Report of the Committee set up to frame National Sustainable Habitat Standards for the Urban Water Supply and Sewerage sector

Introduction

The National Mission for Sustainable Habitat was approved by the Prime Minister's Council for Climate Change in June 2010. One of the deliverables of the Mission is the formulation of National Sustainable Habitat Standards. It is intended that these standards would subsequently get integrated with relevant regulations to ensure that future developments are aligned in accordance with concerns related to climate change. Accordingly, a sub-committee was appointed under the chairpersonship of Ms Malini Shankar, Principal Secretary (Water Supply and Sanitation), Government of Maharashtra to evolve the standards in respect of the water supply and sewerage sector. The order regarding constitution of the committee is placed at Annexure.

Challenges of Water Supply and Sewerage in Urban India

India's population had already crossed the 1 billion mark in 2001 and it has been assessed that the urban population may reach 50% of the total population by the middle of the century, as against about 28% in 2001. It is estimated that the urban population in India in future will be as shown in the following Table.

Table: Urban Population in India

Year	Population (million), Based on		Percentage of total population, Based on	
	Past Census	UN Projection	Past Census	UN Projection
2001	286	303	28	30
2011	377[+]	439	31.80[+]	35
2021	459	575	37	40
2025	492	630	40	45
2050	695*	970	45	48

**Planning Commission now estimates urban population in 2030 at 600 million*

[+]*Provisional results of 2011 Census.*

Water requirements for the afore-mentioned projected population need to be assessed using the internationally accepted norms for the various sectors. Ministry of Water Resources has carried out comprehensive estimates on the demand for water in the country

for various sectors for 2025 and 2050 as detailed below:

Water Requirements for Various Sectors in 2025 and 2050

	Water Demand in Km3 (or BCM)					
	Standing Sub-Committee of MoWR*			**NCIWRD#**		
Year	2010	2025	2050	2010	2025	2050
Irrigation	688	910	1072	557	611	807
Drinking Water	56	73	102	43	62	111
Industry	12	23	63	37	67	81
Energy	5	15	130	19	33	70
Others	52	72	80	54	70	111
Total	**813**	**1093**	**1447**	**710**	**843**	**1180**

*Source: * Assessed by MoWR's "Standing Sub-Committee for Assessment of Availability & requirement of Water"(Year 2000) mentioned in the Report of the Working Group on Water Resources for XI FYP (2007-2012)*

#National Commission for Integrated Water Resource and Development, MoWR 1999

The MoWR working group report also mentions that irrigation requirement estimated by NCIWRD is on the lower side as compared to that estimated by the Standing Sub-Committee because NCIWRD assumed that irrigation efficiency will increase to 60% from the 2000 level of 35 to 40%. In view of likely improvement in irrigation efficiency, the recommendation of NCIWRD has been accepted by the Working Group.

Availability of fresh water resources: The fresh **w**ater resource potential of the country has been assessed from time to time by different agencies. The assessment of 1869 Km^3 (or **Billion Cubic Metre i.e. BCM**) of Central Water Commission (**CWC**) carried out in 1993 is generally considered as reliable. Within the limitations of physiographic conditions, socio political environment, legal and constitutional constraints and the technology available at hand, the utilizable water resources of the country have been assessed at 1123 Km^3, of which 690 Km^3 is from surface water and 433 Km^3 from ground water sources. Harnessing of 690 Km^3 of utilizable surface water is possible only if matching storages are built to the required extent. Further, it is scientifically accepted that long range water resources in the geographical environment tend to be constant- no additions can be made. A more direct measure of water availability is the annual

availability per capita according to which geographical regions are classified as water sufficient, water stressed and water deficient when the annual per capita availability of utilizable water is calculated to be – in excess of 1500 cum; between 1500-1000 cum and less than 1000 cum respectively. By this yardstick, India will become water-deficient by 2025. In reality however, many sub-regions in the country may be already water-short due to the uneven distribution of water.

