Chapter 13 WATER SUPPLY & SEWERAGE

- 1. Water supply & Sewerage are an essential component of the basic infrastructure for urban settlement. The number of house holds in Delhi has increased from 18.61 lakh in March 1991 to about 25.54 lakh in March 2001. Besides domestic use water is also required for industries, commercial & other institutions and for firefighting purposes.
- 2. Water Supply and treatment capacity is being increased in Delhi in almost in each five year plan taking into account the requirement of drinking water for the population increasing at a very high rate, almost more than double to the rate of increase at national level. In spite of best efforts made by the Government, water supply in an equitable and or adequate way remained a matter of concern due to various reasons like raw water scarcity and related problems, transmission and distribution losses, supply with less pressure, uneven distribution, depleting ground water level, non-recharge of ground water due to rapid urbanization, increasing cost of water treatment and increasing gap between water supply cost & tariff, etc.
- 3. The water treatment and supply capacity, which was 66 MGD in 1956, was raised to 240 MGD in 1979, 437 MGD in 1990, 650 MGD in 2002 and 810 MGD in 2007. The target for Eleventh five year plan (March, 2012) is kept as 915 MGD water treatment and supply by DJB in Delhi.
- 4. Out of total 25.54 lakh house-holds in Delhi in 2001, about 19.24 lakh house-holds are provided piped water supply system. About 5.60 lakh house-holds are provided water supply through tubewells / deep bore hand pumps / public hydrants. Thus about 75.33% house-holds meet their water requirement through piped water supply system and about 21.91 % house-hold through tubewells / deep bore hand pumps / public hydrants. Remaining 2.76 % households depend on other sources like wells, river, tanks, canal, ponds etc. (Table No. 13.8)

5. WATER REQUIREMENT

5.1 Based on a norm of 60 Gallon Per Capita Per Day (GPCD) as per CPHEEO norms prescribed in MPD 2021, the water requirement for 2007-08 was 990 MGD. As per CPHEEO manual, the per capita per day water requirement is60 GPCD as Details given in the Statement No. 13.1



1.	Domestic	172 LPCD
2.	Industrial, Commercial and Community	47 LPCD
	requirement based on 45000 liters per	
	hectare per day	
3.	Fire protection based on 1% of the total	3 LPCD
	demand	
3.	Floating population and special uses like	52 LPCD
	Hotels and Embassies	
	Total	274 LPCD (60 GPCD)

5.2 In MPD-2021 by DDA proposed water requirement with the norm of 80 Gallon Per Capita Per Day (GPCD), out of which 50 GPCD is for domestic requirement and 30 GPCD for non-domestic purposes. The domestic water requirement of 50 GPCD comprises of 30 GPCD for potable needs and 20 GPCD for non-potable water. The requirement details are given in the Statement No. 13.2.

Norm	Quantum (in GPCD)		Source for non-potable water	
	Potable	Non-potable		
Domestic @ 50	30	20	-	
gpcd				
Residential	30	20	Recycling and permissible	
			Ground Water (GW)	
			extraction at community	
			level.	
Non domestic	5	25	-	
@ 30 GPCD				
Irrigation,	-	10	Recycling from Sewerage	
horticulture,			Treatment Plants (STPs) and	
recreational,			permissible Ground Water	
construction,			extraction.	
Fire @ 6.65				
LPCD				
Public-semi	5	15	Recycling from Common	
public,			Effluent Treatment Plants	
Industrial,			(CETPs)	
commercial				
Total @ 80	35	45	-	
GPCD				

Statement No. 13.2



With the norms of 60 GPCD, water supply requirement, for projected population of 23 Million in 2021 in Delhi, will be 1380 MGD as per MPD-2021.

6. WATER SUPPLY TARGETS-2008-09

6.1 Delhi Jal Board had proposed to increase the water supply capacity from 650 MGD as on 31.3.04 to 855 MGD as on 31.3.2009 as per details given below in the Statement No. 13.3. However, at the end of march, 2009, The D.J.B. could achieve 785 MGD water capacity in Delhi.

