particularly energy costs for pumping and treatment. The costs of capital investment or the costs of operation and maintenance are not paid for by even the richer users, who use water and thus generate waste. Large parts of the modern cities remain unconnected to the sewage system as they live in unauthorised or illegal areas or slums, where the state services do not reach.

18. If sewage systems are not comprehensive – spread across the city to collect, convey and intercept waste of all – then pollution will not be under control. Currently, according to estimates of the Central Pollution Control Board, the country has installed capacity to treat roughly 30 per cent of the excreta it generates. But it is well accepted that some of these plants do not function because of high recurring costs – electricity and chemicals or some that do function cannot because they do not have the sewage to treat. This is because, like water pipelines, sewage

pipelines will have to built and then maintained. The fact is that most of our cities, old and new, do not have underground sewerage systems. If all this is put together, then officially the country actually treats 30 per cent of the human excreta it generates.

The bulk of sewage treatment capacity exists in the metropolitan cities—with 40 per cent of wastewater generation, these cities have some 70 per cent of the installed capacity. More importantly, just two cities—Delhi and Mumbai—have some 40 per cent of the country’s installed capacity. In other words, although these cities generate some 17 per cent of all the sewage in the country, they hog the bulk of the country’s sewage treatment infrastructure. (SEE TABLES)

The final blow comes when the partial sewage cleaned through expensive treatment gets mixed with the untreated sewage of the majority of the people. In most cities some, not all, waste is collected and conveyed for treatment. This is because most cities work on the assumption that unless they first build the underground sewerage and unless they can convey it in these official drains, the waste in open drains cannot be treated before disposal. Sewage is divided between ‘official’ and ‘unofficial’ matter, depending on the nature of the drain it is being transported in.

In most cities, then, only a proportion (and nobody can hazard a guess on the exact amount) is transported for treatment. The tragedy of pollution is that if the treated sewage – transported in official drains – is allowed to be mixed with the untreated sewage – transported in unofficial and open drains – then the net result is pollution.

The added problem is that the location of the hardware – the sewage treatment plant – is not designed to dispose off the treated effluent so that it actually cleans the water body. To understand pollution in cities, it is important to understand where the sewage goes, where is it disposed off. Most cities don’t seem to think of this factor when they build their infrastructure for sewage. They build a sewage treatment plant where there is land. The treated sewage is then disposed off, as conveniently as possible. If the plant is near a river, then the treated effluent is disposed off in the river; if it is far from a river or lake then it is disposed off in the nearby drain.

CPCB 2009 estimate

sno		Class 1 (0.1-1 million)	Class II city	Total
4.	Wastewater generated (mld)	35,558	2,697	38,255
5.	Waste treatment capacity (mld)	11,554	234	11,788
6.	Missing capacity (mld)	24,004	2,463	26,467
7.	Untreated (%)	68%	92 %	70%

Source: CPCB 2009, *Status of Water Supply, Wastewater Generation and Treatment in Class-1 cities and Class-II towns of India*, Central Pollution Control Board, Delhi

Table: 2 metros: disproportionate treatment

	38,255 mld	Delhi	Mumbai
Total wastewater			
Wastewater in Metro cities	15,644 mld	3800 mld	2671 mld
% in metro cities as total wastewater generated in	41 %		

country			
Total treatment capacity in country	11,788 mld		
Treatment capacity in metro cities	8,040 mld	2330 mld	2130 mld
% in metro cities of country's treatment capacity	68%	20%	18%

Source: CPCB 2009, *Status of Water Supply, Wastewater Generation and Treatment in Class-1 cities and Class-II towns of India*, Central Pollution Control Board, Delhi

19. Climate change will demand that cities get serious about water. Already every rainfall becomes an urban nightmare as roads flood and dirty water enters homes and adds to filth and disease. Scientists predict that climate change threats will manifest in more extreme and variable rainfall – it will rain but in shorter number of rainy days. Cities, which cry today because of shortages of water, will weep tomorrow because of the growing intensity of rainfall. Clearly, the way to cope with this new threat is to do better on the waterways of the past, which created water storage as locally as possible.

The Working Group has the following recommendations for the implementation in the 12th Five Year Plan.

B. Recommendations

1. The scale of investment needed in this sector is substantial. We require careful assessment of the total costs of water and sewage sector so that the effort is to ensure that the projects are planned for affordability and sustainability.

It is clear that Urban India will require huge investment in building and keeping pace with the water and sewage infrastructure needs of all. In the past five years JNNURM has been an important game-changer in this sector, providing much needed public funding to build and refurbish assets. Under JNNURM the bulk of the projects are for water and sewerage – some 70 per cent of the sanctioned cost of Rs 60,000 crore (see table).

Table: Sectorwise allocation of JNNURM funds(as on 21.9.2011) 100th CSMC

Sector	Rs/crore	% of total cost allocated
Water supply projects	19233	32.09
Sewerage projects	14,624	24.40
Drainage	8208	13.69
Preservation of water bodies	116	0.19
Total water sector	42,181	70.39
Other urban sectors	17,748	29.61
Total sanctioned	59,929	

Source: JNNURM 2011, Sectorwise release of funds under sub-mission for urban infrastructure and government, Ministry of Urban Development, 2011

Between 2005 and 2011, roughly Rs 43,000 crore worth of water, drainage and sewage projects were sanctioned under these schemes. This needs to be compared to the Rs 3,700 sanctioned for the same purpose in the 25 years before and the Rs 5,000 crore sanctioned under the river conservation programmes (see table).

Table: Money on water and sewage over the decades

		Rs/crore
1980-2005	Central assistance for water and sewage	3700
1995-2010	Central assistance for river conservation	5000
2005-2011	Central assistance (JNNURM)	43,000

The investment incurred in this sector is small as compared to the scale of the transition that is needed. The Working Group has tried to assess the financial implications of the urban water and sewage sector.

The High Powered Expert Committee Report on Indian Urban Infrastructure and Services pegs the per capita investment needed for capital infrastructure in the water, sewerage and storm-water sector at Rs 14,000 and another Rs 840 annually for operation and maintenance. The total capital investment needed according to this estimation is Rs 7,54,627 crore in the next 20 years. However, this may be an underestimation, given that the costs of water treatment and sewage drainage and treatment, are increasing.

The average cost of a comprehensive water supply scheme under JNNURM is roughly Rs 3 crore per mld. The average cost of a sewage project is Rs 3.33 crore per mld. However, the cost of building sewage treatment systems and networks under the Union government's revamped Ganga programme averages over 5 crore per mld – with small cities like Munger in Bihar getting as much as Rs 7 crore per mld (see table).

Table: Cost of water and sewage infrastructure

		Rs/crore/MLD	Rs/crore/km	Rs/per connection	Per capita (Rs) ^{***}
1	Average cost of comprehensive water supply schemes (based on 36 schemes funded by JNNURM)	3.00			4500
2	Augmentation of water supply schemes	2.00			3000
3	Rehabilitation of water supply distribution scheme (laying pipelines)*		0.74-1.00	20,000-30,000	
4	Water treatment plants (cost depends on technology and quality of intake water)	0.22-1.00**			330
5	Average cost of comprehensive sewage project, including collection network and treatment	3.33-5****			4000

	plant)				
6	Building underground sewage systems		0.74-1.00		
7	Sewage treatment plant	0.30-1.00			360-800
8	Sewage network –pumping stations and mains		0.80		

*Depends on location and size of mains: smaller diameter lines cost Rs 0.50 crore/km. Most DPRs estimate costs at 0.74 crore/km.

** Agra will spend this amount as the intake water is very polluted

***Water supply estimated at 150/lpcd and sewage generation at 120/lpcd

Source: MoUD 2011, Compiled analysis from projects sanctioned under JNNURM, Ministry of Urban Development, New Delhi

****Ganga Action Programme 2011

Costs of water treatment

The cost of water treatment depends on the quality of the water to be cleaned. Conventional water treatment technologies, in use in most cities, require relatively clean and living water, water that conforms to most parameters of surface water quality. The capital cost of such technology would be Rs 20-22 lakh/mld currently; operation costs would be minimal – Rs 0.01-0.10/kl. But as water quality deteriorates, the cost of treatment is going up. Most cities are installing plants with modern technologies, using flocculation or membranes. The most expensive plant in the country is clearly in Agra, where polluted water in the Yamuna has made the city's task impossible. The city will end up paying a phenomenal Rs 1 crore/mld and as much as Rs 4-5/kl to clean its water for supply. (SEE TABLE)

Table: Cost of water treatment: modern plants in India

	Technology	Capa city (mld)	Capital cost (Rs/crore)	Capital cost (Crore/mld)	O&M costs (Rs/kl)	Power costs (Rs/kl)	Total O&M costs (Rs/kl)
Sonia Vihar, Delhi*	Presettler-Pulsator+ Aquazur (Degremont)	635	189	0.30	0.38	1.04	1.43
Chembara mbakkam*	Pulsator+ Aquazur (Degremont)	530	135	0.25	0.39	0.82	1.21
TK Halli-1*	Pulsator+ Aquazur (Degremont)	300	45	0.15	0.22	0.10	0.32
Nagpur*	Pulsator+ Aquazur (Degremont)	120	15	0.13	0.39	1.04	1.43
TK Halli-II*	Aquadaf+ Aquazur (Degremont)	550	190	0.34	0.32	0.10	0.42
Agra**		144	156	1.08	3-4	+	4-5
Minjur, Chennai	Desalination plant	100	473	4.73	48.66***	10-12	59-61
Nemmeli	Desalination plant	100	1034	10****	--	--	21

Source: * Mukesh Grover 2011, Degremont; water treatment technologies and a case study of 635 MLD water treatment plant at Sonia Vihar, Delhi, presentation at Ministry of Urban Development, New Delhi, mimeo

** Uday Kelkar and Ghulam Mustafa 2011, Agra Water Supply Project, presentation made to Ministry of Urban Development, March, New Delhi, mimeo

*** MetroWater 2010, Annual Report 2009-2010, Chennai Metro Water, Chennai; difference in cost because of contract – Minjur is BOT, while in Nemmeli, cost of capital being paid by government

Costs of sewage treatment

The cost of a treatment plant for waste depends on two key factors – the quality of raw influent and the quality of the receiving medium. Currently, most cities do not have treatment plants, installed or running to treat human excreta or chemical industrial waste. Furthermore, most sewage treatment plants use basic technologies for cleaning waste. These were built at times when the characteristic of waste was basic – biological and not chemical – and more importantly, the receiving environment had capacities to assimilate the treated waste. CPCB's last detailed evaluation on sewage technologies in mid-2006 revealed that most cities use waste stabilisation ponds or activated sludge process (ASP), a conventional sewage treatment system, which uses biological processes to settle solids and then a variety of aeration systems to oxidise and clean the waste. According to this report, 60 per cent of the sewage treatment plants were based on some variation of this technology.¹ This was reconfirmed in 2009, by the National River Conservation Directorate in its compendium of sewage technologies found that, under the Ganga Action Plan, 60 per cent of the treatment capacity was based on conventional ASP.²

The big issue for sewage technology is the price of capital, the availability of land and the cost of operation and maintenance. Land is in short supply in urban areas. It is particularly so because sewage treatment is discounted in public planning. In all these cities are struggling to find the right answers to treat and clean waste, all at a time, when costs are rising.

In the mid-1990s, when the first-generation sewage treatment plants were built, they cost Rs 20 lakh to Rs 30 lakh per mld. Today, the same plants cost close to Rs 1 crore per mld to build, with operation costs increasing because of rise in energy bills. The recently ordered SBR technology plant for the city of Kolhapur will cost the city some Rs 1 crore per mld and more. It is fortunate that the plant will be funded by the Union government's river conservation programme. The sewage treatment projects sanctioned under the National Ganga River Basin Authority will cost anywhere between Rs 2.4 to 8 crore per mld – partly because they involve the construction of sewage networks and interception systems as well.

If the cost of capital investment in building the sewage treatment plant is taken at Rs 1 crore per mld and if the quantum of sewage is taken at the current 'gap' (untreated) sewage then India needs to invest Rs 30,000 crore to build capacity to treat its 30,000 mld of sewage.

But this is if the cost of treatment does not increase even further. We know that the choice of technology and its cost will depend on the capacity of the giving and receiving environment. As rivers become dry and polluted, sewage and waste treatment will mean more advanced and more expensive technologies.

In Srinagar, the battle to clean the Dal is bringing new technology challenges. The lake is highly eutrophied – it is shallow and has large numbers of people living inside its water body. As a result, even treated effluents add to the burden of nutrients in the lake. So the city has ordered two new sewage treatment plants, based on SBR but including de-nitrification technology. The plants, being built under the Central

government's lake cleaning programmes, will cost Rs 1.5 crore/mld – much above what is paid for sewage treatment in normal cases.

Tertiary treatment plants, capable of cleaning water for reuse in households and industries (and close to drinking water) are being built, but at steep prices. In the case of Cubbon park, where a small plant has been set up to supply the city garden drinking quality water, the price of capital is high – Rs 3 crore/mld – and the operation costs is Rs 9/kl. In Delhi, the lowest bid price for 4.54 mld membrane bioreactor based sewage treatment plant built for the Commonwealth games was as exorbitant as Rs 5.23 crore/mld for capital and another Rs 3 crore/mld for operations for the next 10 years. A total price of Rs 8.25 crore for 1 mld treatment (SEE ANNEXURE 1: TABLE).

Given these costs, it is critical that urban infrastructure is planned carefully and funded with scrutiny to assess how cities will afford costs and how they will build for sustainability.

It is therefore important to choose the correct technology in order to prevent wasteful expenditure. There is no need to pay for more expensive technology to treat water to a higher level than is required for subsequent use. For instance, water from the MBR plant built for the Commonwealth Games is only being used for flushing and gardening, whereas such high quality water is typically only needed by certain industries. Similarly, in the case of Cubbon Park, tertiary treated water is not required for gardening – secondary level treatment would suffice and be much cheaper.

Cities can also find ways for (at least partial) cost recovery, by putting restrictions on freshwater use and actively promoting the sale and use of sewage treated water from which they can earn revenue even if it is priced at a discount. Companies with large water requirements that build their own pipelines to the city's sewage treatment plant can recover their pipeline costs in a few years just by buying treated water at a lower price than the industrial tariff.

2. Recommendation: Private investment will not be the answer to the infrastructure challenge. Public-Private Partnership will have to be differently conceptualized in this sector.

Current models of city public-private water partnerships are diverse, from concessions for treatment plants to service contracts for billing, collection and metering. In India, as yet, most projects focus on distribution improvement –that is, managerial and technical skills of the private company are employed to improve functioning of the water distribution system. Only in a few places has the country experimented with citywide distribution — Jamshedpur, where the industrial house of Tatas have set up the water supply system, and in Tirupur, where a joint sector company is in charge of this hosiery capital's water (see table). Tirupur is also cited as an example where the private sector leveraged 20 per cent investment.

But many more projects are coming up: Naya Raipur in Chattisgarh has decided to give its water distribution contract to Jindal Company on private partnership mode. Kolhapur in Maharashtra has the distinction to be the first to go in for PPP for sewage treatment.

It needs to be seen whether these private initiatives in the water-sewage sector will bring much needed financial investment or will these be contracts to improve the efficiency of the operations of the public water supply.