Supply of water in Urban India: A report by the ADB (2001/2004) mentions that the per capita water usage in European cities is about 130 lpcd (litres per capita-day) and suggests a maximum of 150 lpcd for Asian Cities, perhaps considering the differences in climate.(The MoUD's benchmark for the same is 135 lpcd). It is significant that the norm refers to the quantity delivered to the customer and not the installed capacity which always tends to be higher. The CPHEEO Manual on Water Supply & Treatment, Ministry of Urban Development published in May, 1999 gives the per capita supply norms as given in Table below:

Table: Per Capita Supply Norms

S. No	Classification of Towns/Cities	Recommended Water Supply Levels (lpcd)
1.	Towns provided with piped water but without sewerage system	70
2.	Cities provided with piped water supply where sewerage systems is existing/contemplated	135
3.	Metropolitan & Mega cities provided with piped water supply where sewerage system is existing/contemplated	150

Figures exclude "Unaccounted for Water (UFW)" which should be limited to 15%.

Status of Water Supply Services

While the water supply norms are prescribed, the actual delivery of water to the households may not be in tune with the norms. An assessment of the status of water supply service delivery has been attempted under the pilot study on service level benchmarking carried out by Ministry across 28 select cities in 2009. Table below gives the results:

Water Supply	Benchmark	National Average	Gap in service, % or % points
(1)	**(2)**	**(3)**	**(4)**
Water supply coverage	100%	63.7	36.3
Per capita supply	135 LPCD	123.7	8.4
Non revenue water	15%	41.8	26.8
Consumption metering	100%	34.6	65.4
Continuity of supply	24 x 7	4.7	80.0
Quality of water supply	100%	91.2	8.8
Cost recovery in water supply	100%	68.6	31.4
Collection efficiency	100%	63.8	36.2
Complaints redressal	80%	77.8	2.2

Cities for pilot study were: Ahmedabad, Amritsar, Bangalore, Berhampur, Bhopal, Bhubaneswar, Bokaro, Chandigarh, Chas, Delhi, Dharamshala, Guntur, Hyderabad, Imphal, Indore, Jalandhar, Kolhapur, Kozhikode, Nashik, Palampur, Pimpri-Chinchwad, Raipur, Shimla, Surat, Tiruchirappalli, Trivandrum, Udhagamandalam and Ujjain.

The results show substantial gap in respect of all the indicators in spite of all the infrastructural additions over the years.

Status of Sewerage Services:

Generation of wastewater: With the enhancement of drinking water supply to urban areas, wastewater generation is also increasing. If such wastewater is not properly collected, treated and disposed (including proper reuse and recycling), it will adversely impact the locally available freshwater sources and even the piped water supply system. The cumulative effect of untreated wastewater can have wide-ranging degenerative effects on both the public health and the ecosystem. Hence, proper treatment of wastewater is a must. Status of Municipal Wastewater Generation and treatment capacity in Class I and II Cities is given below:

Category	No. of Cities	Total Water Supply (in MLD)	Wastewater Generation (in MLD)	Treatment Capacity (in MLD)
Class-I City	498	44,769.05	35,558.12	11,553.68
Class-II town	410	3,324.83	2,696.70	233.70
Total	**908**	**48,093.88**	**38,254.82**	**11,787.38**

CPCB Annual Report 2008-09

The estimated sewage generation from Class I cities and Class II towns (as per estimation made for the year 2008) is 38254 MLD. Against this, treatment capacity is only 11787 MLD which is just 30 % of present sewage generation. This ominous situation of sewage treatment is the main cause of pollution of rivers and lakes. To improve the water quality of rivers and lakes, there is an urgent need to increase sewage treatment capacity and also to ensure its optimum capacity utilization. This urban management function needs to be recognized as one of the most important indicators of Country's development in general and of water management in particular. The present status of the sanitation sector also throws up several other challenges as can be inferred from the results of the service level benchmarking study conducted in 2009. Table below gives the results of MoUD's pilot benchmark study:

Sewerage & Sanitation Services	**Benchmark**	**National Average**	**Gap in service, % or % points**
Toilet Coverage	100%	85.8	14.2
Sewerage network coverage	100%	48.5	51.5
Waste water collection efficiency	100%	41.9	58.1
Wastewater treatment adequacy	100%	48.8	51.2
Quality of wastewater treatment	100%	58.8	41.2
Extent of reuse & recycling of treated WW	20%	6.8	13.2
Cost recovery - waste water	100%	38.3	61.7
Collection efficiency	90%	42.5	47.5
Complaints redressal	80%	76.4	3.6