S.No.	Name of Plant	Existing capacity as on 31.3.2004 (MGD)	Proposed capacity at the end of 31.3.09 (MGD)
1	Chandrawal Water	90	90
	House No. 1 & II		
2	Wazirabad I, II & III	120	120
3	Haiderpur	200	200
4	North Shahdara (Bhagirathi)	100	100
5	Bawana	-	20
6	Nangloi	40	40
7	Sonia Vihar	-	140
8	Rainy Wells and Tube wells	81	100
9	Optimisation of W.T.P.	19	-
10	Recycling of Waste Water at Chandrawal, Bhagirathi, Haiderpur and Wazirabad	-	45
	Total	650	855

Statement No. 13.3

- 6.2 Nangloi Water Treatment Plant could not function upto its full capacity of 40 MGD due to non-supply of raw water through WJC system by Haryana Government in spite of raw water supply available from Bhakda Vyas Management Board (BVMB). Haryana Govt. is constructing two Acua-ducts on Western Yamuna Canal to enable the system to carry additional raw water. Further, non release of full 300 cusec of raw water for Sonia Vihar Plant by U.P Govt. has also adversely affected the achievement of water supply targets.
- 6.3 Two new Water Treatment Plants are proposed to be constructed at Dwarka (50 MGD) and Okhla (20 MGD) during the 11th Five Year Plan. Raw water for the two plants will be available on construction of the pucca parallel channel from Munak to Haiderpur.



7. WATER CONSUMPTION

- 7.1 DJB supplies treated water in bulk to the NDMC (New Delhi Municipal Council) and to the DCB (Delhi cantonment Board), both of which are responsible for the distribution of water within their own territories. The water supply infrastructure in these territories is owned by them and, consequently, is not the responsibility of the DJB. MCD area is the responsibility of DJB.
- 7.2 During 2007-08, water production by DJB was 720 MGD with water obtained from a range of sources such as river Yamuna, Bhakra Storage, Upper Ganga Canal and from underground water resources. The billed quantity of water during the year 2007-08, substantially reduced to 254.59 MGD due to following three main reasons:
 - (i) Fixing of upper average water consumption at 20 kl/30 kl per month w.e.f. 28.9.2005 for domestic consumers whose DJB/private water maters are nonfunctional till defective water meter is replaced. For residential premises having built up area upto 200 sq.m. and above 200 sq.m., the fixed average is 20 Kl and 30 Kl per month respectively. However, if the actual average consumption is less than 20 Kl/30 Kl per month, the water charges will be calculated at actual average.
 - (ii) JJ re-settlement colonies and rural areas in Delhi are inhabited by weaker sections of society and in order to provide some economic relief to persons residing in these areas, the Board as a policy have been providing un-metered water supply to these areas and water charges are being recovered at assumed average of only 10 KI per month per connection till un-metered connections are converted into metered. Besides, assumed average of 10 KI per month, service charge is also recoverable along with sewerage maintenance charge, if applicable. Out of 16.75 lac sanctioned water connections 3.46 lac are un-metered connections.
 - (iii) Around 5.00 lac water meters out of 12.96 lac metered connections are nonfunctional and defective.
- 7.3 During the years 2003-04 and 2007-08, 277.10(MGD) and 221.03 (MGD)water was distributed and charged to various categories of consumers respectively is given below in the Statement No. 13.4:



Category	No. of	Sales (in MGD)		Percentage of Sales	
	Connections				
	2007-08	2003-04	2007-08	2003-04	2007-08
Domestic	15,37,931	243.62	194.46	78.38	76.38
Commercial	1,15,635	26.25	20.70	8.45	8.14
&					
Institutional					
Industrial	22,888	7.23	5.87	2.33	2.30
Sub-Total	16,76,454	277.10	221.03		
Bulk		33.70	33.56	10.84	13.18
supplies to					
DCB and					
NDMC					
Total	16,76,454	310.80	254.59	100%	100%

7.4 In spite of increase in water treatment and supply capacity in each five year plan in Delhi, the average per capita capacity of water remained at 48 GPCD in 2007-08 (Table No.13.1).

8. WATER RESOURCES

8.1 The water supply treatment plants of DJB treated 629 MGD surface water and 81 MGD ground water as on March, 2007. The water resources of DJB are indicated in Statement No. 13.5.

Statement No.13.5

(March 2008)

S.No.	Source of Water	Quantity (MGD)
1.	Yamuna River	339
2.	Ganga River	171
3.	Bhakra Storage	130
	Sub Total	640
4.	Rainy Wells / Tube W ells (Ground Water)	100
	Total	740



Ground Water

- 8.2 The decreasing ground water level in Delhi has become a matter of serious concern. At some places in South and South West Delhi, the water level has gone 20-30 meter below the ground level. The quality of underground water is deteriorating and in several places, it has been found to be unfit for human consumption. The salinity of ground water is increasing in South-West and North-West Delhi. In some areas of Shahdara and Kanjhawala, nitrate content has been found to be more than 1000 mg/ liter. Fluoride and chemical concentrations, more than prescribed limits, have also been found in ground water at various locations in Delhi. To tackle these problems, the Central Ground Water Board has taken steps to regulate the number of tube-wells being commissioned in Delhi.
- 8.3 As on March 2008, DJB has 2488 functional Tubewells and 21 Rainy Wells. The Flood prone area upstream of Wazirabad barrage is being exploited for commissioning of more tube wells by DJB. The deepening old lakes and other water bodies, preserving and developing the forest area in Delhi, construction of check dams at Asola Wild Life Sanctuary and plantation of trees, are some of the steps being taken to improve ground water resources.