Table: Private water efforts 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
1.	Salt lake, Kolkata (2010) Rs 60 crore	Jusco- Voltas	30 year contract for management of water supply and sewerage -- distribution contract	Yes: Rs 60 crore	Under implemen- ta- tion
2.	Chennai (2006) Rs 473 crore	IVRCL	100 mld desalination plant – bulk supply on fixed rates	Yes: Rs 473 crore	Operational
3.	Nagpur (2007)	Veolia	7 year contract for 24x7 for distribution system – distribution, rehabilitation, augmentation and bulk supply	No: Management contract	Under implemen- ta- tion
4.	Hyderaba d		Non-revenue water reduction and performance improvement	No: Management contract	Being tendered
5.	Hubli- Dharwad, - Belgaum- Gulbarga (2005)	Veolia	4 year contract to increase connections, supply 24x7 water – distribution contract – in pilot areas	No: Management contract	Operational
6.	Latur, Maharash tra (2008)	Subhash Projects	10 year contract for distribution	No: Management contract	Work suspended as disputes arose on terms of contract and delays
7.	Mysore Rs160 crore **	JUSCO	24x7– over million people and 150,000 connections	No: Management contract	Under implemen- ta- tion but may require renegotiatio n as final contract underestim ated work and money
8	Haldia ** Rs 100 crore	JUSCO	25 year contract for design, development, operation and maintenance of	Lease cum BOT	Under implemen- ta- tion

			water supply in Haldia on lease (of existing assets) and BOT of new assets		
9	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.
10	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
11	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
12	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
13	Kolhapur (2010) Rs 75	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: ICRA 2008, Presentation on Financing Experience in Water Sector, ICRA Ltd (an associate of Moody's investors services USA), Bangalore

**JUSCO 2011, 24x7 Urban Water Supply at Jamshedpur: Experience on PPP in urban water supply and sanitation sector, presentation to Working Group on Urban and Industrial Water Supply for 12th Five Year Plan, April, mimeo

****GOI 2011, Information from PPP database website, provided by Planning Commission, May 2011

Current experience of PPP projects

In India, currently, most projects are publicly funded and the capital belongs to the water utility. The private entity brings in managerial expertise.

However, in the Chennai-desalination project, for instance, the proponent has invested in the capital project costs of the plant, but on the guarantee of long-term off take of the output. Similarly in the Haldia project JUSCO, has been contracted by the

Haldia Development Authority to take on lease existing assets and invest in building new assets and create systems for management. In this case, JUSCO is the water operator of the project, with the responsibility for selling water and earning revenue. It promises a guaranteed income to the development authority—over the 25 years concession period—of Rs 1,220 crore. This model has been applied in Salt Lake as well, where there are substantial residential areas for the utility to reach and recover costs. It is early to say if these projects will fructify and will be successful if providing models for private investment in water, with returns that are bankable.³ But clearly, these few models must be carefully watched and experience for the future gathered.

Who will set and recover the tariff? Where the operators invest in capital, then the agreement is to allow them to earn revenue from higher tariffs. In Haldia, where the project is primarily geared to industrial users, the Haldia Development Authority has kept the charge of setting tariffs, with the contract agreeing that these will increase by 3 per cent at the minimum each year. But in Salt Lake city, JUSCO has been allowed to levy 'water and sewerage charges' of Rs 25/kl (Rs 15 for water and Rs 10 for sewerage) from connected industries. It pays for bulk water at Rs 5/kl, which it needs at a specified quality. The tariff escalation of 10 per cent is accepted every five years. The 'risk' of collecting the charges remains with JUSCO.

In the water supply projects of Madhya Pradesh – Khandwa and Shivpuri – the base tariff is set before the project takes off. What is surprising here is that even with 90 per cent public financing the project is only viable when the tariff is between Rs 12-15/kl – way above what water utilities across the country can charge or recover. In other words, in these two cases, public subsidy for capital does not lower costs of providing water. (SEE BOX)

In almost all other cases, the tariff is set by the public utility and its private contractor has the responsibility for improvement of recovery of the charges, for which it is paid a pre-determined fee. For instance, in the case of Karnataka 24x7 projects, the operator is paid over Rs 5/kl, based on performance indicators.

Who will pay for sewage costs? In almost all cases (except Salt Lake city) there is no reference to costs of sewage, which will need to be inbuilt into the project design and management costs. It is clear that the quantum of water, if it increases, will increase the quantum of sewage as well. No project, it would seem, is designed to take care of the capital and operational costs of this fall-out. This is the biggest risk in the projects of today.

The risk of data gaps is high: In most other cases, the private operator, has limited financial exposure and limited risk. The payment is given to manage the operations of the project, based on pre-determined performance indicators – quantum of leakage loss to be reduced or resolution of complaints in serviced area.

The private sector claims that even in situations where public funds are driving the project, risks remain considerable, as it has to deliver. Guaranteeing performance is difficult as the project design often is misleading and inaccurate. In these cases, the contract requires modifications – on the design and cost – but this put the project in a bind, as renegotiation on tendered agreements is difficult in most cases. The project then becomes unviable or even poor in implementation.

For instance, in Mysore, where JUSCO bid for a performance-based contract to refurbish the city's water supply system to provide 24x7 water it found that the total pipeline that needed replacement was 1,900 km, not 800 km, and the cost rocketed accordingly. There may be a need for renegotiation with related complexities related

to transparency and accountability. If the cost is not revised, the work will be half done and results will be poor. The aim of the investment will be negated. Without baseline data on the water-sewage situation in a city, contracting becomes difficult and estimating costs of what needs to be done almost impossible.

As a result, some serious players are not bidding for projects. The newer water contracts are going to newer companies and it is yet an open question how serious these will be in a difficult and untested business.

Box: Khandwa's PPP project

Khandwa is a mid-size town in the heart of Madhya Pradesh – with 0.2 million inhabitants in 2010. The city administration estimates that on the basis of 135 lpcd, it needs 29.53 mld, but can provide only 17.20 mld. Therefore, it has proposed that it should forget all its many decaying lakes in its midst and concentrate on getting water from the Indira Sagar project, being built on Narmada, some 52 km away. With this scheme in hand, which would involve bringing water from this distance and building-refurbishing pipelines for its distribution and for recovery of its bills the city government when on a hunt. It said its local agencies were weak and unable to function because of political interference. The project could only take off, if there was a private party, which would take on the task of water supply. PPP made the project attractive and viable and the idea was sold.

In 2009, the tender document was put out and a Hyderabad based infrastructure company, Vishwa won the contract. The total cost of the project was put at Rs 115.32 crore and the deal was struck. The company has the responsibility to build the water transportation network and to supply 24x7 water to all of the city inhabitants.

But what is interesting is that in this PPP, the private side, does not bring in capital funding. The government of India provides 80 per cent and the state government another 10 per cent – adding up to Rs 96 crore in public financing. The private company contributes a mere 10 per cent.

The deal is sold on the basis of the operational costs and the inability of the city administration to recover its water bills. As a result, even with public financing of 90 per cent, the water tariff has been set at Rs 12 kl. The calculations are that the company will sell Rs 14.81 crore worth of water each year – some 34 mld – of which 29 mld is for supply and another 5 mld for losing. It will spend Rs 7.62 crore in operation and maintenance and so in this calculation it is a sweet deal.

However, these calculations leave the sums unsolved.

The fact is that the city government in 2007-08 recovered a mere Rs 94 lakh in water bills, after spending Rs 3.18 crore on distribution – roughly 30 per cent recovery. Now magically, the private company will be able to charge and recover tariffs of Rs 12 kl – which is roughly double of what even Bangalore pays for its water. This is when the city, according to government's own assessment is poor – roughly 40 per cent lives in slums. Then there is no metering or any distribution system to speak off. Now the private company is expected to turn around this situation but nobody says how.

Instead the project document is repeat with the standard infrastructure conditions – for instance, it says that there will be ‘no competing facility’ created during the time of its 25 year concession period. This condition could be disastrous, if the company, as can be safely assumed, will not be able to supply 24x7 water to all of Khandwa's poor

inhabitants for Rs 12 kl. This would mean that governments, once tied into the contract cannot even invest in improvement of local water bodies – lakes and ponds or recharge groundwater.

Then the project has nothing to say or do with the sewage this water will result in. Given that the water-utility or local municipality will be further starved of money as the customers will be busy paying for expensive water, pollution is a guarantee.

But Khandwa is a clear success as its neighbouring city of Shivpuri has already signed on to a similar deal, but with an even higher base price of water – Rs 15.40 kl. ^{4,5}.

Box: Naya Raipur's bids for private water

Chattisgarh the mineral-forest rich but poor state, carved out of Madhya Pradesh, is building its new capital – Naya Raipur. In 2008, the city advertised as India's best planned city, put out a bid for the Rs 240 crore project for the development of water supply system for the city. According to the draft concession agreement made by the Naya Raipur Development Authority, the successful bidder would have to do everything – from building infrastructure for supply, treatment and distribution to billing and maintenance of facilities. According to this, the citizens of Naya Raipur would need 24 mld – based on 135 lpcd, while government and all other establishments would consume another 9 mld. The bidder would be bound by a performance-based guarantee to supply the water 24x7 and to address all complaints.⁶

In 2009, it was reported that Jindal Water Infrastructure, a subsidiary of the mega-steel giant – has won the contract, valued at Rs 156 crore. The company has to set up the intake well on Mahanadi and lay the water pipeline for supply of 52 mld to the city and 61 villages. It would also maintain the assets for the next 8 years and recover its investment through water sales.⁷ The project in 2011 was just getting off the ground.

Private sector's future role

The Working Group is of the view that the private sector already plays a role in water and waste services — as a contractor to the public utility to build and even operate key components of the system. This role must be recognized and indeed encouraged. However, the current experience is that the private sector is reluctant to enter into capital and operational investment.

But equally important is that this partnership must be planned carefully and with full knowledge. Often city governments bid for more and more expensive pieces of hardware, without any idea of how this investment will be sustained. Chennai, for instance, has already invested in a 100 mld desalination plant in Minjur, where the agreement with the private operator is on a BOOT basis. The capital cost of Rs 473 crore was borne by the private operator, but with the guarantee that MetroWater, the city's water agency, would pay the company Rs 48.66/kl for the next 25 years. In addition, it would pay for power costs, according to information given to the committee by city engineers.

The second plant at Nemmeli, also of 100 mld, is being built also by a private company and with a different arrangement. The contract is to build the plant and to operate it for the next seven years. The water board will own the plant and capital investment has been paid through Central subsidy. This will underwrite the costs of the delivered water—at roughly Rs 20/kl.

But the big issue is what these two capital-intensive and expensive plants will do to the sustainability of the city’s water board. Chennai MetroWater is an efficient water utility with balanced books—more than many others. But the high capital and operation and maintenance will require the utility to rethink its future finances. The Tamil Nadu government has committed that it will pay for the cost difference. But all this does mean that utilities will continue to have to depend on external funding for their viability.

It is the same in Agra where, for good reasons, the city municipality has contracted out the building of a water treatment plant to take near-sewage from its river Yamuna and turn it into water. According to the presentation made to the committee, the plant is expensive—paid here through Japanese assistance—and the cost of water it produces will be Rs 3 to Rs4/kl without the cost of energy. In a city like Agra, with poorer water accounts, where will money come from to bear these high costs?

Water utilities must be required to consider financial sustainability before embarking on projects.

3. Recommendation: 24x7 projects must be carefully scrutinized and learnt from before adopting these as the model for PPP in this sector

In India municipal water reforms have become synonymous with 24x7. The reasoning of these projects is impeccable: supply constant water so that pressure in the pipes will reduce leakage from sewage pipes and, in turn, reduce contamination of household water supply. Furthermore, create tight management contracts based on performance terms so that leakage -- non-revenue water -- is reduced. This will add to the financial viability of the municipality/water utility.

The most cited example is from Karnataka, where in 2004 the cities of Hubli-Dharwad, Belgaum and Gulbarga were chosen for continuous water supply demonstration projects. Later, Mysore was added to the list. In Tamil Nadu, Madurai’s 24x7 has been announced. In Maharashtra, besides Mumbai, work has started in Nagpur and Pimpri-Chinchwad, a city on the outskirts of Pune. Many other cities are waiting to adopt 24x7 schemes. The experience till now needs to be studied.

Hubli-Dharwad

Karnataka’s water reform began with a project period of 2004-2008, but this has been extended to 2011. The Rs 237 crore project, funded jointly by the World Bank and the state government, has led to the establishment of the Karnataka state urban water supply council. The project awarded performance-based management contracts to private companies—French water major Veolia water won the contract—to repair the water system for 24x7 supply and to manage operations, including billing and collection, in the pilot zones in February 2011, with some Rs 200 crore spent, the project had laid 108 km of transmission mains, 238 km of distribution mains and 26,045 metered house connections. Continuous water supply was operationalized in all demonstration zones across the three cities. Leakages are down (see table) without any major increase in water tariffs. The project also included a specific tariff plan for the urban poor, defined as those living in houses of less than 600 sq feet built up area.⁸

Karnataka’s 24x7 achievements: what has been done

	Demonstration zones	Reached (no of house connections)	Real losses (litres/connection/day/metre pressure)

1	Belgaum (south)	4566	5.21
2	Belguam (north)	4314	10.52
3	Hubli	7834	5.45
4	Dharwad	5945	4.84
5	Gulbarga	3386	2.36
		26045	

Source: KUWASIP 2011, World Bank assisted Karnataka Urban Water Sector Improvement Project (KUWASIP) – experience on PPP for achieving 24x7 water supply and control of UFW, presentation to Ministry of Urban Development, New Delhi, April, mimeo

To reduce losses the pipeline network had to be completely re-laid and modernised. The new pipes are of high-density polyethylene (HDPE), replacing PVC pipes. A system has also been devised to check data from meters over a 24-hour period; if the meter is running during non-use hours of the night, leaks can be isolated and fixed.

In the project area, tariffs have been revised upwards, but functioning and high-quality meters ensure the measure is accurate and based on consumption. There are four slabs, with tariffs ranging from Rs 6 per kl to Rs 20 per kl, the latter for consumption above 40kl. This, say analysts, has helped cross-subsidise revenue collection. The Dharwad demonstration zone has 5,500 connections with a population of 37,000. Veolia's records show 43 per cent of the customers consume less than 15kl per day, contributing to 15 per cent of the total water charges and 16 per cent of the water used. On the other end of the spectrum, 40 per cent of the households use more than 25 kl per day, use 60 per cent of the water and account for 58 per cent of the collections. Monthly collections in this pilot zone have increased from Rs 2.5 lakh to Rs 8 lakh, which pushes towards financial sustainability.⁹

PPP experience: How workable is it

It is important to analyse the experience of 24x7 to understand how it will succeed in the country.

Firstly, it is clear that the challenge of scaling-up and replication will be significant. In Hubli-Dharwad the pilot project has taken time for implementation and has also been implemented at significant capital cost. In other words, reaching some 10 per cent of the twin cities' existing connections has taken some 7 years and more. It has also been costly. How will this reach the rest of the city, and by when? More importantly, will it impact the supply and sustainability of water sources — will there be quantifiable reductions in the amount of water to be sourced for supply? As yet, there is no evidence to suggest this will happen.