Keeping in view the status of urban water supply and sewerage services and the wide gap in their delivery, it may be concluded that the availability of water supply will become 'short' due to increased urbanization and made worse by the polluting potential of untreated sewage. In order to contribute effectively to public health and economic development, the water & sanitation services need to be made universally accessible and operationally sustainable but the benchmark studies indicate substantial shortfall in service delivery, posing several challenges. The challenges in the water supply and sanitation sector summarised in the XI plan document are as follows:

Water Supply

(a) Sustainability & Equity

(b) Demand & Supply Management

(c) Financing and institutional issues

(d) Tariff & O&M

Urban Sanitation (Sewerage)

(a) Expansion of Sewerage & Sanitation Facilities

(b) Financing

(c) Creating awareness on sanitation

(d) Preparation and execution of sanitation plans for growing population

(e) O&M of the Sanitation Facilities

Historically, the planning response to these challenges has been expansion of infrastructure with greater capital investment. Decentralised governance was attempted with the 74th Constitutional Amendment Act, 1993 delegating the functions of water & sanitation, among others, to the urban Local Bodies. Yet, the sector performance could not be improved to compare with the best practices the world over as evident from assessments from time to time and from the benchmarking studies. In a paradigm shift, the Government took up the challenge of implementing urban reforms aimed at improving the delivery of services in the entire urban sector including water supply and sanitation under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) launched in December, 2005. Under the scheme, Additional Central Assistance is provided to the cities and subject to the implementation of a set of reforms. The reforms particular to the water supply and sanitation sector are:

- 100% cost recovery for O&M
- Universalization of service access including the urban poor
- Revision of Building bye-laws for making rain water harvesting mandatory
- Revision of building bye-laws for reuse of treated waste water

Given the above background, the committee has identified the following strategies for bringing about sustainability in the water supply and sanitation sector:

Water supply

1. Supply side management
2. Demand Side Management
3. Leakage Management - Reduction in NRW
4. Rain Water Harvesting
5. Water Audit
6. Use of Water Efficient Appliances

Sewerage

1. 100 % toilet coverage
2. 100% treatment of sewage
3. Recycle and reuse of waste water

Energy Efficiency

Another issue crucial for sustainable habitats, common to both water &sanitation sectors is the energy efficiency.

The Bureau of Energy Efficiency (BEE) has identified water pumping systems and sewage conveyance & treatment systems as some of the major energy loads in municipalities. It has targeted both water and sewage treatment & pumping among the municipal energy efficiency audit. The goal is to provide municipal water supply and sewerage services at the least cost and least environmental impact as energy involves burning of fossil fuels. BEE has identified 171 ULBs for energy efficiency studies under the MUDSM(Municipal Demand Side Management) Programme being implemented in phased manner. Investment Grade Energy Audit (IGA) has been completed across 112 ULBs and is in progress for the rest 64 ULBs. ULBs' capacity in energy efficiency needs to be built by BEE. ULBs can also take up energy efficiency studies and measures proactively, based on BEE guidelines.

The detailed recommendations of the committee are as follows:

Water Supply:

Supply side management:

1. Water utilities should be encouraged to create/develop own sources for water supply to avoid conflicts with irrigation/agriculture sector.

2. In case of multi-purpose projects, ensuring first priority of allocation to drinking water supply from available storages at any point of time

3. Long-distance water supply systems must service all habitations enroute, where feasible, covering a reasonable distance on either side.

4. Local sources of water such as lakes, ponds, springs must be environmentally managed and used for water supply

5. Conjunctive use of surface and ground water should be explored

6. Water resources departments may adopt socially conscious actions such as imposing royalty on water; mandating water supply to all habitations in influence area; introducing efficiency incentives/disincentives on the quantum of water drawn w.r.t norms; imposing conditions for 100% treatment of waste (return) water and if not, penalties thereof.

7. Quality of source water for water supply shall be ensured and sound surveillance systems implemented.

8. Mapping and digitization of water supply networks for distribution shall be done on continuous basis. Hydraulic modeling shall be adopted for rationalizing pipe networks and ensuring equitable pressure.

9. Intensive and continuous public campaigns implemented for awareness on all water related aspects- the real worth of water; health & economic losses due to polluted water, wastages and even shortages.

Demand side management

1. Adoption of universal consumer metering and volume based tariff

2. Over-consumption of water to be controlled by escalating tariff blocks. Lifeline access of 20 lpcd (as per WHO & UNICEF) can be subsidized whereas at consumption level of 135 lpcd, full cost recovery should be built into tariff. Consumption beyond the benchmark should attract progressively increasing tariff. This will lead not only to sustainable consumption but also revenue generation and promotion of equity.