PARALLEL CHANNEL FROM MUNAK TO HAIDERPUR

8.4 About 30-50% of the raw water discharged from Tajewala Head works is lost in the present water carrier system through the Yamuna River and the Western Yamuna Canal system. To prevent this loss, a parallel pucca channel is under construction from Munak to Haiderpur. This channel of 102 kms. Length is being constructed by the Haryana Government. The estimated cost is Rs. 314.15 crores and it is targeted to be completed in 2009. The entire cost of the project will be financed by Delhi Govt. Water availability will increase by 80 MGD on construction of this channel.

RESERVOIRS

8.5. Renuka Dam, Kishau Dam and Lakhwar Vyasi Dam are proposed to be constructed so that Delhi gets its share in Yamuna water as per Yamuna water sharing Agreement signed in May, 1994. The approved allocation of Yamuna water to each state may be seen at Statement No. 13.6. About 275 MGD water will be available to Delhi from Renuka Dam. Delhi will also get 372 MGD water from Kishau reservoir and 135 MGD from Lakhwar Vyasi reservoir.



S.No.	States	Allocation (BCM)			Total (BCM)
		July to	Nov. to	March to	
		October	Feb.	June	
1.	Haryana	4.107	0.686	0.937	5.730
2.	Uttar	3.216	0.343	0.473	4.032
	Pradesh				
3.	Rajasthan	0.963	0.070	0.086	1.119
4.	Himachal	0.190	0.108	0.080	0.378
	Pradesh				
5.	Delhi	0.580	0.068	0.076	0.724
		(Consumptive	(Consump-	(Consump	(Consumptive
		1926+495	tive	-tive	806 + 495
		return flow)	231+495	255+495	return flow) or
		or 2421 cusec	return	return	2350 cusec
			flow) or	flow) or	
			726 cusec	750 cusec	

8.6 Himachal Pradesh Power Corporation Ltd. is taking up the work of construction of Renuka Dam, and at present, land acquisition is in progress. However, since the Renuka agreement of 1994 was not signed by the State of Rajasthan, the other signatory states; particularly, UP and Haryana are now questioning the legality of the agreement.

9. WATER ACCOUNTING & AUDITING

- 9.1 Till now DJB was using old system for measuring the quantity of raw water available at water treatment plants and the quantity of treated water supplied by treatment plants for distribution. Similar was the position at under ground water tanks, reservoir and booster pumping stations. Due to this system, DJB was not able to assess exact amount of water distribution losses. To overcome this situation, DJB has started a comprehensive programme for installation of bulk meters at all water treatment plants. About 86 bulk meters have already been installed.
- 9.2 DJB has also decided to install bulk meters on all distribution mains, underground reservoirs and booster pumping stations for correct measurement of water supply from these points' upto different localities / consumer points. Under this project, 305 sophisticated bulk meters will be installed by July, 2009.
- 9.3 Complete and correct water supply accounting could not be maintained by DJB due to the following facts :-



- (i) Out of total 16.75 lac water connections as on 1.4.2008, 3.46 lac are un-metered connections.
- (ii) And even out of 13.29 lac metered connections, around 5.00 lac meters were defective or non-functional.
- (iii) Fixing of maximum average of 20 KL/30 KL per month (as the case may be) for domestic consumers if water meters are non-functional and till defective water meter is replaced.
- 9.4 DJB has streamlined its system for obtaining water connections along with installation of water meter. The existing system of supply of water meter along with sanction of water connection has been amended and now consumers can purchase water meters of approved specifications from the open market. The consumers having DJB's defective meters have been allowed to get the defective meter replaced with private water meter and have been given option either to get the refund of meter security or get the same adjusted towards water charges in future.