Secondly, more experience is needed to assess its effectiveness: For instance, the claim on the reduction of leakage also needs to be carefully scrutinized, as the experience is limited. The proponents of this scheme often end up comparing the total leakage (as estimated) for a city, against the reduction of leakage seen in limited households with careful intervention. While extrapolating, due care needs to be taken of other variables.

Thirdly, financial sustainability must be reviewed: The project (across all cities), with high tariffs and efficiency of recovery, is not able to balance its books. This is also because the cost of water is high, over Rs 12 per kl. Interestingly, the cost to the operator and auditor is more than the cost of bulk water—Rs 5.45 per kl.¹⁰ Clearly, in this scenario, the big question is the cost of delivery of water in our cities and what this will do to the sustainability of local bodies and the strain on the already poor investment of sewage systems. The more water the city uses, the more its sewage.

It is clear that the cost of management will have to be paid and the question remains that if these costs are paid then even public water utilities would be able to deliver on supply and quality. The question is how to reorganize and restructure water utilities for public delivery.

Karnataka: Costs and revenue of 24x7

A	Cost of water	Rs/kl			
	Bulk water	5.09			
	O&M charge	0.35			
	Operator remuneration	4.67			
	Technical auditor fee	0.78			
	Debt recovery	1.70			
	Total	12.59			
B.	Cost/recovery				
	Water consumption/month/kl		5,95,234		
	Revenue/month Rs			52,12,510	
	Revenue recovered/Rs/kl			8.76	
	Deficit/month/Rs			22,81,486	
	% of cost not recovered			30%	

KUWASIP 2011, World Bank assisted Karnataka Urban Water Sector Improvement Project (KUWASIP) – experience on PPP for achieving 24x7 water supply and control of UFW, presentation to Ministry of Urban Development, New Delhi, April, mimeo

Fourthly is the non-answered question of sewage. In other words, more water will be supplied, which will not be paid for completely. And in addition, more sewage because of the increased water supply will be generated, which will not be paid for at all. In this way the public utility will be burdened with these costs, without sources of revenue. It is clear that these projects must be reviewed to ensure that the cost of building sewerage infrastructure and running it are provided in the initial design.

In the next few years there will be enormous experience gathered in the cities, which are currently operationalizing these projects. This knowledge must be gathered and learnt more, before further projects are signed. We would suggest that a mid-term review of the 12th Plan includes this assessment.

4. Recommendation: Water and sewage must be paid for but equally important is recovery of costs and sustainability of the resource. Future planning must take this into account

Water and sewage costs must be paid for, but the questions are how will this cost be recovered and how much can be charged? It is important to note, that contrary to perception, many municipalities and water utilities have in the recent past raised tariffs for domestic and industrial use. But the question is how will they recover their bills. Meters do not exist and where they do, they often do not work. The cost of recovery adds to the costs of operations. This is where inventive solutions are needed. But it is also a fact that the higher the costs of operations the less the municipality and water agency can and will balance their books.

In fact, municipalities have found that they can recover part of their costs through high tariffs on industrial users. In a survey of water utilities, jointly by the Union ministry of urban development and the Asian Development Bank, commercial and industrial consumption of water averaged to 15 per cent in the 20 cities surveyed. But interestingly, billing for this water filled only 40 per cent of the revenues.¹¹

In Bengaluru, while the commercial and industrial usage is 5 per cent of its total water supplied, the billing amounts to almost 40 per cent. This city, which charges Rs 6 per kl for the lowest domestic slab and Rs 36 per kl for the highest, charges as much as Rs 60 per kl for industrial and commercial use. The situation is the same in Chennai and other key cities. Hyderabad has also revised its tariff, arguing that most metropolitan cities like Chennai, Mumbai and Bengaluru charge higher rates for non-domestic use. Its tariff is now Rs 35 per kl, against Mumbai's Rs 40 per kl and Delhi's Rs 50 per kl. But interestingly, Hyderabad is the only city, which charges increased rates -- Rs 60 per kl -- where water is used as a raw material—in bottled water, soft drinks or alcoholic beverages.

It is also logical that cities, struggling to find ways to meter all houses that use water, will recover costs from high-users of their product. These are institutional buyers, easier to locate and easier to bill. It is for this reason that most cities have different rates for water usage in commercial and industrial areas. The danger however is that as the price increases, industries and institutions simply move to the source that provides them cheaper water – groundwater. This then leads to greater unsustainability of this resource.

Price and then recovery

If meters are needed to measure and account for water—then the technology for these is also the most neglected within the country. It is well known most customer meters will register airflow. Given that most cities have intermittent water supply, this could lead to inaccurate reading. But no study exists on the extent of such error. In 2003, Chennai MetroWater commissioned a study, funded by the World Bank, to study how it should implement a citywide metering scheme. The experiment threw up interesting and difficult issues regarding the workability of meters. (SEE BOX)

There are no real facilities to test and to certify meters, something all water utilities need before they can go ahead and procure or ask customers to install. The country has only three laboratories – Fluid Control Research Laboratory (FCRI), in Palghat, Kerala, Electronic and Quality Development Centre of the Gujarat government in Gandhinagar and BIS Central Laboratory in Sahibabad near Delhi. These laboratories test against basic parameters laid down by the Bureau of Indian Standards (BIS). These parameters and tests need an urgent revamp as does the capacity for testing and certification.

Chennai: Learning about working meters

In 2003 Chennai hired Generale des Eaux, a French water multinational, to recommend how it should implement a city-wide metering scheme. The study, funded by the World Bank, started and ended with the simple proposition that if the city installed meters and raised bills it would reduce distribution losses, the unaccounted-for water. The study, which took a detailed look at some 1,600 connections—a tiny proportion of the mega city population — found that the technology of meters needed careful review.

To check reliability, the study installed different makes of Indian and foreign-made meters, costing less than Rs 500 to over Rs 3,500. Each meter was sent to the Fluid Control Research Laboratory in Kerala for initial performance. The pilot study then tested the meters after 6 months and again after 12 months.

Since 'reading of air' in meters was a key concern, the study adopted a revised methodology to assess this factor. The study used the highly accurate class D in-line type customer meters as reference meters. The flow recorded during the time when there was no water in the system was considered as registration of air. But the agency found that this method was

very laborious and slow; the results, too, not consistent. It then sourced specific meters from Europe and the UK, which would not read air.

All this done, it took some 45,000-meter readings from October 2003 to December 2004. The single biggest problem it found, in roughly 40 per cent of the cases, was that the meter reading mechanism would get blocked due to silt. High dissolved solids in the water would block the filter meters. In another 30 per cent of the cases, access was blocked: Meters were installed in pits where rubbish or other material was thrown; sometimes, the property where the meter was installed was found locked. This was the biggest problem—it required meter readers to go back again and again to check and record. Another problem noted was condensation. Moist air would condense the face of the meter dial. All in all, the study found that meters could be working to record more or less of what was being supplied. This meant that as customers found the meter readings difficult to accept, they did not pay.¹²

Installing meters: city experiments

Jamshedpur, has been able to install meters across its area or has used the technology of measurement to reduce its losses. Jamshedpur is uniquely placed because of the nature of the township—it is an industrial town of the Tata's steel industry. Its work to control distribution losses is exemplary (SEE BOX).

Most cities – Chennai, Hyderabad and even Bengaluru – have pilot projects on metering and measurement. But these cities are finding it difficult to scale up this work. Cities are experimenting with various kinds of electromagnetic meters. Bangalore has installed some 38,000 meters, Nagpur 15,000 and Chennai roughly the same.

There is a huge challenge to scale up these experiments. Equally, it is clear no city knows the full cost of this transition: the cost of the household meter is only a small component, for the pipelines that bring water to the house have to be refurbished drastically for the system to work. Hyderabad, for instance, started its pilot non-revenue water reduction project in early 2000. By 2006, the city replaced some 140 km of cement mains and 650 km of modern pipes. It also installed 73 bulk flow meters and changed the domestic meters in some 1,76,000 households. Still, there was no result—the water utility could not assess or quantify reduction in water losses. It then decided to take up a micro-study in two sites, where it installed conventional and flow meters in some 40 households each. The study showed some reduction in measurement of unaccounted water, from 33 per cent to 29 per cent in conventional meters and from 25 per cent to 18 per cent in flow meters.

The city then took up the challenge to tackle a medium-level pilot project, in the rich locality of Banjara. It was confident that this time it would learn to deal with this challenge. The area was relatively easy to map, for the source of water was from a single point and meters existed in households. The effort was laborious. Each day, city water officials were tasked to record daily readings from the bulk meters to check on water supply and to reconcile this with individual meters. But with all this done, the study was still not accurate and the city could not reconcile its water accounts. Now Hyderabad is devising a new experiment to arrest its water loss. It is putting in place a SCADA (system for supervisory control and data acquisition) for mapping its water system. It hopes this will help it get a handle on the losses.¹³

The question also is if metering of households is indeed the best (and only) way ahead in managing an efficient billing and accounting system. Chennai, for instance, has no metering but it has an efficient revenue collection system. The city lowers its

costs using the existing property tax system to collect its water bills. The water and sewerage tax is a component of the annual rental value of the property, collected in two equal installments.

Surat shows the possible way ahead, as it combines various options to manage its water. First, it has taken control of its high-value and bulk consumers, to check for water consumption. Out of the 770 mld the city supplied in 2011, roughly 55 mld (7 per cent) is directed to industrial users, whom it charges Rs 22 per kl. Each user has been metered using electromagnetic instruments and water consumption is carefully monitored. As a result, losses are down to negligible; the city even imposes a leakage charge on industry, of 5 per cent, to cover its missing water. As a result, the city earned in 2009-10 some Rs 36 crore from industrial users, a little less than half its annual revenue. The city water agency is now exploring the possibility of contracting out its sewage for tertiary treatment, which it can use to supply additional water to industries. It has received proposals from private companies, willing to treat and sell sewage-water for Rs 18 per kl.

In addition, it has identified its bulk users: hotels, malls, hospitals and the like. In each such case, defined as a user with over ½ inch pipe, the city water agency installs meters and charges hefty rates (Rs 18 per kl). All new areas are also metered.

In the rest of the city, water bills are raised as a component of the property tax. This city has a collection efficiency of 93 per cent for this tax. But the charge is miniscule and so the option is for the city to increase its flat water rate, based on the size of property or location. It has mapped the city for leakage—the old city area was found to be the worst in this regard, and so the city is taking remedial steps to improve piping.

The bottom line is that Surat, with just 1 per cent of its area metered, has a cost recovery of 92 per cent and its efficiency in collection of water charges is 94 per cent. The downside is that it still has 20 per cent (estimated) non-revenue water.¹⁴ This nuanced and step-up approach is a good example for other cities to follow.

Jamshedpur: the town that counts

This industrial town, which has grown around the Tata Iron and Steel Company (TISCO) has set up its own water provider—JUSCO. Also a Tata company, this is India's first private sector service provider in the water business. Its core area of work is in managing the water and waste business of Jamshedpur, but now it is branching out to offer its services to many other needy cities and industries.

In Jamshedpur, a town spread over some 64 sq km, with roughly 0.7 million inhabitants, JUSCO is responsible for water and waste services. It supplies some 190 mld over a network of 550 km of water mains. The key achievement is that in this town non-revenue water—or water that gets lost, say through leakage or in other ways—has been brought down from 36 per cent in 2005 to below 10 per cent by 2010. The success lies in the company's ability to manage its water supply efficiently. It has replaced pipes and has service-guarantee conditions. It monitors leakage and distribution losses through a city-wide computer mapping system. JUSCO says that with all this done, failures (complaints) about the water system are down from 44 each month to nil. Its 57,000 connections are not completely metered—only 30 per cent are—but with losses down, operating costs have lowered and recovery has improved. It has only 4 employees per 1000 connections, lower than most cities even in Asia.¹⁵

The big question now is if this Jamshedpur experience can be replicated in other cities of the country. JUSCO, which has now bagged performance-based management contracts in Mysore, Haldia and Salt Lake cities for supply of water and reduction of losses, will have to work its magic once again.

5. Recommendation: Ensure the Right to Clean Water to all: legislate and implement

While much has to be done to make our water systems deliver for all, the starting point is to provide a framework for an entitlement based drinking water system. This will create conditions for people to demand water as a right. In addition, if the quality standards for clean and potable water are defined and mandated, it will create the right to **clean** water. This will in turn provide the incentive for reform and build the pressure on government agencies to deliver on the promise.

In the Indian Constitution, water is a state subject. It features in the state list (list II, schedule 7, 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 1 (inter-state rivers)”. The 73 and 74th Constitutional Amendments devolved the responsibility to local bodies. However, as the Constitution does provide the fundamental right to life, which has been interpreted by the Supreme Court, as the right to a clean environment, water must be seen as an unalienable right.

In India, water is not provided free as a right, but cities have differential pricing, to provide for lower rates for smaller users of water – where it is metered – and for smaller holders of property --- where it is charged based on the pipeline connection. Across different cities, this lowest water slab varies between 6 kl to 15 kl per household. At 6 kl, assuming a family of six, each person would get 30 litres per day and with eight in a family it would be down to Rs 25 lpcd – subsistence level water usage. Delhi, for instance, charges Rs 2 up to 10 kl consumption; Kerala charges Rs 4-5 for up to 10 kl. But this rate, does not guarantee water, which in many cities does not reach households un-connected and un-served by the pipeline.

People also need to have the right to clean water, which is safe to drink. In India, there are no legislated standards to define clean water, unlike other parts of the world. For instance, in the US, potable water quality is legally enforced through the Safe Drinking Water Act. The act, lays down standards for drinking water and also penalties for failure. Similarly, in South Africa, water authorities by law are required to test drinking water quality on a monthly basis to ensure that it meets the compulsory national standards for potable water. The country has devised three separate standards – Class 0, which is equivalent to internationally best and most stringent quality; Class I, which is acceptable for lifetime consumption and Class II to take into account the realities of water supply in the country. However, unlike the US, non-compliance with these standards is not illegal in South Africa. But it is illegal to withhold information about water quality. This then requires city (and if necessary federal) government to test and dissemination information about the quality of water that is being supplied.

In India, the Bureau of Indian Standards defines the quality of drinking water (Drinking water – specification, IS 10500, revised in 2011). These standards are not mandatory, but instead provide guidance. In addition, the CPHEEO combines these standards and those published by the World Health Organisation to issue separate

guidelines to cities. The IS 10500 defines two sets of standards – acceptable limit and permissible in absence of alternative source.

The question that is often raised is that municipalities do not have the wherewithal to invest in infrastructure to meet standards for potable water. This will put a burden on the water supply agencies. Water Quality monitoring infrastructure needs to be strengthened. But the fact is that while it costs to clean water, it also costs double to clean water, which is already dirty. Agra, for instance, will spend roughly the same to clean its drinking water from the much-abused Yamuna as it would to treat its sewage. This is when Agra is still trying to clean the easiest of contaminants – biological – and not industrial and chemical waste, which is difficult to clean and gets progressively more expensive as the toxins become more complex and more industrial.

The wise choice is to not to first pollute and then clean it up. The imperative is to protect the source of drinking water. But in India, municipalities and water agencies have no control over the pollution of their drinking water source – surface or groundwater. This needs to change.