3. Tariff should consist of a separate "energy surcharge" worked out per unit of water delivered. It should be the minimum charge on even the lifeline consumption. It should be related to the unit energy charges and adjusted/escalated automatically as per the changes in energy charges.

4. Water supply shall be on 24x7 for equity, effective metering and for best hygiene model of supply. Systems leaks & thefts can easily be revealed only with a 24x7 supply pattern.

5. Water Meters and conveyance pipe upto private property line but including the meter, meter box, valves etc., shall be the property of water utility/ULB. Tampering, theft and scrap dealing in these materials shall be made illegal and offenders prosecuted.

6. The utility/ULB shall levy a meter rent (preferably as % of water consumption bill). Testing and calibration of meter shall be responsibility of utility / ULB, along with its repair and replacement.

7. The utility/ULB shall make a provision in the form of depreciation fund/sinking fund at about 5% of assessment/bill and these funds may be used towards replacements and repairs.

8. Incentives for using treated wastewater water and also from decentralised local sources.

Leakage Management and Reduction of NRW:

1. Universal metering shall be adopted.

2. Illegal connections shall be identified through water audit and community participation.
3. The 'free connections' shall also be metered and regulated such as free supply up to a pre-determined quantity;

4. The staff responsible for water supply shall also be made responsible for the leakage, theft identification and their control.

5. The system shall be pressurised 24x7 and visible leaks repaired immediately. However, automatic pressure management systems for reducing the pressure under minimum demand conditions can be adopted to reduce overall NRW.

6. Purchase of leak detection equipment and use should be last step in implementing the measures for reducing NRW.

Rain Water Harvesting:

1. RWH and recharge recommended to be made mandatory.

2. Wherever the number of rainy days is high, rainwater storage & use systems shall be used. Incentives may be provided on the quantum of water consumption avoided from the organized water supply system.

3. Ground water recharge areas need to be delineated, mapped and protected.

4. Low lying areas, lakes and flood plains may be identified and reserved for storing rain water for better environmental conditions.

5. Local nallahs, drains and streams shall have low-level check dams for storing rain water and improving recharge in the areas.

6. ULBs/ Town Planning authorities shall identify and reserve 2-5% of development area for water bodies, either natural or constructed.

7. A system of Ground Water Table monitoring wells may be developed at ward level. To be used for assessing efficiency of RWH measures and also warnings against excessive exploitation of ground water.

Water Audit

1. Utilities/ ULBs shall adopt universal metering for consumers, bulk supply and transfer etc., of water for enabling measurement of system input and output and calculate the losses.

2. Utilities/ ULBs shall develop management tools/ formats for daily assessment of Water Balance for each source/system/zone using data of Water supply & delivery.

3. All consumer premises shall be checked for 'no-direct water supply' condition in meter-shut off position for identifying water theft and illegal connections.

4. The water supply and other utilities networks shall be mapped and city & zonal digital maps prepared for frequent check & validation of the infrastructure. The new developments and additions in infrastructure shall be regularly added to the database and digital maps.

5. Water Audits may be carried out at periodic intervals.

Water Use efficiency in Fittings / Fixtures:

1. Smart water saving fittings (taps/faucets, flushing tanks, water closets, urinals, bidets and bath tubs) may be promoted through citizen information as well as fiscal incentives for manufacturers.

2. Water saving automatic taps; air-mixing taps and soft closing taps may also be promoted though citizen awareness programme.

3. Showers with consumption displays and with announcements for wastages may also be promoted.

4. Fittings with automatic controls shall be mandated for high footfall locations.

SEWERAGE - SANITATION

Complete access to sewerage - sanitation

1. Access to sanitation facilities shall be universalised (100%) without any barriers of any cost/fee, land tenure etc., including urban poor settlements, unauthorized slums / colonies.

2. All properties/ holdings should be connected to sewerage system, even if they are not connected to a public/municipality water supply system.

3. Sewerage system need not be the only sanitation system for liquid waste. Hence, Onsite sanitation systems shall be adopted for less dense settlements.

4. Sewerage charges shall be levied on the basis of water consumed and in the water bill itself. In case of no water supply, alternative methods of billing shall be used.

5. Sewerage charges should also have an 'energy' surcharge/component, which shall be directly linked to the unit energy charges levied by the power utility.