10. EXISTING WATER TARIFF:

- 10.1 The existing tariff is based on the principle of "use more pay more". At higher consumption levels, the tariff acts as a disincentive to consumer for excessive use of water or wastage of water.
- 10.2 Special subsidy in water charges has been allowed to resettlement colonies and rural areas where water charges are being recovered on assumed average of 10 Kl. per connection per month. As a public welfare measure, water consumption upto 6 Kl. per connection in a month is without any charge for all domestic consumers except service charge. Salient features of existing water tariff are as under:
- 10.3 Existing water tariff has two parts. One is Service Charge and other Volumetric Water Consumption Charge applicable w.e.f. 1.12.2004 and 1.4.2005 respectively.
- 10.4 50 % of water consumption charges are recoverable towards Sewerage Maintenance Charge from such colonies / areas where sewerage services have been provided / maintained by the DJB.
- 10.5 In case of bulk connection for a colony / group housing society serving a number of residential premises, water charges will be worked out as per residential unit-wise at the domestic rates applicable from time to time.



10.6 WATER TARIFF FOR UN-METERED CONNECTIONS IN JJ RESETTLEMENT COLONIES AND RURAL AREAS :

Water charges on assumed average of 10 KI. PM per Connection and service charge. Water consumption rates are same as referred to in the preceding Para.

Sewerage maintenance charge is also recoverable, if sewerage services are being managed by D.J.B.

Besides above, water cess is recoverable from all consumers at the rates determined by the Central Government from time to time.

11. RAIN WATER HARVESTING

- 11.1 All Government Departments, Local Bodies and Public Sector Undertakings have been directed to install rain water harvesting system in their buildings / complexes. Buildings norms have also been modified and now all new buildings with 100 sq.meters and above area will have to provide rain water harvesting system in their lay out plan for approval to Local Bodies. PWD, MCD, DJB have installed rain water harvesting system in the buildings / complexes being maintained by them.
- 11.2 A plan scheme to promote rain water harvesting is being implemented by DJB. Technical know how is being provided to all willing individuals, RWAs, institutions, Housing Societies, etc. Financial incentive of Rs. 1,00,000/- or 50% of cost, whichever is less, is also being provided under the scheme. A number of RWAs have found very encouraging results from rain water harvesting system introduced in their respective areas.

12. WATER CONSERVATION

12.1 Delhi has a network of about 10,000 Kms. of water supply mains of which, a significant portion is as old as 40 to 50 years and prone to higher leakage losses. Normally water losses are calculated by water billed or consumed subtracted from the water produced. In the case of Delhi, water billed or consumed and leakage losses there from cannot be calculated exactly as a majority of houses do not have working meters. According to the estimates of DJB, the total distribution losses are of the order of 40% of the total water supplied. These are quite high as compared to 10-20% in the developing countries. The distribution losses include losses due to (a) leaking pipes and (b) theft of water through unauthorized connections.



- 12.2 DJB has taken several steps to minimize leakage losses. To address this problem, a leak detection and investigation (LDI) cell was set up. The Board has replaced about 1200-km length of the old, damaged and leaking water mains during the last five years. As a result of these initiatives, the Board expects to bring down the distribution losses to 20% level in the near future.
- 12.3 DJB has formulated a programme for recycling of backwash water in four major water treatment plants at Haiderpur, Bhagirathi, Chandrawal and Wazirabad. The work for commissioning of recycling plant of 16 MGD at Haiderpur has been completed and work at Bhagirathi, Wazirabad and Chandrawal plants will be completed in 2009. On completion of programme of all 4 Water Treatment Plants, about 45 MGD water supply will be available without any additional raw water.

13. SEWAGE TREATMENT CAPACITY

13.1 The sewage treatment capacity of DJB has been increased from 402.4 MGD as on 31.3.2001 to 512.40 MGD by March, 2008 as per details given below :

S.No.	Name of STP	Capacity	Capacity	Actual
		(MGD)	(MGD)	treatment
		As on	As on	in MGD as
		31.3.2001	31.3.2008	on
				31.3.2008
1.	Okhla	140.00	140.00	131.81
2.	Keshopur	72.00	72.00	69.66
3.	Coronation Pillar with	46.00	46.00	26.35
	Oxidation P onds at			
	Timarpur			
4.	Rithala	40.00	80.00	41.18
5.	Kondli I, II, III, IV	45.00	45.00	63.26
6.	Yamuna Vihar I, II	10.00	20.00	9.65
7.	Vasant Kunj	5.00	5.00	3.94
8.	Ghitorni	5.00	5.00	-
9.	Pappankalan	20.00	20.00	13.20
10.	Narela	10.00	10.00	0.80
11.	Najafgarh	5.00	5.00	1.58
12.	Delhi Gate	2.20	2.20	2.52
13.	Sen Nursing Home	2.20	2.20	2.45
14.	Rohini	-	15.00	-
15.	Nilothi	_	40.00	16.00
16.	Mehrauli	_	5.00	1.20
	Total	402.40	512.40	383.62