If this is not done then the cost of bad water will be paid. It will be paid in terms of health costs – waterborne diseases costs big time in terms of mortality and morbidity. The cost of bad water is also paid in terms of investments made by households in buying devices to clean water before consumption – household water purifiers. If the size of the market is any indication, then dirty water is an issue that pains. According to market analysts, the water purifiers in the household segment have been growing at 22-25 per cent annually, reaching Rs 1500 crore by 2010-11. If the market for bottled water – estimated at Rs 2000 crore is added to the water purifier business then this roughly Rs 3500 crore investment is benefiting private industry and not public municipal services.¹⁶ While it is difficult to compute the exact budgets of the water agencies of the country given their poor state of accounting it is clear this private market is a substantial competitor.

6. Recommendation: Future investment in water supply must focus on demand management (reducing water usage); in reducing inter-city inequity and in quality of water supplied

The focus on augmentation of water supply must change to managing the supply for all and managing to supply clean water. The fact is that we cannot catch up with the water we use, the sewage we generate, the sewage we transport and the sewage we actually treat and then dispose off in ditches, lakes or rivers. In any case our rivers have less and less water to assimilate our mess. We will have to think differently. First, we will have to spend less in bringing water to our houses. In other words, cut the length of the pipeline to reduce the electricity and pumping costs and its resultant 'leakage'. This means that we will have to revive local water bodies and recharge groundwater, so that we can source water from as close as possible. Secondly, we must use less, not more water in our homes, so that we have less to treat and less to dispose off. Thirdly, we must again cut the costs and transportation of sewage – use decentralized networks and use a variety of technologies to treat sewage as locally as possible. Finally, we must begin to learn that we will have to reuse every drop of our sewage – turn it into drinking water with expensive technology or re-use and recycle it in our gardens, in our industries or use it (after treatment) to rejuvenate natural water bodies. This would require change of standards so that groundwater pollution boards incentivize the reuse of wastewater for recharge. This water-waste agenda needs to be incorporated deliberately into city plans.

This will require reworking the reform conditions, essential for investment in this sector.

7. Recommendation: To cut the costs of water supply and distribution losses focus on building, renewing and replenishing local water sources, including groundwater

The single biggest charge on municipal water supply today is the problem of distance – cities are expanding their water footprint because they find it easier to look for new water rather than fixing their infrastructure of supply. The first problem with distance is that it adds to the burden of costs because there are huge losses in transportation. Cities are struggling to contain water leakage.

In all this, there is still no understanding how water losses will be controlled, if the length of the pipeline gets longer and longer. Water planners, engineers or consultants do not make this connection. They believe there are answers to check wastage, without reconfiguring their water system. Clearly, given the lack of resources for maintenance, this will remain a pipe dream.

Secondly, water utilities spend the little or everything they have in building and then repairing the pipe system. It is a catch-up game, which they never win. It costs to build each kilometre of pipeline – some Rs 1 crore per km, is the cost that is estimated. It costs to connect each household to the pipeline network – some Rs 20-30,000 per connection is estimated. In all this, there is little money for new investment, what there is goes into fixing what is broken.

It is equally clear that the cost of the pipeline is not in the missing water or the missing money. The expenditure that the city incurs in bringing water to its people is high. Most cities today spend the bulk of their water supply budgets in electricity bills – pumping to bring water a considerable amount of which is lost and then pumping to supply it to households.

The fact is that cities have choices, which they are ignoring today. The fact is that cities had sources of water close to where people need supply. Rain, as it is said is decentralised and so should be water supply. The city sources are its water bodies, which capture rain or floodwater from rivers and the city sources are its underground water aquifers. All these have been neglected, desecrated and decimated – lakes and ponds wilfully destroyed for land and groundwater over-extracted because there is no official water for use.

This is not to say that these sources will suffice to meet the city's water needs. But these are certainly the start of the water supply pipeline. The rest of the solution lies in taking back the water, treating it and then recharging the same waterbody and aquifer – water to water. It is only in times of crisis that the city must need to bring water from distance.

Include groundwater in water supply calculations

There is a need to factor in groundwater as a part of the overall planning for water in the city. If cities understood the critical need that groundwater supply is currently meeting in water supply, planners would perhaps be less disrespectful of the underground wealth. The groundwater-sewage connection also needs understanding. It is clear that the sewage, which is not connected, transported, treated and then safely disposed off, will make its way into drains and into the ground. It will contaminate the same water that is used for drinking.

There is another aspect. All economists talk about the need for pricing water supply. This is undisputable. But the unforeseen outcome of the increased water tariff is the increased dependence on groundwater. Across the country, as the price of water begins to pinch the company bottom-line, water's bottom-line is exploited. Bangalore, Chennai and even Hyderabad are clear instances of this water-switch. In this way the water agency loses twice over – it loses the paying customer, who could help cross-subsidize its expenditure and it has severely depleted sources of water.

Any move to regulate extraction rarely works as licensing only raises the transaction costs and breeds corruption. In Gurgaon, the important direction of the high court to ban the extraction of groundwater for non-drinking water uses, has been flouted with impunity. It is impossible to regulate the licenses of million well-owners.

In all these ways, the agenda to map groundwater will inform, advice policy and stimulate action. The fact is that groundwater is critical and we need ways of keeping the source healthy and replenished. The agenda for supply is to build on this underground reserve, not to write it off. Groundwater as a source of supply is the way of the past and the way of the future.

Legislate to protect water bodies

There is no specific legislation in India to protect water bodies – urban or rural. In December 2010, the Union ministry of Environment and Forests issued the Wetlands (Conservation and Management) Rules, 2010. Under the rules, wetlands have been classified, into different categories based on location and size. In addition, the Central Wetland Regulatory Authority has been set up for regulation. But these rules, however, important will still leave out most urban water bodies from the ambit of protection. In cities, water bodies, are supposedly governed by city development rules. In most cases, these are listed and the change of landuse will require notification. However this is easier said than done and will require working with other ministries whose mandate covers waterbodies.

As a result, these lakes and water systems, which at one time even gave names of the localities and people, are in desperate need of recognition and protection. The only cover is the hundreds of struggles of individuals, fighting land mafia and indifferent government agencies, to protect local lakes. There is a growing concern that climate change and its promise of growing intensity of extreme rain events will bring even more flooding to cities and even more despair.

The question is how will cities protect urban waterbodies and make them a part of their water system. This is when cities have grown over the waterbody and its functional parts – its drains and its catchment. Guwahati is the one city, racked by incessant flooding, which has decided to legislate the protection of its key water structures. It has identified the land holding the water and recorded the area of the catchment in its waterbodies preservation and conservation bill 2008. But it is finding protection difficult. The catchment over years has been legally handed over to the rich and powerful for buildings. It has also been taken over by the city's poor for their settlements. This is not unique to this city on the banks of Brahmaputra as poor, marginalised by the city, neglected for their housing and yet essential for growth, are relegated to finding homes on unused public lands, catchments of waterbodies and drainage channels – the same lands that cities need water security. Perhaps this ironical twist is the real revenge – the valued asset is now in the hands of the most neglected and forsaken.

What makes matters worse is that for the years, waterbodies have been truncated to suit truncated and disjointed bureaucracies and policies. In most cases either the

waterbody itself has been divided – the waterhead is owned by own agency and the waterbody by another. Or there will be many agencies which ‘own’ different waterbodies of the city and no planning, policing and protecting is difficult. Jammu and Kashmir is one state, which has mandated its Lakes and Waterways Development Authority the right to manage not just the lake but also the catchment. Clearly, this is the model for other cities as well.

Include local water bodies into water supply infrastructure

The agenda for change requires each city to consider, as first source of supply its local waterbody. Unless these structures are built into the water supply infrastructure, there will be only lip service for protection and at best, efforts to ‘beautify’ the lakefront for recreational purpose, not for its essential life-giving service. Therefore, cities must only get funds for water projects, when they have accounted for the water supply from local waterbodies. This condition is vital. It will force protection and will build the infrastructure, which will supply locally and then take back sewage – the water’s waste connection -- also locally. It will cut the length of the pipeline twice over – once to supply and the other to take back the waste.

8. Recommendation: Future investment in this sector, must focus on sewage and join the dots with pollution of rivers and waterways

Investment in sewage must match the investment in water supply. It is also important to note that pollution control is not possible without the investment in sewage systems – to convey waste and then to treat it before disposal and reuse. More importantly, if the waste of all is not treated, then pollution control will not work. In other words, sewage facilities must be extensive – reach all people and intercept the waste of all for treatment. Otherwise, treated sewage – and it is expensive to build sewage plants and it costs to run them – will be mixed with untreated sewage. The end result will be (and is) pollution.

It is also clear that India has a huge backlog of sewage facilities to build. In most cities settlements have grown without underground sewerage infrastructure. ‘Fitting’ in the sewage lines into already built, crowded and congested and haphazard construction is a difficult task. This challenge is compounded by the fact that even where sewerage lines exist, they are already buried, broken or choked. Worse, nobody really knows the state of disrepair. But even as the old needs repair, there is much more that needs to be built as city’s sprawl out of control.

In this situation, pollution control is a near impossible task. It can only work when the method of controlling pollution is changed – it does not wait for sewage to be first intercepted through underground drainage and it does not treat pollution as waste, but as a resource.

The fact is that Indian cities have the opportunity to reinvent sewage paradigms, simply because they have not yet built the infrastructure. They can leapfrog into new ways of dealing with excreta, which is affordable and sustainable.

The principle has to be to cut the cost of building the sewage system, cut the length of the sewage network and then to treat the waste as a resource – turn sewage into water for irrigation or use in industry.

9. Recommendation: To cut pollution, build sewage systems differently and focus on software and not hardware

The sanitation divide in our cities – where toilets are not available or not working -- is bad for health and unacceptable. The need for sanitation is “more important than

Independence” said Mahatma Gandhi. There is no question that this message is even more important today.

But equally important is to consider how the toilet in the home is connecting to its transportation system. The toilet ladder can go from no-toilet to the flush, but its connection with the outside world may still go nowhere. The flush toilet within the house – important for hygiene and sanitation – may lead to an open drain and this in turn would lead to even more unhygienic conditions and be the cause of disease. Therefore, the complete sanitation solution is the only answer – the toilet that works and the sewage system that can convey and treat sewage for safe disposal.

Make drains treatment zones

Sanitary engineers-turned-pollution managers have a one-size fits all solution – first build underground sewerage network (however long it takes), then connect households to the system (even if there is resistance or delays) and then once the pipeline has been officially inaugurated, it will transport official waste to the treatment plant (built earlier but not working because of lack of sewage). This will be done and pollution will be controlled.

So, the question is how the waste – generated in households and conveyed through open drains and then into the river can be cleaned? The drains exist – lead to stench, disease and unliveable conditions. Instead of waiting for the end-day when the drain will be transformed into the storm water carrier it was meant to be and the sewage will disappear mysteriously into underground chambers, new solutions can be found. The drain, open and unhygienic, can be used as a treatment zone. The sewage can be treated in the open drain, intercepted in the open drain and then conveyed for after-treatment to the already built sewage plant. This is not to say that this open-air treatment will clean sewage and turn it into drinking water. But it will certainly reduce pollution and also turn the drain, from a stinky and dirty sewer to a planted waterway, which will be part of the city’s landscape.

Again, this is not a tried or easy solution. But experiments to clean stretches of drains, using bioremediation technologies have been conducted, with success. The challenge is now to up-scale this approach and to integrate it into the pollution plans of the country. It is also a challenge to compute the costs of this emerging technology and to develop indicators for its performance so that projects do not become new scams, this time in the name of pollution.

The bottom line is that the city has to invest in sewage management, but it has to invest to do things differently.

10. Recommendation: Set real and hard targets for affordable recycling and reuse of treated waste water

The location of the sewage treatment plant is just as important as the plant and building. The fact is that cities plan for sewage much after they have generated their waste. By now the city has grown, water has been supplied and sewage flows through open drains – because it has nowhere else to go. Then the city grows up – it wants to be modern and wants to be counted. It plans for sewage disposal. The first step is to identify land in the already crowded and built area. It builds the sewage plant, without considering how it will get the sewage to the plant or how it will dispose off the treated effluent.

It is because of this plants come and pollution does not go. The treated effluent, even if it meets the strictest of discharge standards has not been planned in its disposal.

The plan is that the disposal will be done in the drains or streams that flow in the vicinity of the treatment plant and the assumption is that these disposal channels will be for the exclusive use of treated effluent. But this rarely happens because cities have more untreated effluent, than treated effluent. So instead pollution happens. And the built infrastructure goes waste.

Given this real-life situation, the sewage treatment system must plan for safe disposal, before it can even be planned for treatment. The following could be options:

- a. Discharge directly in rivers or lakes to add to water quality
- b. Discharge in lakes or other waterbodies designed for secondary treatment for recharge of groundwater
- c. Piped to green spaces for watering
- d. Channels for irrigation in agriculture
- e. Reuse in industry

In each case, treatment plan will be different. But in all cases, the treated effluent will improve the hydrological cycle. It will return water and not waste to the environment.

Rethink the scale of waste treatment to plan for reuse

In this situation where reuse is more important than use, the size of the sewage treatment plant will also matter. If the plant is designed to be big, the cost of operations is reduced, but the transportation of sewage to the plant and the treated effluent from the plant, has a cost. If the plant is designed to be fitted to size – collects the waste of a group of houses, an institution or even colonies – then the cost of operations may well increase but there is substantial saving in the piping and pumping cost.

If the city rethinks the scale of sewage plants, it also has the opportunity to rethink the technology. It can innovate to look for options like bioremediation and microbes to decompose and de-pathogenise its sewage.

Define what recycling and reuse means

The question is what does this recycling mean? What will it cost and how can it be done? Clearly, it is in the interest of the city to find ways to find buyers and users for its sewage. In this way it can work out the effluent profile of its treated effluent and segregate its waste to meet the needs of the end-user.

Recognise and support reuse in agriculture

This is not to say that recycling or reuse is a new idea. In fact, most wastewater of cities is reused in agriculture – cities discharge waste, which farmers, desperate for water use to cultivate. This practice is not recognised or promoted, it just happens by default. As a result this system of reuse of wastewater is breaking down, or it is adding to the load of pollution – this time of the cultivated fields and vegetables that make it back to the city again.

Kolkata, for instance, had an intricately designed system for waste management -- using agriculture and fisheries to reuse its discharge. In this system, the waste is treated at no cost to the city. In fact it provides livelihood benefits to people. This wetland of the city is its kidney and also its sponge – it cleans waste and helps to mitigate floods. But this system is not recognized as essential to its water-waste future. The city, like all others, wants the water for new land to build more houses and more industries.

Similarly in Hyderabad large proportion of the treated and untreated waste is an important resource for the farmers who live in the vicinity. Studies done by the

Colombo based International Water Management Institute (IWMI) estimate that some 40,000 hectares (ha) of land is irrigated using the domestic-industrial waste concoction from the Musi. It is practically the only source of water available for farmers, other than the variable monsoon rain.¹⁷ So, technically, this city, does promote reuse of its wastewater. The problem is that this reuse happens because of poverty of the people living beyond the city and their desperation for water – even wastewater. The use is not planned, so that policy ensures that water used for agriculture meets parameters, which will make it useful for agriculture but not harmful for humans.