6. In view of the higher polluting potential, sewerage charges should reflect full cost recovery for all sewerage O&M operations.

7. For on-site sanitation, periodic cleaning shall be ensured. ULB may provide the equipment at a fee and also for final disposal, depending on the type of on-site treatment involved.

8. Buildings may have double-stack plumbing system for separation of grey & black water.

9. On-site packaged treatment units may be used to treat grey water, black water or a combination, depending on the user choice.

10. Using a combination of on-site and off-site sewerage / sanitation systems for waster water / sewage, 100% treatment shall be ensured, for environmental protection and sustainability.

11. It is suggested that Sewage Management Rules, similar to Municipal Solid Waste (Management & Handling) Rules may be framed and notified under the EPA & Water Pollution Acts etc., in order to consolidate provisions under different Acts/Rules/Notifications and to focus attention on Sewage Management issues. Guidelines/Standards for Septage management and Reuse of Treated Wastewater have to be formulated.

Recycle and reuse of wastewater:

1. In case of multi-storeyed constructions and gated communities, internal dual piping for toilet flushing shall be made mandatory. It shall also be mandated for high end users such as Hotels, Malls and Industries.

2. Such building communities and groups of housing implementing dual piping shall also ensure on-site treatment of waste water to the water reuse standards of the nation or as per international best practices till the national standards are developed.

3. Supply of treated wastewater to industrial and other consumers shall be explored.

4. Utilities/ULBs may provide incentive on the quantity of waste water treated and reused for which separate metering may be necessary.

5. Dual piping at street level shall continue to be prohibited due to the public health risks involved. However, dual piping at street level may be adopted in cities with well laid out service ducts and with 24x7 water supplies but the pressure in the main water supply network shall always be maintained at least twice of the pressure in the dual pipe carrying treated wastewater.

6. The water for reuse may be mandatorily colored.

7. Models for reuse of used-water may be developed and its applications identified and widely propagated for encouraging reuse at local level (E.g. Israel is said to practice reuse 6-7 times before the intervention of treatment system. This may be studied and intensive water users encouraged to adopt such practices).

8. Incentives may be provided to customers (in water tariff, property tax etc) for the recycle and reuse of treated wastewater.

Energy Efficiency:

Energy Audit may be mandated at prescribed intervals for efficient functioning of electro-mechanical equipment in the sector.

Mainstreaming of Service Level Benchmarks (SLBs) for sustainability:

The service level benchmarks earlier referred to in the report have been formulated by the MoUD with a view to achieving all-round sustainability including environmental sustainability. Accordingly, in addition to the specific recommendations above, the committee suggests that implementation of service level benchmarking which implies an outcome oriented approach be mainstreamed further at every stage i.e. planning, implementation and monitoring. In recognition of the fact that the SLB framework may not be met initially, a range of values for SLB indicators has been suggested as per the chart (on the next page) for different grades of sustainability, the ideal being the SLBs themselves.

WATER SUPPLY:

S.No	Indicator	Green (Sustainable)	Black (Deficient &	Red Excessive and

			degrading)	degrading
1	Coverage of connections	100%	<90%	----
2	Per capita availability of WS at consumer end	135 Lpcd	<100	>200
3	Extent of metering of WS connections	100%	<100%	----
4	Extent of Non-Revenue Water	15%	----	>20%
5	Continuity of Water Supply	24 Hrs	<16	
6	Efficiency of redressal of Customer Complaints	80%	<70%	----
7	Quality of Water Supplied	100%	<100%	----
8	Cost recovery of in Water Supply Services	100%	<90%	----
9	Efficiency in collection of Water Supply Charges	90%	<90%	----

SEWERAGE:

S.No	Indicator	Green (Sustainable)	Black (Deficient & degrading)	Red Excessive and degrading
1	Coverage of Toilets	100%	<100%	----
2	Coverage of Wastewater network services	100%	<90%	----
3	Collection efficiency of Wastewater network	100%	----	----
4	Adequacy of Wastewater treatment capacity	100%	<90%	>120%
5	Quality of Wastewater treatment	100%	<95%	
6	Extent of reuse & recycling of treated Wastewater	20%	<10%	----
7	Extent of cost recovery in Wastewater management	100%	----	----
8	Efficiency of redressal of Customer Complaints	80%	<80%	-----
9	Efficiency in collection of sewerage-related charges	90%	----	----