Statement 13.7



- 13.2 These STPs are not functioning up-to their full installed capacity due to various reasons, such as, low flow of sewage to STPs, trunk and peripheral sewer lines still to be connected to STPs, etc. The sewage generation, at present, is estimated to be around 716 MGD = 770 (water production) X 0.8 + 100 (Pvt. Ground water extraction) and treatment is around 384 MGD only. This untreated sewage (332 MGD) falling in river Yamuna is major cause of river pollution.
- 13.3 DJB has a net-work of branch, peripheral sewers of about 6217 kms. Also there is network of 160 kms of trunk sewers. About 91 kms of trunk sewers was settled and silted. The rehabilitation / de-silting have been completed in 40 kms. and in remaining 51 kms., the works have been awarded and are in progress.
- 13.4 The consultant for World Bank funded, "Delhi Water Supply & Sewerage Project" estimated 5259 MLD water supply requirement for Delhi in 2021 and waste water generation from this level of water supply will be about 3760 MLD as per Statement No.13.8.

Source of Waste Water	Volumes, mld				
	2004	2005	2006	2011	2021
Total water demand	2685	3763	4090	5181	6272
Total net water supply	2265	2362	2461	3573	5259
Waste water generated	1812	3010	3272	4144	5017
Treated at CETP	200	217	234	346	755
Proportion not sewered	14%	13%	13%	10%	5%
Outside sewered area	254	302	302	294	210
Net generated wastewater	1358	1722	1798	2218	3242
Infiltration	518	518	518	518	518
Gross Wastewater to	1876	2240	2316	2736	3760
treatment					

14. WASTE WATER REUSE

14.1 The main opportunities for reuse of treated wastewater in and around the city are considered to be irrigation, horticulture and industrial use. There is now demand for sue as cooling water in the power stations. Others options include ground water recharge, return to be raw water source, and the treatment and reuse of sullage water, i.e. water that does not contain human excreta, for flushing toilets, etc.



- 14.2 Presently DJB supplies about 138 MGD of treated waste water to the Irrigation Deptt. This is discharged directly to the Irrigation channels from the sewage treatment plants.
- 14.3 A number of small reuse projects are in the planning or implementation stages. They comprise horticultural, irrigation and industrial uses, and will use up to 46 MGD (210 MLD). Besides, STPs of Delhi Jal Board, treated waste water is available from CETPs in industrial areas being maintained by DSIIDC and Mini STPs of Slum & JJ Department.
- 14.4 18 major drains pollute Yamuna river for various reasons including due to over-flow of untreated sewage from unsewered areas. It has been decided to lay interceptor sewers for cleaning Yamuna river. Engineers India Ltd. has been appointed as Project Management Consultant (PMC) for this project and an escrow account has been created. Data collection in terms of quantity / quality of flow in drains has been completed. Geo technical survey has been done. Detailed feasibility report submitted on September, 2008 and detailed project report submitted on 15.12.2008 which is being scrutinized for calling of tenders.
- 14.5 DDA is responsible for 4,451 hectares of open spaces, all of which are irrigated via tubewells. There is also irrigation of MCD open spaces, Central Government properties, private parks and properties, road verges, sports stadiums etc. The details of the green areas being maintained by the various agencies is indicated in Statement No. 13.9.

Agencies	Green Areas (in Hectare)
NDMC	445
MCD	2,428
DDA	4,451
CPWD	2,200
Forest Department	11,000
Total	20,524



1.	Treated effluent supplied to CPWD for horticultu re purpose in Lutyen Delhi from Okhla STP	20.00 MGD
2.	Treated effluent supplied to Pragati Power Plant from Dr. Sen Nursing Home Nalla and Delhi Gate Nalla STPs	4.00 MGD
3.	Treated effluent supplied to DDA for Japanese Park in Rohini from Rithala STP	5.00 MGD
4.	Treated effluent supplied to Minor Irrigation Deptt. Govt. of National Capital Territory of Delhi from Okhla STP -42 cusecs, Keshopur STP -37 cusec, Coronation Pillar STP - 70 cusec for irrigation purpose	80.5 MGD
	Total	109.5 MGD

15. WASTE WATER MANAGEMENT

15.1 Due to the continuous inflow of migrants and the mushrooming growth of unauthorized colonies and JJ clusters, the landscape of Delhi is spotted with different types of settlements. More than 45% population is residing in such unplanned settlements where sewerage system is not provided. The estimated waste water generation in Delhi in January, 2000 and the population served with sewerage system may be seen at Table No. 13.2. Now, plan schemes to provide sewerage systems in regularized unauthorized colonies, J.J. resettlement colonies, and urbanized villages, are being implemented and the present status of these colonies may be seen at Table 13.4.