It is in the interest of this city and many others, which are drowning in excreta to improve the system of waste to wealth. It would require cities to segregate industrial waste from domestic waste. It would then require treatment of waste to remove pathogens and to meet parameters for discharge on land. It is important to note that treatment of waste for reuse in agriculture will be cheaper for the city, than cleaning water for reuse in drinking or industrial use. But this requires that this strategy for reuse is part of the grand design to clean waste of the city, not just its unintended consequences.

Plan tertiary treatment carefully

Cleaning sewage for reuse in industry or even domestic requires tertiary level treatment – using reverse osmosis membrane and other technologies. This is expensive, but not unaffordable, given the reality of water in the country.

There is insufficient experience in the country of building and running large plants, capable of tertiary treatment, but small plants – 2-10 mld are being built. In this case, the capital cost of the tertiary treatment plant, which is designed to treat sewage, which is already cleaned to the secondary level, is roughly three times more. But compare this cost to the cost of bringing water to the city – Hyderabad notes that bringing Krishna water will cost it Rs 18 kl.

The challenge is also to find ways to treat sewage to turn it into clean water at affordable rates – reinvent technologies so that instead of expensive reverse osmosis options, the cycle of waste to wealth is made cheaper and easier. This can be done by segregating the waste stream – taking out toxic chemicals at the source itself. It can also be done by changing technologies for treatment, using bioremediation and other coagulation options. This is important because reverse osmosis is becoming the mantra that could well fail.

Current practices in recycling

Chennai has the distinction of having the country's first recycling project – the city's sewage was sold to the Chennai Petroleum Company Limited (CPCL), which in turn used reverse osmosis technology to filter sewage and turn it into water for its use. In this water-scarce region, the refinery found the option viable. In 1990, when the plant was commissioned, CPCL (then Madras Refinery) spent Rs 25 to build this 12 mld plant. It costs the company Rs 28 kl to turn treated sewage into usable water. But this cost is cheaper as compared to the commercial and industrial water rates of MetroWater. More importantly, it is reliable. Even when there is no water to source, there is always sewage to buy.

Cities are also building the concept into their policies. But uncertainty and confusion abounds – nobody is clear why and how they will implement recycling and reuse.

The first response of cities has been to ask for the separation of water – black (sewage) and grey (wash and kitchen) in homes. This requires houses to construct

dual pipe systems – one outlet for sewage and another for the rest. But it is expensive to install and the city direction asking for this to happen has been more or less neglected.

In February 2010, the town of Nanded in Maharashtra issued orders to revise its development control regulation to include grey water recycling systems. The byelaws are applicable to all housing, commercial and industrial premises more than 2000 sq metres or if the water quota is more than 60,000 litres/day. In these regulations, the waste from the toilets needs to be separated from grey water – bath and kitchen waste and taken into a separate discharge system. This grey water is then to be recycled and reused for non-potable purposes. The house or institution owner, who has done grey water recycling will be entitled to a rebate in the water, sewage tax. This is after the municipal officer is satisfied that the building or residential structure “has successfully reduced their potable water consumption by a specific percent.”¹⁸

Nanded is not the first city to do this. In 2009, Rajkot amended its byelaws making recycling mandatory for buildings more than 270 sqm. Again, the purpose was to separate out the grey from the dark water and to encourage use of this ‘reusable’ water for non-potable purposes. Under JNNURM 46 cities have included byelaws on reuse of recycled water. However, implementation of this dual piping system is still a challenge.

In India cities are also beginning to look at the potential of their sewage for water. But as yet the implementation is hesitant, small in scale and unclear of the purpose. Bengaluru treats its sewage to tertiary level. It has installed small plants – 1.5 mld -- in its prestigious green spots of Cubbon Park and Lalbagh. But the question is why it would need to treat water to this ‘tertiary’ level for its gardening needs.

Similarly, the planned city of Chandigarh has announced a policy to recycle its wastewater. The city has already commissioned a project to treat 90 mld sewage to tertiary level for use in its parks. But the capacity created is hardly used – roughly 30-36 mld – because the city does not have the requisite pipes to take back the treated water to the gardens spread across the city. The location of the sewage treatment plant is such that the city would require an extensive pipe system to first bring sewage for treatment and then to take back the treated sewage for gardening.

It would possibly be more feasible for the city – with huge garden and open spaces – to implement a rainwater harvesting system to recharge groundwater, which can be used for watering green spaces. This local water harvesting, done without pipes to transport water and then sewage, would be cheaper and sustainable. Therefore, while planning recycling, other options such as rain water harvesting need to be examined

Modern Delhi inherited a sewage reuse system, designed by its Colonial masters, which uses only raw water for gardens. Now the city, a guzzler for water, finds that it needs new solutions. It has a number of sewage treatment plants but no strategy for reuse. In this case treated effluent is mixed with untreated effluent and pollution gains are lost. So it is trying to look for buyers for its waste. But without an initial plan made when the sewage plants were built, this is turning out to be difficult. The plants are situated where there is no industrial buyer or no green space, which can be watered. As a result it has only found takers for 256 mld of treated effluent (as against over 1500 mld it cleans). In addition it has signed agreements with two power stations in the city, which will take another 265 mld off its hands. The city is selling treated water at Rs 4 per kl and the power plant will install the tertiary treatment system.

The policy for recycling must be part of water supply system

What is clear is that cities must plan for reuse and recycling of waste at the very beginning of their water and waste plan. It cannot be an after-thought. It is also clear that cities must think through the plan for reuse for affordability and sustainability. The diverse options for reuse must be factored in – use in agriculture, for recharge of waterbodies, for gardening and for industrial and then domestic use.

But the bottom line is clear; if Indian cities do not learn the science and art of living with scarce water then there is trouble ahead. Indian society is a water prudent society today because it is poor. As it gets rich it will have to learn not to first waste and then clean up.

11. Recommendation: Build capacity at all levels and explore institutional and management options which work for water and sanitation in cities

It is clear and often repeated that Indian cities need capacity to take managerial and technological decisions regarding essential public services and to implement and deliver these services to all. This internal capacity is even more important in the situation where many elements of the urban services are to be contracted to private companies.

There is no best model that is currently in place to manage water and sanitation services in the country. Therefore, what is needed is to build internal capacity to measure, to review, to implement and to monitor these services, with the objective of providing water to all and taking back and treating and reusing sewage of all. The challenge is to find models of service delivery and technologies that are affordable and sustainable. Therefore, the 12th Five Year Plan needs a deliberate and innovative strategy to build this capacity to plan and implement such a strategy.

In this context, the working group would suggest the following:

- a. To greatly build internal capacity at the Union Ministry of Urban Development and CPHEEO to be able to provide guidance and effective monitoring of funded projects.
- b. To build capacity of municipal officials and engineers to implement innovative and emerging technologies and approaches in water and sanitation.
- c. To strengthen state and city level water supply and sanitation institution.

C. Proposal and fund outlay suggested for 12th Five-Year-Plan

As the report clearly suggests, the funds required for this sector – urban water and sanitation – will be substantial. India has a huge backlog in building infrastructure, particularly in the field of sewage and pollution control. Please see the report for details of the unmet challenges of water and sewage in our growing and expanding cities. It is also clear that without this investment, there will be implications for public health, as the burden of dirty water is enormous and crippling. It is therefore, clear that this high financial outlay is necessary.

It is also clear from the available assessment that the private sector will not bring in the necessary funds for this sector. Please see the report for details of the current PPP models and their functioning in the country.

In this context, that this working group is proposing that the most important pre-conditions for the sector has to be to ensure that the funds allocated and used are spent to get the maximum benefits. The objective has to be to ensure affordability and sustainability of these schemes.

It is for this reason that we are suggesting that the 12th Five Year Plan must focus on the conditions required for better implementation of the schemes and to ensure their effectiveness.

Our proposal for:

Second-generation JNNURM in the water, sanitation and sewage sector: designed for affordability, sustainability and meeting the needs of all

	Programme and performance condition for funding of new projects	Non-negotiable conditions
1	Evaluation of physical losses anticipated in supply of water from new sources	
2.	Evaluation of cost of delivery of water from planned source, including cost of electricity needed for distribution	
3.	The mapping of local water sources, including local aquifers and their recharge for water supply	No funds for water supply until there is legislated protection of current water sources, like lakes and their catchment
4.	Assessment of groundwater usage, including private groundwater usage in city water supply	
5.	Ensure equity of clean and potable water supply to all	No funds for water supply projects without a mapping of inter-city water supply and ensuring equity of supply to all
6.	Plan for reduced leakage and usage of water in cities with measurable benchmarks	Metering of bulk water distribution points with MIS on leakage report and metering of commercial water users and recovery in first stage.
7.	Plan for tariff recovery and costing to include water supply and sewage	
8.	Plan for sewerage interception, conveyance and treatment	No funds for water supply, unless there is a combined plan for sewage management, which is both feasible and sustainable
9.	Plan for sanitation for all in the city	No funds for water supply, unless there is a combined plan for provisioning of hygienic and environmentally friendly sanitation for all and for sewage management

10.	Plan for pollution control of water bodies in the city	No funds for water supply must be linked to plan for pollution control of water bodies in and around city. Funds will be conditional to meeting the pollution parameters
11.	Plan for stormwater drainage as flood mitigation and recharge measures	
12.	PPP contracts must include water and sewage provisioning	
13.	PPP contracts must not take away right of state to invest in alternate or supplementary water sources	
14.	Public or private investment in water and waste infrastructure must plan for financial sustainability	
15.	Current PPP contracts in this sector must be carefully evaluated for lessons learnt before more schemes are sanctioned	
16.	Plan for full waste reuse and recycling	No funds for water supply or sewerage, unless there is plan for affordable and feasible full recycling and reuse proposal

Annexure 1
Table: The sewage ladder: costs of treatment

Technology	Name and place	Capacity (mld)	#Land (ha/mld)	#Capital cost (Crore/mld)	O&M costs (Rs/kl)	Energy consumption (kWh/mld)	Power costs (Rs/kl)	Total O&M costs (Rs/kl)
Waste stabilisation ponds	Mathura (mid-1990s)	12.5	1.12	0.35	0.60	Negligible	--	0.60
	Howrah	30	0.78	0.24	0.80	Negligible	--	0.80
Activated sludge	Okhla – Delhi (mid-1990s)	72	0.15	0.26	4.40	211		4.40
UASB	Agra (2003)	78	0.26	0.24	0.70	11		0.70
Advanced Aerobic Biofiltration process (Effluent BOD ₅ < 10mg/l, TSS < 15 mg/l)	Sen Nursing Home and Delhi Gate-Delhi* (2003)	2 x10	0.04	0.50 (as in 1995)	1.73	220-284	1.28	3.01
High Load ASP + Aerobic Biofiltration process & Cogeneration (effluent BOD ₅ < 15mg/l, TSS < 20 mg/l)	Rithala-Delhi (2003)	182	0.05-0.08	0.40 (as in 1995)	0.87	215	0.38 (from Grid)	1.25
ASP with Nitrification and Denitrification (Effluent BOD ₅ < 20mg/l, TSS < 30 mg/l)	Raja Canal-Bangalore *(as in 2002)	40	0.13-0.23	0.80	0.57	197	0.74	1.31
Sequential Batch Reactor/C-Tech	Haridwar 2011);	27		0.8				
Tertiary treatment (after partial Secondary Treatment, BOD =80 mg/l, TSS=100 mg/l)	TTP at V Valley-Bangalore (as in 2002)*	60	0.02	0.50	1.14	144	0.54	1.68

Extended Aeration + Tertiary Clarification + Sand Filtration + UV	Lalbagh-Bangalore (2005)*	1.5	0.25	2.00	5.11	950	3.63	8.74
Membrane Bioreactor (MBR) (Effluent BOD ₅ < 5 mg/l, Turbidity < 2 mg/l)	Cubbon Park-Bangalore (2005)*	1.5	0.19	3.00	5.48	1,100	4.13	9.61

Source: NRCDC 2009, Compendium of sewage treatment technologies, National River Conservation Directorate, MoEF, GOI, August

**Mukesh Grover 2011, Degremont; water treatment technologies and a case study of 635 MLD water treatment plant at Sonia Vihar, Delhi, presentation at Ministry of Urban Development, New Delhi, mimeo

Annexure 2

Additional Comments received from Shri Shripad Dharmadhikary, Manthan Adhyayan Kendra and Shri Himanshu Thakkar (SANDRP), members of Working Group on Urban and Industrial Water Supply and Sanitation

We are sending this note to be read with the Final Report of our Working Group on Urban and Industrial Water Supply for the 12th Plan. We think that the Report makes many important points. However, we are disappointed that some of the key issues, like Water as Fundamental Human Right have not been articulated strongly enough in the Report. Moreover, we have serious problems with the articulation of the issue of privatisation.

This is particularly disappointing as we had made specific comments related to these issues when the Draft Report had been circulated, but we find that these comments have not been incorporated into the Final Report.

In particular, we would like to elaborate on few points that we find problematic with the Report. There are other points where we have issues with the Report, but we are giving here only a few points that we feel are the most significant.

1. The recommendation that right to adequate and clean water should be included as a fundamental human right has not come out strongly enough. We feel - and we think this feeling was shared in the group - that this was to be one of the central recommendations of the Report.

Secondly, as we had discussed in the Group, and as we had also pointed out in comments on the draft, the Group should recommend a multi-tiered safeguard structure that would go a long way in ensuring that water supply systems are accountable and effective. This would include a Constitutional Right to Water, legislation(s) according legally mandatory status for adequate quantity and quality of water supply and other service parameters and licensing conditions for water supply utilities that mandate specific service standards.

Without such a legally binding mechanism, there is little chance of implementing and ensuring proper water services.

2. In case of privatisation and PPP in water supply, we think that the Report has missed out on highlighting the many serious problems of privatisation and PPPs and has neglected the serious implications of these problems. As a result, its recommendations are weak.

In particular, its recommendation that the private sector already plays a key role in water and waste services as a contractor to the public utility to build and even operate key components of the system and "this role must be recognized and indeed encouraged" is not what we would agree with.

We had already conveyed the recommendation that "there should be no privatisation in the drinking and municipal water supply systems". Even if some members of the Group find this as an "extreme" stand, this stand should have been noted in the Report. At the least, the Report should have then stated that there was a diversity of perspectives about privatisation, with views ranging from "no privatisation" to other views. However, we also believe that even if some members of the Group may not endorse the stand of "no privatisation", there was in general fair amount of skepticism regarding privatisation and many serious questions that were expressed in the Group. The Report does not reflect this.

At the least, we think a recommendation of "*no privatisation and PPP till (a) adequate constitutional and legal safeguards as expressed in 1 above are in place and (b) till a more rigorous independent analysis of the pilot projects already being implemented is done.*" was clearly warranted.

3. The report does not address the crucial issue of governance of urban water supply and the need to address the serious problems that plague the current governance in this sector. In fact addressing these governance problems is key to achieving any significant improvement in urban water systems. Without addressing the fundamental governance problems in this sector, any amount of financial resources, any technological changes, any amount of new infrastructure or any amount of water will have limited usefulness. Broadly, we would like to define the governance problems plaguing this sector as lack of participation of the urban water users at various levels from bottom to top and from needs assessment to operation and maintenance. Secondly, there is lack of transparency in the way this sector is governed at various levels and various stages. Thirdly, and related to these two is the issue of institutionalising accountability norms and mechanisms to ensure that serious problems are identified and those responsible held accountable in a timely manner.

4. During the functioning of the group, specific group members were given specific tasks on specific issues. For example, there was the issue of need to ensure better environment governance (at various stages including at environment impact assessment, compliance, among others for Urban water and sanitation projects including large dams for this sector), then there was the issue of institutional and governance reforms required in the sector. On these issues notes were prepared by the specific group members and handed over to the members of the group. The conclusions of such notes should have been included in the report. At the least, such notes should also be attached with the report. We are attaching herewith four notes in the preparation of which we were involved. These relate to Institutional Reforms, Urban Water and EIA, Right to Water and Water Quality, and Privatisation and PPP.

In conclusion, we appreciate the difficulty of putting together a report based on views of so many different people. However, we think that if we had had a meeting after the first Draft Report was circulated, and used the meeting to formulate 3-4 pages of Agreed Conclusions and Recommendations, this difficulty would have been greatly addressed.

As such, now we have some difficulty in fully endorsing this Report, even though it has many important points that we agree with. Ideally, we would suggest that even now, if we can have a meeting as above to discuss and agree on the key conclusions and recommendations, that would be the best. Else, we would request to please take on board these views and recommendations by including this note in the Report.

**Shripad Dharmadhikary, Manthan Adhyayan Kendra (manthan.shripad@gmail.com)
Himanshu Thakkar (SANDRP) (ht.sandrp@gmail.com)
November 14, 2011**

Copy to: Dr. Mihir Shar, and All Members of the Group

Attached:

1. Institutional Reforms Note
2. Note on Urban Water and EIA
3. Consolidated Note on Right to Water and Water Quality
4. Points related to PPP in Domestic Water Supply

Institutional Reforms¹

Background

The urban water supply and sewerage (WSS) utilities² in India suffer from lack of democratic governance leading to poor quality infrastructure and service delivery. Barring a few exceptions, no city is found to be performing well when measured against standard performance indicators. They are in general poorly managed, operate with huge inefficiency, non transparent, non participatory and unaccountable governance, tariffs well below cost recovery levels particularly from the well to do and therefore are struggling financially and lack the governance structure and pressure to improve performance.

The water sector has considerable emotive appeal amongst different stakeholders. Because water is so important in people's lives it is understandably exploited for political reasons. Not all non-performance issues can be explained by political interventions. The lack of service orientation, poor accounting or asset management practices are some key shortcomings which cannot be attributed to political involvement. The grant or donor-based funding approach to capital investments with built-in presumption of undemocratic governance and on non-recovery of user charges has not subjected the utility managers to the discipline.

In water, there is a greater emphasis on infrastructure creation rather than improving service levels. The sector goes through several investment cycles but seldom have the utility managers been made accountable for past investments and the service levels delivered. The absence of pressure to perform has over period of time blunted the ability of the utility managers to manage water supply operations effectively and efficiently. The gradual decay in managerial capacity and inadequate accountability makes a potent combination for non-performance.

A well governed and efficient water utility is at the core of the reform process. The roadmap for utility reform needs to break the vicious circle of unaccountable investments, low recovery and poor levels of service. The need for democratic governance and financial viability has been under-emphasised and neglected in the past. The costs of neglect, which are cumulative, will take a longer time to get corrected. Accordingly, the reform process will be lengthy and no quick turnaround can be expected.

Sector Reforms in the past

The response to governance or performance improvement is often seen as an external intervention required. Solutions such as developing PPP models or more providing grant funding are often explored to address the problem of performance improvement without addressing the governance issues. In absence of serious attempt to improve governance and internal drive for performance improvement, the external interventions planned would not be effective.

The first step for any governance or performance improvement planning exercise is understanding current governance model and performance metrics in a reliable manner. But the governance system or performance matrix of a water utility is seldom reliably known today. Governance or Performance improvement planning will be meaningful and optimum only if the existing governance and performance

¹ Note made for the 12th Plan Working Group on Urban Water and Sanitation, by Abhay Kantak and Himanshu Thakkar

² The term utility here refers to a generic term implying urban local bodies, state departments, boards or any other institution responsible for providing water supply and sewerage services

assessments are reliable. JnNURM has sanctioned and approved projects worth Rs. 66,000 crores in the water and sanitation sector. In the absence of reliable governance parameters or performance data, choice of projects approved for funding may not be optimum. These projects are often designed to create assets rather than improving governance or service delivery. Today many of the projects are encountering problems in implementation on account of unaddressed governance issues and unreliable baseline performance data.

The absence of pressure to improve services is also holding back key urban reforms. For instance cost of service provision is not reliably known. Improper classification of revenue and capital expenditure can distort the measurement of costs incurred to provide services. The migration from single entry accounting system to double entry accounting system³ can allow utilities to capture cost of service provision more accurately. But seldom do we see utilities migrating to double entry voluntarily. It requires an external driver like JnNURM which pushes utilities to adopt double entry accounting system. Even where the utilities have migrated to double entry accounting system it is undertaken more as a check-list approach rather than using the new accounting system for decision making purposes. A utility internally driven to improve performance would demand double entry system on its own rather than undertaking it as a compulsion under a reform-linked incentive fund like JnNURM.

Internalising the Utility Reform Agenda Key to Improved Governance and Sector Performance

The governance of urban water sector is non transparent, unaccountable, with no mechanism for the citizens to participate in the governance in a bottom up, direct, legally enabled way. A significant proportion of the urban people still do not have easy access to reliable water services and citizens do not even get to know why this is so, who are responsible for this state of affairs and how such persons can be held accountable and issues addressed in a transparent way. Quality and reliability of service is a serious issue for consumers being served. The current undemocratic and soft financing approach is not serving the existing consumers well and jeopardising the ability of the system to meet the demands of the unserved consumers. Nor is this approach allowing the scarce public funding available to be supplemented by funding from commercial sources.

Often in the past government grants or PPP interventions have been the starting point or prime drivers of utility reform. These interventions even where needed, would not help unless governance of the utilities is improved and democratised. Utilities today have poor operating performance, high inefficiencies and weak managerial capacities. The focus of the utility at this stage should be to improve governance and internal efficiencies. The utility should target bringing transparency in their functioning, bringing in legally backed mechanisms for involvement of citizen representatives in ground level subsystems (e.g water supply in each colony, zones and district, each water treatment plant, STP and solid waste management unit) federated upto the utility level, improvement in collection efficiencies, reducing apparent water losses, quick reduction in technical losses and visible improvements in customer service. These improvements are the core of utility operations. Reduced costs and increased revenues provide the utility additional commercial freedom to undertake small capital investments. The cycle of improved governance, commercial efficiency improvement and small capital investments can contribute to gradually increasing utility performance.

³ The mention of double entry accounting system is only by way of illustration.

The momentum generated by the internal reform process for performance improvement when supplemented by large scale external public or non-public funding will improve sector performance.

Designing the Institutional Structure which will internalize the reform process

The objective of the reform process is to make utilities more accountable for service delivery directly to the people at large. The institutional reform design should serve to achieve this objective. Water being a State Subject has resulted in different states having different institutional structures for service delivery. There are three institutional service delivery models which are prevalent in the country. They being:

i. Urban Local Body as the service provider and creator of capital assets

Here the water supply operations are housed within the urban local body (ULB). There is a water supply department within the ULB which provides this service. The responsibility for both capital and O&M is with the ULB. The surplus of the general budget is generally used to balance the deficit in the water supply account.

This model is prevalent in states like Andhra Pradesh (barring Hyderabad metropolitan area), Maharashtra (except in 25 of the 250 ULBs), Gujarat and Madhya Pradesh.

ii. City-level parastatal as the service provider and creator of capital assets

Here the water supply services are provided by city-level parastatal. The provision of water supply and sewerage services is only mandate of the parastatal. The responsibility for both capital and O&M is with this city-level parastatal. This model is seen in Bangalore, Chennai, Delhi and Hyderabad. In the case of the Delhi, the Delhi State Government underwrites 50% of the O&M expenditure by the city-level parastatal viz. Delhi Jal Board. In all the cases, the state government provides funding for capital works.

iii. State-level parastatal as the service provider and creator of capital assets

Here a state level parastatal provides water supply services in all the urban areas in the state. The provision of water supply and sewerage services is the only mandate of the parastatal. The responsibility for both capital and O&M is with this state-level parastatal.

This model is prevalent in states like Haryana, Rajasthan, Kerala, Uttar Pradesh, Uttarakhand, and Orissa. In Uttar Pradesh the agency involved in capital works in a city and that involved in O&M functions are different. Both these agencies though are controlled by the state.

The key learnings for from review of the institutional service delivery options are:

- A single point responsibility is preferable as compared to splitting up of investment and O&M responsibility.
- A city level specialised agency for water supply and sewerage increases the possibilities of better governance, cost recovery, atleast at the level of O & M. Ring fencing of the water supply and sewerage services budget can also achieve similar results, provided governance issues are addressed. *Ring-fencing implies that the water supply and sewerage operations revenues should cover the expenditure requirements. The transfers from the general account if any should be*

pre-determined and should not act as an amount to balance the deficit and should be conditional to improvement of governance.

- The department involved in water supply operations should have dedicated personnel with the requisite skills and training and should be accountable to the people at large
- A hard budget constraint can be introduced by ring fencing the WSS operations from the general budget. The Municipal Law should be able to limit the budgetary support from the general budget to the WSS budget.
- If these measures do not improve service standards within a specified time frame, the WSS operations can be housed in a separate entity under the ownership of the ULB. This separation will increase the financial vulnerability of WSS operations to under performance.
- In case of continued failure of WSS operations to improve governance and services, the state government can recommend measures including third party service delivery options.

In some of the institutional models discussed above many of the institutional design proposed are present or need to be suitably modified to be more effective.

Sr. No.	Institutional Structure	Remarks
1.	ULB Model	<ul style="list-style-type: none"> • A legally empowered mechanism to ensure greater transparency, bottom up participation and accountability in the working of ULB needs to be ensured as a first step. Local communities and other independent groups and citizens must have effective say in achieving this in an institutional way. • Some ULBs may have a separate budget for water supply and sewerage (WSS) operations but they are not ring-fenced. <ul style="list-style-type: none"> - <i>There is a need to ring-fence the WSS budget</i> • Staff for WSS operations may not always be dedicated or if dedicated transferable to other departments <ul style="list-style-type: none"> - <i>There is a need to have dedicated staff with requisite skills and training to manage WSS operations</i> - A step-forward is to have an autonomous entity under the control of the ULB dedicated to WSS operations

Sr. No.	Institutional Structure	Remarks
2.	City-level model	<ul style="list-style-type: none"> • A legally empowered mechanism to ensure greater transparency, bottom up participation and accountability in the working of ULB needs to be ensured as a first step. Local communities and other independent groups and citizens must have effective say in achieving this in an institutional way. • The budgets are ring-fenced; as WSS operations are the only responsibilities of the city-level parastatal • Staff is dedicated for WSS operations and has requisite skills. • Only in the case of DJB, O&M operations are under-written to the extent of 50% hence removing the pressure to perform or have 100% cost recovery on revenue account.
3.	State-level model	<ul style="list-style-type: none"> • A legally empowered mechanism to ensure greater transparency, bottom up participation and accountability in the working of ULB needs to be ensured as a first step. Local communities and other independent groups and citizens must have effective say in achieving this in an institutional way. • Budgets are ring-fenced at the state level; city level ring-fencing is absent. <ul style="list-style-type: none"> - <i>City-level ring fencing on accounts is essential</i> • Separation of O&M and capital works functions creates distortion in asset creation and service level requirements. <ul style="list-style-type: none"> - <i>O&M and capital works responsibility to be housed in a single agency which is dedicated to a particular city.</i>

Government Support to Utilities During Transition Phase

As mentioned earlier, government support to utilities has been provided without an internal reform momentum to democratize governance or improve performance. Legally enabled mechanism described above and Ring-fencing is expected to bring about the pressure for the utility to develop performance-oriented culture. At this stage the utility may continue to require budgetary support. By providing performance (which will firstly include improving governance) linked budgetary support, the Governments will introduce the next critical structural change. In the medium term utilities will continue to be dependent of the public budgetary support for meeting the

capital requirements. The extent of such support to be made available and timing of such payments needs to be communicated to the utilities and should be in step with the governance improvement. This will allow the utility to plan its capital expenditure and operations well.

The utility should build sound databases and systems including bulk water metering at each subsystem interaction, all readings of such metering being in public domain, baseline system maps, costing systems and financial management systems. The utility should also benchmark itself with its peers to identify areas of improvements and implement best practices in participation with the citizens.

Moral hazard can result in utilities turning to its old ways given the government's willingness to periodically write-off utility debts. As part of the reform process, the extent of write-off can be linked to per-determined governance and performance milestones that the utility would need to achieve as per the agreed timelines. A moratorium of the unpaid liabilities in the intervening period can be put in place.

For the identified governance and performance improvement milestones in the performance contract signed with the government, the utilities need to prepare a credible governance and performance improvement plan. The governance and performance improvement plans will be an aggregation of minor and major steps and projects leading to the achievement of the governance and performance targets. A critical component of the improvement plans will need to be process improvements which can result in additional revenues or cost reductions without any significant capital expenditure. The increase in consumer base through simplification of the new connection application process or identifying un-authorized connections and legalizing them by a one-time penalty are some measures that the utility can take-up as an immediate priority.

For the identified projects which are not commercially viable but necessary as part of the social obligations grant funding can be utilized. The utilities can structure such projects for funding from commercial sources and part funding using government grants. The intergovernmental transfers can be seen as incentive to improve governance and viability gap funding that is made available to the utilities.

The governance and performance improvement areas for the utilities will be several. Constitution of governance committees at the lowest subsystem in different sub sectors, federated up to the Utility level, Reduction in non-revenue water, increasing the consumer base and reduction in operational costs can be some of the identified areas of intervention. Availability of skills or capacity can be a constraint for the utility for governance and performance improvement through such interventions. The utility can engage the outside experts including the private sector through service or performance contracts for making such interventions possible.

Phased Approach for Utility Institutional Reform

There would be a phased approach to reforming the existing institutional governance and service delivery model. If the utilities do not perform as desired within a specified time-frame, a modified reform model would be thrust upon them which will reduce their control over WSS operations. In the event no improvement is reported in their governance, operations and service delivery, then appropriate consequences should follow including the option of engagement of a private operator.

Phase I – Immediate: Of the models, ring fencing of the UWSS operations is the bare minimum that needs to be enforced. There needs to be a transition period for

the utility to completely ring-fence its WSS operations. In the transition period, the ULBs will be expected to improve their governance, service levels and also improve cost recovery.

Phase II – Three years from launch of reform process: Ring-fencing aims to improve financial sustainability of operations. It does not guarantee service improvement. A time-frame needs to be given to the utilities for improving governance, service levels and sustainability of operations under a ring-fenced framework. If there is no significant improvement, the state governments through its powers transfer the entire WSS operations to separate entity under the ULB. The state government will ensure

- a. Democratic governance as described above.
- b. cost recovery tariff. If this is not implemented at the intervention of ULB, the ULB will be required to provide cash transfers as a substitute
- c. service standards. Appropriate accountability measures will be recommended by the state government for linking service standards to tariff (or) financial support.

Phase III: Five years from launch of reform process: Continued shortfalls in governance or performance can result in the state government recommending appropriate steps including the option of transfer of WSS Operations to a third party arrangement (PPP).

Brief note for the 12th plan working group report on Urban and industrial Water Supply and Sanitation⁴

Recommendation 1: All large dams (as per ICOLD/ WCD definition) for urban and industrial water supply should require environment clearance under the EIA notification of Sept 2006

Note The Sept 14, 2006 EIA notification lists "LIST OF PROJECTS OR ACTIVITIES REQUIRING PRIOR ENVIRONMENTAL CLEARANCE" under a schedule defined in the Notification. Section 1(c) of this schedule is for River Valley projects. This section includes only hydro projects above 25 MW and irrigation projects. Thus any large dams built for industrial and urban water supply stands excluded. This is a serious anomaly, since it is not the purpose of the river valley project that decides the impacts. Huge projects now being proposed/ built for urban and industrial water supply do not require environment clearance. Hence there is also no Environment Impact Assessment and no public hearings. Recent Examples: Kalu dam in Thane district in Maharashtra, with submergence area of over 2100 ha and storage capacity over 457 Million Cubic Meters do not require EIA, PH or EC. Shai dam project in the same region also involves massive dam. Both projects are for urban and industrial water supply for Mumbai and surrounding areas. There are several other huge projects planned for urban and industrial areas in various parts of the country, which won't require EIA, PH or EC if the EIA notification as mentioned above is not amended.

The EIA, PH and EC process is useful in not only screening unviable, expensive and non-optimal projects, it is also a process through which the planners, decision makers and affected people get to know the impacts of the proposals and this helps taking and informed decision. The process also helps provide a window of opportunity for the local population to know about the project and its impacts. The EIA compliance process during the implementation phase also provides opportunity for corrective measures.

All this would also help in weeding our unviable or unacceptable projects and would also help achieving optimum, informed decisions. Thus it would also be in the interest of the better decisions for the Urban and Industrial water supply projects.

FOLLOWING RECOMMENDATION WAS NOT DISCUSSED AT THE MEETING ON JUNE 9 (THAT I ATTENDED), BUT I AM ADDING IT BY WAY OF ADDITIONAL SUGGESION FOR CONSIDERATION OF THE WORKING GROUP

Recommendation 2: Any project taken up in the Urban local body area that affects the existing local water systems, lakes, ponds, wetlands or flood plains should be included under EIA notification under category B project.

Note Category B projects under EIA notification require state level environment clearances after due process of impact assessment and public consultation. This amendment in the EIA notification could help provide a check against destruction of local water bodies, which faces no hindrance or checks currently. This will also provide an opportunity to assess impacts of the projects that destroy such bodies and also provide some space for public consultations and weeding our non optimum, undesirable projects. This has the potential of providing some protection to the local urban water bodies, lakes, tanks and wetlands.

Himanshu Thakkar (ht.sandrp@gmail.com)

⁴ This note was prepared following decision by the Working Group in its meeting on June 9, 2011

Note on the Right to Water and Mandating Water Quality and Quantity Norms

Introduction: India's constitutional-legal-policy regime does not explicitly recognize the right to water as a basic human right. This right is recognized only implicitly with the Supreme Court's interpretations of the Article 21 of the Constitution as right to life with dignity.

Water is most basic to survival of all life, including human. It is also critical to life with dignity. In spite of this, India's constitutional-legal-policy regime does not explicitly recognize the right to water as a basic human right.

This right is recognized only implicitly with the Supreme Court's interpretations of the Article 21 of the Constitution as Right to Life with dignity. See for example the following observation of the SC in the *NBA* judgment.

"Water is the basic need for the survival of the human beings and is part of right of life and humans rights as enshrined in Article 21 of the Constitution of India and can be served only by providing source of water where there is none. The Resolution of U.N.O. in 1977 to which India is signatory, during the United National Water Conference resolved unanimously *inter alia* as under:

"All people, whatever their stage of development and their social and economic conditions, have the right to access to drinking water in quantum and of a quality equal to their basic needs.....

"It is a matter of great concern that even after half a century of freedom, water is not available to all citizens even for their basic drinking necessity violating human right resolution of UNO and Article 21 of the Constitution of India."

Judgment, Supreme Court of India 18 Oct 2000 in *Narmada Bachao Andolan vs Government of India and Ors. WP319/1994*

Further, exhaustive drinking water quality standards exist in the country but these are not mandated or implemented through a statutory framework. Currently, standards are merely recommendatory in nature, except for the bottled drinking water industry.

1. Implications

Implications of the non-recognition of the fundamental right to water are:

- a. No legally binding responsibility of the state to ensure provision of water to people
- b. Far lesser accountability of the state in provision of water to the people
- c. People cannot ensure the provision of water through the use Courts
- d. A more casual and less serious approach followed by the state (including Central, State level and local level governments) in provision of water
- e. All this has been significantly responsible for the fact that millions of people do not have proper access to water for basic needs.

2. Need to explicitly make water a fundamental right

- a. There is an urgent need to make the Right to Water a fundamental right under the Constitution. This will ensure that the state is legally bound to provide water to all citizens.
- b. The Right to Water should cover basic needs like Right to Water for Drinking and Domestic needs at the least. There is also a case for extending the Right to Water to cover livelihood and other needs, but this can be done in phases.

- c. The Right to Water should include right to Adequate and Clean water. (Both quantity and quality should be covered).
- d. If this process is to take time, legislation should be enacted making the Right to Water a legal right, pending its becoming an explicit Fundamental Right.

3. Similar Right to Sanitation should also be enshrined in the Constitution

Sanitation is another basic human need, and necessary for life with dignity. However, situation with regards sanitation is even worse than that of drinking and domestic use water. Hence, this also should be enshrined in the Constitution as a fundamental right, either as a part of the Right to Water, or a separate right.

4. UN has Recently Recognized The Right To Water And Sanitation

- a. On 28 July 2010, the General Assembly of the United Nations passed a resolution recognising "the right to safe and clean drinking water and sanitation as a human right". India voted in favour of this resolution.
- b. The UN has earlier recognized water as a human right, but implicitly, as a part of the right to adequate standards of living, in the *International Covenant on Economic, Social and Cultural Rights* adopted by the General Assembly in 1966.
- c. Thus, the recent resolution marks an explicit recognition of water and sanitation as a human right.
- d. It includes the right to "safe and clean" water.
- e. Since India voted in favour, it has clearly agreed to this explicit recognition at the International level.

5. Right to Water Will Improve Situation

The explicit recognition of the Right to Water and Sanitation will improve the situation in many ways:

- a. It will ensure that many groups of people who are denied water and sanitation today due to distorted legalities will be entitled to water. (E.g. slumdweller in "non-recognised" or "illegal" slums, homeless people, people who cannot pay for water under privatized regimes etc.)
- b. It will make it more difficult to deny water (or access to water resources) to any particular group of people on the basis of caste.
- c. It will place a legally binding responsibility on the state to provide water and sanitation to every citizen.
- d. In other words, it will create an explicit legally binding entitlement, and on the other hand will explicitly prohibit arbitrary denial of water and sanitation.
- e. It will tremendously improve the accountability of all agencies charged with provision of water and sanitation.
- f. It will help enforce the prioritization of water use. The Government of India's Water Policy and all State Water Policies put drinking water as the highest priority for

allocation of water. However, in practice, this is often sidelined by other interests. A right to water will help implement this prioritization.

- g. It will help communities and people that need water for basic needs to resist appropriation of water resources for and by more powerful interests and needs.

6. Current Legal Status of Drinking Water Quality Standards in Urban India:

The Standards/Norms: Drinking water quality standards/norms for water supply is not mandatory and differing norms are adopted by urban and rural local bodies in the country.

- a. *Bureau of Indian Standards:* The most important water quality standard in the country are the Bureau of Indian Standards (BIS) IS:10500, which were prepared by the BIS with the objective of assessing the quality of water resources, and to check the effectiveness of water treatment and supply by the concerned authorities. In the formulation of this standard, assistance has been derived from the following other standards: a) International Standards for Drinking Water issued by the World Health Organization, 1984, b) Manual of Standards of Quality for Drinking Water Supplies, Indian Council of Medical Research, 1971, c) Manual on Water Supply and Treatment (third revision), Ministry of Urban Development, 1989.

“The drinking water standards were laid down for the first time in 1983 and these were revised and updated in 1991 (IS 10500) and presently these standards are again under revision. The standards for packaged drinking water (IS 14543) were first formulated in January 1998, according to which the standards as far as pesticides are concerned were specified as ‘below detectable level’. Based on the decision of the Drinks & Carbonated Beverages Sectional Committee, FAD 14, second amendment was issued in September, 2000 incorporating new packaging materials, new techniques etc. Thereafter, Gazette Notification, GSR No. 760(E) dated 29 September, 2000 was issued by the Ministry of Health & Family Welfare incorporating packaged drinking water standards under the PFA Rules and making the BIS certification mark on the product compulsory *w.e.f.* 29 March, 2001. However recently after the report on the presence of pesticides was brought out by the Centre for Science and Environment— a non-governmental organisation—the standards were revised to align the standards with the Gazette notification issued on 18 July, 2003. The standards for individual pesticides have now been prescribed at 0.0001mg/litre and for total pesticides at 0.0005mg/litre.”⁵

In revising the drinking water standards in 2000, the Ministry of Health and Family Welfare reviewed and compared the WHO standards, CODEX, USFDA and the EU norms. It was found that there are about 49 pesticides for which norms are prescribed by various countries in the world. The WHO norm for pesticides covers only 24 pesticides out of these 49 pesticides and their norms do not cover those pesticides which are found underground, while the USFDA prescribed norms for only

⁵ Chapter 4, Joint Parliamentary Committee Report on Pesticide Residues in and Safety Standards for Soft Drinks, Fruit Juice and other beverages.

21 out of the 49 pesticides. It was found that only the the EU norms set a limit for all the 49 pesticides.⁶

- b. *Central Public Health and Environmental Engineering Organisation (CPHEEO)*: The CPHEEO guidelines which include qualitative norms for supply of tap water are based on a combination of WHO and BIS standards. The CPHEEO guideline values for physical, chemical and bacteriological parameters of drinking water that have been indicated in the manual are only recommendatory and not mandatory on the part of the State Water Supply Departments/Water Utilities to follow. Central Public Health and Environmental Engineering Organisation (CPHEEO), the technical wing of the Ministry of Urban Development & Poverty Alleviation deals with drinking water supply (supplied through piped network) for urban areas only. CPHEEO acts as a facilitator and helps the State Water Supply Agencies/Urban Local Bodies by way of formulating and providing technical guidelines for planning, designing, execution and operation and maintenance of water supply and sanitation projects. To provide guidance in this regard, CPHEEO brought out a manual on "Water Supply and Treatment". CPHEEO has no statutory power to set/fix up standards for drinking water.
- c. *ICMR/WHO Guidelines*: Apart from the above, the WHO guidelines for drinking water criteria present a useful framework for developing standards and regulations regarding drinking water. India has accepted it as baseline. The quality criteria of drinking water prescribed by the Indian Standards Institute (IS: 10500-1989) and the Indian Council of Medical Research are exacting and exhaustive.⁷

For urban water supply the guidelines issued by the CPHEEO (which comes under the Ministry of Urban Development) is adopted by most water supply authorities, while the rural water supply follows the BIS standards. The lack of adequate testing facilities, manpower and equipment is another important factor in shaping drinking water quality standards and implementation. The lack of adequate facilities lead to the adoption of the two categories of essential and desirable characteristics - all essential characteristics are to be examined routinely, while all desirable characteristics should be examined either when a doubt arises or the potability of water from a new source is to be established.

The format followed in these standards is dividing characteristics of water into two- a) desirable and b) essential. This was purportedly done on the ground of limited facilities (for testing etc.) and resources available with the country. The categorization leaves a lot to the discretion of the authorities and has resulted in limited enforceability. Since 2003 the BIS has been in the process of bringing about a second revision of these standards, primarily relying on the EU Directives relating to the quality of water intended for human consumption (80/778/EC).⁸

In April 2005 the Group of Ministers asked the Department of Drinking Water Supply and Sanitation (DDWSS) to initiate the drafting of a model law providing for enforceable drinking water quality in the country. This model legislation was duly

⁶ Ibid.

⁷ Ibid.

⁸ Adil Khan, Notes on Water Quality in India, Unpublished.

prepared in September 2007 and circulated for discussion by various Central Government Departments and Ministries (Department of Drinking Water Supply, Central Groundwater Board, Department of Legal Affairs and the Ministry of Urban Development) and relevant State Government Departments (Public Health Engineering Departments, Public Health Departments, State Groundwater Boards, Rural Water Supply and Sanitation Departments) and certain international agencies (UNICEF, WHO and the WSP).

7. Implementation/Monitoring: Various agencies are tasked with the job of regulation, monitoring and setting of standards for drinking water in the country. These include:

1. Ministry of Health and Family Welfare
2. Bureau of Indian Standards under the Ministry of Food and Consumer Affairs and
3. Ministry of Rural Development

4. Ministry of Urban Development

5. Ministry of Environment and Forests

6. Ministry of Water Resources

7. Local Bodies

Two specialised bodies, apart from the Central and State Pollution Control Boards, that monitor water quality and drinking water quality specifically are the WQAA and the CGWB.

8. The primary responsibility of supplying drinking water vests in the local bodies – urban or rural.⁹ It is a statutory responsibility and in urban areas, the Municipal enactments mandate the supply of adequate and clean drinking water. These enactments use a variety of phrases to refer to the standard of quality and quantity of drinking water to be supplied - ‘proper and sufficient’, ‘insufficiency and unwholesomeness’, ‘fit for human consumption’, ‘sufficient supply of pure and wholesome’, ‘pure and fit for human consumption’ and ‘defective and insufficient’. The guiding factor is clearly the effect the quality or quantity has on the health of the inhabitants of the municipal area. Certain acts actually empower the State governments to make rules specifying the exact quantity or quality – and the same would be binding upon the Municipalities.¹⁰ In certain acts a duty to analyse and perform quality checks is also imposed upon the Municipalities.

⁹ The responsibility of rural water supply in states lies with Public Health Engineering Departments/Water Authority/locally named Statutory Agency/Panchayati Raj Institutions, while urban water supply is mostly entrusted with Municipal Corporation/Municipal Authority/Water Authority/ Water Board/ Developmental Authority etc.

¹⁰ See Section 311 of the Bengal Municipalities Act, 1932; Bihar and Orissa Municipal Act, 1922, Section 314. In *Manindra Nath Pal and others v. Municipal Commissioners of Barangore*, 1956 AIR 291, while commenting on the effects of such aspects being prescribed by the State Government the court opined: “What is ‘sufficient’ has not been laid down. But where the Government, under powers conferred by Section 311, has framed rules, and fixed the quantity of water to which a ratepayer is entitled to, in the absence of other indications, it must be presumed that the quantity specified under the rules is the measure of sufficiency” (para. 6).

Recommendations on the Right to Water:

1. The Working Group recommends that the Planning Commission ask the Government to explicitly make the right to water a fundamental right under the Constitution, in the long term. In the interim, it is recommended that a Central Legislation be enacted mandating the right to water and prescribing water quality and quantity standards.
2. This will ensure that the state is legally bound to provide water to all citizens. In particular, it will prevent denial of water to many groups due to technicalities (e.g. “unauthorized” slumdweller), or due to caste based discrimination.
3. It will also ensure much better accountability of the process, and will empower citizens to take direct action in case of failure to supply water.
4. The Right to Water should cover basic needs like Right to Water for Drinking and Domestic needs at the least. There is also a case for extending the Right to Water to cover livelihood and other needs, but this can be done in phases.
5. The Right to Water should include right to Adequate and Clean water. (Both quantity and quality should be covered).
6. Should the Right to Water mean a Right to free water? After reviewing extensive literature on two diverging opinions on the right to free water – a) some minimum free supply; b) no free supply but specified and protected low tariffs, we recommend that a South Africa model of a certain quantity as free supply be adopted. However, the model needs to be adopted with a slight modification, namely, in South Africa, the free entitlement is quantified at the household level, thus making it more difficult for the larger households. (they get lesser per capita free water). Hence, we can suggest that the Right should entitle every PERSON to a certain quantity of free water. While it is difficult to specify and mandate the minimum quantity of water to be supplied uniformly across the country (due to varying climatic/geographical zones with differing water availability) it is recommended that some minimum standards be mandated as a national average that all states should progressively seek to realise.
7. A similar Right to Sanitation should also be recognized and enshrined.
8. If this process is to take time, legislation should be enacted making the Right to Water a legal right, pending its becoming an explicit Fundamental Right.
9. It should be noted that the UN has also recognized such a right. On 28 July 2010, the General Assembly of the United Nations passed a resolution recognising "the right to safe and clean drinking water and sanitation as a human right". India voted in favour of this resolution.

Recommendations exploring legal options for mandating National and Uniform Water Quality Standards for the Country:

‘Water’ is a subject in the ‘State List’ of the Indian Constitution and restricts the ability of the Centre to mandate statutory national standards that would be applicable uniformly across

the country. The State Legislatures alone are competent to enact legislations pertaining to water resources. Consequently, there have been several suggestions over the decades to transfer 'Water' from the State List to the Concurrent, the latest being the Ashok Chawla Committee scheduled to submit its report in June 2011.¹¹ However, it must be noted that the centralising trend may not augur well for natural resource management and there is immense value in further decentralising and strengthening water resource management and conservation. Setting aside the option of a constitutional amendment to shift 'water' from state to concurrent list as one of last resort, this note explores other legal avenues available for providing a statutory framework for a national water quality standard.

There are two specific options available under the existing constitutional schema for mandating water quality standards at the national level.

- a) "The Parliament can, under Article 252, make laws even on topics in respect of which it has no powers, provided the legislatures of two or more States resolve that Parliament should make such law. Thus, we have the Water (Prevention and Control of Pollution) Act, 1974, which was a law on a topic relatable to Entries 6 and 17 of the State List. The justification for a central law to tackle the growing problem of pollution of rivers and streams was traced to the inadequate and unsatisfactory nature of local laws."¹²

Article 252 further provides that any Act so passed shall apply to such States and that while it may be amended or repealed by an Act of Parliament passed or adopted in like manner it shall not be amended or repealed as respects any State by an Act of the Legislature of that State.

- b) As a temporary measure, Art. 249 empowers Parliament to legislate with respect to a matter in the State List if the Council of States (Rajya Sabha) declares by resolution supported by not less than two-thirds of the members present and voting that it is necessary or expedient in the national interest so to do. The power of Parliament extends so long as the resolution remains in force but not exceeding one year.

Thus, the existing constitutional schema allows for a central legislation, with the consent of the states, mandating water quality standards uniformly across the country. The next question to be addressed is the approach or perspective that needs to inform such a law. Traditionally, water quality issues have been viewed from a public health perspective, guided largely by the immense contribution made by the World Health Organisation, and further understood within the context of a role for municipal and local bodies to ensure the protection of public health, at large. While this perspective needs to be retained, it requires further strengthening through an understanding of water as a natural resource that needs to be protected, conserved and effectively managed to preserve and sustain the water quality at source. Any legislation on water quality standards must ensure drinking water source protection and wherever feasible, with active community and citizen participation.

Over the decades, several recommendations have been made to overcome the lacunae in a statutory framework for drinking water quality standards. We examine a few of these here:

1. Public Health and Food Law: The Government of India considered the issue of regulation of drinking water by making suitable provision in the integrated Food Law

¹¹ Bharath Lal Seth, Moyna, 'Water May Shift From State to Concurrent List', May 15, 2011, Down to Earth.

¹² S. Muralidhar, in Eibe Reidel & Peter Rothen eds., *The Human Right to Water* (Berlin: Berliner Wissenschafts-Verlag, 2006), p. 65-81

Bill. Various formulations on the issue of either putting water in the definition of food, or alternatively, having a separate provision for schemes relating to water, their implementation etc. or their inclusion in the Integrated Food Law are under consideration.

2. Environment Law: To mandate the standards through a notification under the Environment Protection Act, 1996, under which we have the notifications issued by the Ministry of Environment and Forests in exercise of the powers under Section 3 of the said Act. Under the Environment (Protection) Act, 1996, we have the notifications issued by the Ministry of Environment and Forests in exercise of the powers under Section 3 of the said Act. The Government of India has also set up by a notification under this very statute the Central Ground Water Authority, to regulate the existing indiscriminate use of ground water in various parts of the country and in particular the major urban metropolises.¹³

Both these legal options would restrict the regulatory scope of the authority set up under the statute deriving its jurisdiction from subject specific statutes. It is important that a legislation dealing with quality and quantity of drinking water supply incorporate and carry forward the public health, the environmental and human right perspectives. Thus, such a statutory framework should ideally be located within the Ministry of Water Resources or the Department of Drinking Water and Sanitation. It is also pertinent to note here that the trend across the world (and gradually within India) is to move away from a sectoral approach to water management towards a more integrated approach. Such an approach would necessitate a comprehensive Water Act, that deals with all aspects of water management, development and conservation. In keeping with this larger goal, an enactment mandating quality and quantity of drinking water supply should be located within the regulatory reach of the Water Resources Ministry.

In conclusion, it may be noted that while a legislation mandating drinking water quality standards is critical, it need not be a restricted to quality standards. An opportunity at legislating on water by the Centre with the consent of the states, must necessarily be viewed more holistically to include the basic right to water – both quantity and quality, lay down norms on water source protection, wastewater treatment, water conservation and related matters.

¹³ See note.19 above.

Some Point Related to PPPs in Domestic Water Supply

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For Working Group on Urban Water Supply for the 12th Plan

1. By Public Private Partnership, we understand any venture in which the private sector is involved in a manner that it exercises control on some (or all) part(s) of the water supply system, from production, transmission, treatment to delivery. Typical EPC contracts would therefore not be considered a PPP, but an O&M management contract would. We also refer to any such PPP arrangement as privatisation.
2. We strongly urge that drinking water supply must be kept out of the ambit of PPP projects. Some of the reasons are as follows:
 - a. Drinking (and domestic) water is a basic human necessity and hence a responsibility of the state to ensure its provision. It is important therefore that it remains in public hands.
 - b. Privatisation changes the nature of water supply from that of a social responsibility to that of a commodity supply.
 - c. Often, the basic motive of a private enterprise, to ensure profits and a good rate of return on its investments, is not compatible with the larger social goals of water supply.
 - d. The experience in India does not instil confidence that a PPP domestic water supply scheme can meet the social goals of water for all at affordable rates. On the contrary, many PPP projects have had serious issues with them. The global experiences support this.
 - e. Some of the recent experiences that are being presented as models to follow are more in the nature of pilot projects, with external support (World Bank etc.) and their efficacy still needs to be evaluated.
 - f. On the other hand experience in India shows serious problems including sharp rise in tariffs, insistence on removal of community taps, barring the development of any alternative arrangements of water supply in the concession period etc.
 - g. The capacities, especially in the small and medium towns to handle the complexities of a PPP contract are virtually absent.
3. In particular, domestic water supply must never be piggy-backed upon an industrial water supply PPP project. Doing so subjects the domestic water supply to all the risks faced by an industrial water supply project like recession, vagaries of market demands for industrial goods, pollution problems etc. (Experience of Tiruppur and Dewas). Sometimes the domestic component is added to an industrial water supply PPP project to make it more acceptable.
4. In general, even if a PPP approach is to be chosen for a water supply project, there must clarity on why this approach is being chosen. There are several advantages claimed for PPP - for e.g. that it can leverage funds (Governments put in small funds to bring in much higher amounts for the project), efficiency of operation and delivery, better technology etc. However, in selecting PPP as a vehicle for implementing any specific project it must be clear as to which of these advantages are being sought and how they will be ensured, and whether the agreement is being structured to ensure this end. For example, PPP projects under

- the JNNURM typical have the central government bringing in upto 80% of the capital cost. Thus, the advantage of leveraging is not there.
5. Equally important, no PPP project for domestic water supply should be undertaken without complete safeguards and protection for the social objectives including water for all and the interests of the weaker sections. This should be done through several measures some of which are indicated in points 8 to 13 below.
 6. Further, such a selection of a PPP for a specific purpose(s) should be done through a participatory process with wide ranging public consultations and involvement.
 7. What is really necessary is that the publicly owned and handled water supply schemes must be held accountable to deliver. This can be done in several ways.
 8. The most important and basic instrument to ensure accountability and performance will be to make the right to water a fundamental right under the constitution. (See a separate note on this circulated earlier). If this is to take time, then such an entitlement can be guaranteed by legislation.
 9. Service provision norms must be codified and must be enforced using legislation on the lines of the recent Madhya Pradesh Public Service Guarantee Act 2010.
 10. Other measures of making provision of water accountable and transparent should be put in place.
 11. These suggestions would apply equally to any PPP projects. Often, PPP agreements have clauses to enforce cost recovery and financial returns, but not for service delivery. Any PPP agreements should have strictly enforceable service delivery and performance norms, with the community (consumers!) having an important role in the monitoring of the implementation.
 12. There are several other serious issues with the concession agreements that are currently being used for PPP projects. These need to be set right and the working group should prepare either a draft concession agreement, or at least a set of guiding principles and some important point to be ensured in any agreement. (For example, restrictions on developing other water sources¹⁴.)
 13. Any PPP project in water supply sector must be fully under the ambit of the Right to Information Act 2005.
 14. Post-contractual changes are a serious problem with PPPs and privatisation and must be avoided.

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June 6, 2011

¹⁴ Normal commercial principles of PPP / monopoly competition etc will not apply to water sector.

Annexure 3

Members and TOR of Working Group

[*Working Group on Urban and Industrial Water Supply and Sanitation* for the Twelfth Five-Year Plan (2012-2017) was constituted by Planning Commission's Order No.25(1)/A/2010-WR dated 15.10.2010 and amended vide Orders of even number dated 13.1.2011, 2.6.2011 and 22.6.2011.]

Composition:

1.	Ms. Sunita Narain, Director, Centre for Science and Environment, New Delhi	Chairperson
2.	Shri Navin Kumar, Secretary, Ministry of Urban Development, Government of India, New Delhi	Co-Chairperson
3.	Smt Malini V Shankar, Principal Secretary, Water Supply and Sanitation Department, Government of Maharashtra	Member
4.	Shri Ashok Vardhan Shetty, Pr. Secretary, Municipal Administration & Water Supply, Government of Tamil Nadu	Member
5.	Shri S. Raghupathy, Senior Director, CII, Hyderabad	Member
6.	Ms Ritu Anand, Head Policy, IDFC, Mumbai	Member
7.	Shri Ravi Parthasarathy, CMD, ILFS, Mumbai	Member
8.	Shri S. R. Ramanujam, CRISIL, Mumbai	Member
9.	Shri Aromer Ravi, Director TARU, New Delhi	Member
10.	Shri Shripad Dharmadhikary, Manthan, Mumbai	Member
11.	Ms. Roopa Madhav, National Law School, Bangalore	Member
12.	Member Secretary, Central Pollution Control Board, New Delhi	Member
13.	Member (SAM), Central Ground Water Board, Faridabad	Member
14.	Shri Himanshu Thakkar, SANDRP, New Delhi	Member
15.	Dr S. Bhaskar Reddy, Head, Agriculture and Water, FICCI, New Delhi	Member
16.	Representative of <i>Arghyam, Bangalore</i> - Shri L. Viswanath, Advisor	Member
17.	Joint Secretary (UD), Ministry of Urban Development, Government of India, New Delhi	Member – Secretary

Terms of Reference:

- Provide a critical review of the physical and financial performance of the sectors during the 11th Plan and suggest strategies, priorities and allocations for the 12th Plan
- Develop an accurate picture of domestic water vulnerability in urban areas
- Examine relative merits and demerits of alternative pathways (public, PPP, private etc) to develop urban water supply and sanitation systems, keeping in mind the goals of security, safety, sustainability and equity based on national and international experience and the following objectives
 - Integrated planning and management of all water sources in the urban water cycle

- Encouragement of innovative, efficient and safe water supply
 - Increased water use efficiency and effective demand management
 - 100% metering of both production and consumption through transparent water metering and billing arrangements that help alter water use practices
 - Innovation in water supply sourcing, treatment, storage and discharge
 - Development of cost-effective techniques of management of water supply and discharge system losses, including leakage, unbalanced pressure, overflows and other maintenance requirements
- Suggest mechanisms to ensure improved measurement and recording of operational information for benchmarking as a management tool to attain operational efficiency which will work only with a reliable and accurate data-base
 - Suggest ways to develop volumetric pricing regimes in a transparent and participatory manner, which protect minimum water requirements of all, especially the poor, but also incentivise prudent use of water
 - Assess existing sewage and effluent treatment capacities and systems for safe waste disposal and suggest improvements in capacities, technologies and systems. Assess the scope of recycling of waste water in industry to reduce dependence on fresh water.
 - Evaluate the problem of pollution of drinking water sources by industrial effluents in urban centres. Suggest how the pollution load could be minimized through common treatment of industrial wastes.
 - Examine the significance of protecting the integrity of drainage systems in urban areas as also the deleterious consequences of ignoring this. Suggest ways in which this can be made an integral part of urban planning
 - Suggest mechanisms for protection of public health and the environment through effective regulation
 - Suggest ways in which capacities can be built for staff in water utilities including training in utility operations and management
 - Suggest ways in which capacities can be built at the ULB level to manage water supply and sanitation projects
 - Suggest creative ways of developing water-sensitive cities through campaigns for greater public awareness and engagement with these issues
 - Any other issue considered relevant by the group.

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- 2 NRCD 2009, Compendium of sewage treatment technologies, National River Conservation Directorate, MoEF, GOI, August
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- 6 Naya Raipur Development Authority 2009, Request for Proposal Document and Concession Agreement for Development of Water Supply System in Naya Raipur city, mimeo
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- 17 Stephanie Buechler and Gayathri Devi, Household food security and wastewater dependent livelihood activities along the Musi river in Andhra Pradesh, International Water Management Institute, mimeo
- 18 Government of Maharashtra 2010, Development Plan Nanded, Notification, Urban Development Department, Mumbai, *mimeo*