

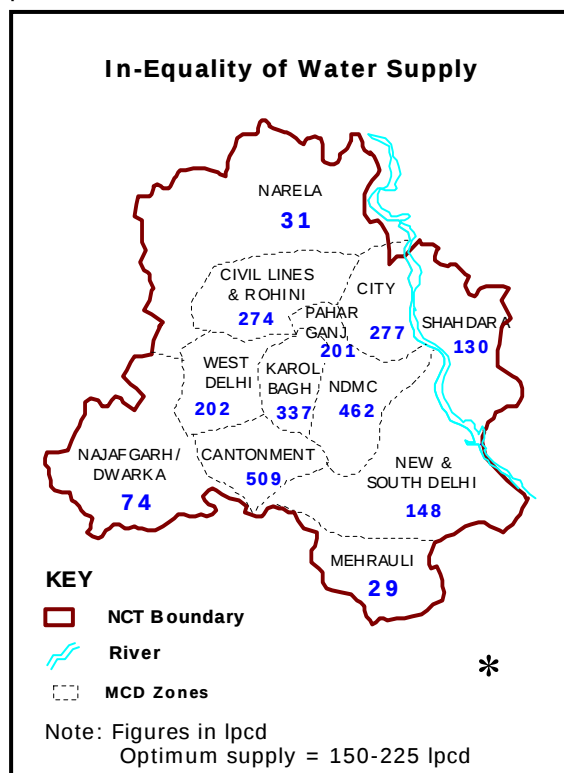
9. Water Management

9.1 Water Supply

9.1.1 Present Deficiencies

Based on the estimated 2000 population, and design demand, the quantity of raw water treated and distributed in Delhi should at present be adequate. However, there is in-equity in the supply of water. Some areas receive quantities of water far in excess of design norms while 10% of the population has no piped water supply and 30% has grossly inadequate access to safe drinking water. It is estimated, also, that over 40% of water distributed is un-accounted for or lost through leaking pipes.

As a result of rapid urban development that has out-stripped expectations, much of which has been un-planned or un-controlled, the water supply infrastructure has failed to match demand. As a consequence, households and businesses have had to resort to exploiting ground water resources that in places have become depleted or saline. Many areas have to rely on water tankers, particularly the urban poor.



Source: Delhi 1999 – A Fact Sheet NCRPB

9.1.2 Objectives and Long Term Goals

The authorities not only have the task of planning and catching-up on the back log of a deficient service but also have to make provision for future growth. Losses have to be reduced to financially manageable levels. Production and supply of potable water has to be increased and made more efficient. The Delhi Jal Board (DJB) has to be more commercially orientated and the customer (households, businesses, industry) have to be prepared to pay for the “real cost” of supply. At present only about 35% of the costs are collected.

The Long Term Goal is to:

- Provide all citizens in the NCT equal access to an adequate quantity of potable water within the available natural water resources.

To achieve this long term goal the objectives will require:

- Greatly improved efficiency in operation and maintenance of the water supply system.
- Reduction of un-accounted for water to less than 20% of water supplied.
- Providing a 24 hour piped water supply.
- Water harvesting and wastewater re-use to reduce the demand on treated piped water for non-essential use.
- Progressive development of water sources and treatment facilities.
- Systematic expansion of the water distribution network to all un-served urban areas.
- Coordinated planning and development of the water sector for future urban growth.

9.1.3 Policy Framework

To achieve these objectives, policies will have to be adopted by the government departments and endorsed by the public in general. In strategic planning for the

future growth of the city very careful consideration must be given to future sources, availability of water and access to the public. To date, DJB has been restrained from investment due to the low rates charged to customers for the supply of water and the legal constraint imposed on providing infrastructure services to unauthorised colonies. This has to be corrected.

The government policies must cover the issues of:

- The Delhi Jal Board to have autonomy to raise water supply tariffs to become financially self-sufficient
- The establishment of an independent regulator to ensure service delivery targets are met and to set fair and affordable rates in consultation with consumer associations
- Water supply tariffs to cover the cost of treatment, distribution and operations
- Urban development to be planned in conjunction with water availability
- Monitoring and controlling the extraction of ground water
- Groundwater extraction license fees and water cess to reflect cost to the environment
- Promotion of water harvesting and re-use at household and institutional level

Permitting DJB to raise tariffs, but controlled by an independent regulator, will give confidence to investors and allow management to plan and operate in a stable environment providing long term sustainability, on a non-political basis.

Many of these issues have been discussed for many years, but need the government and political will to enforce them.

9.1.4 Institutional Framework

It is clear that the DJB has been unable to keep pace with the rapid urbanisation of the city and has not been sufficiently equipped with either the appropriate technical skills or the equipment for implementing, operating and maintaining

an efficient and responsive water supply undertaking.

The DJB has to be more commercially orientated, with improved information systems for analysing operational and delivery performance, with corresponding better financial management.

To undertake the policy changes the institutional framework will require:

- Expansion of Private Sector Participation (PSP) to increase efficiency through incentive and performance management.
- Improved public relations, information and transparency of operations
- Consumer involvement at all levels from planning to implementation.
- Development of low-cost water supply schemes through community partnerships.

The encouragement of PSP financing and higher cost recovery will free scarce public funds for other important social investments, in particular, poverty alleviation and slum improvement programmes. The DJB is already using PSP in the construction and operation of water treatment plants. The next step would be to extend the private sector involvement to include operation and maintenance of a discrete distribution system and supply to customers, in the same way as the NDMC or Delhi Cantonment Board operate as bulk operators.

Expanding the water supply coverage also helps poverty alleviation by allowing consumers to switch from high cost alternative supplies, such as from private tankers, to piped services.

9.1.5 Investment and Action Programme

With 40% of the present population of Delhi without an adequate piped water supply, large investments are required to make up the deficiencies, even before starting to address the issue of growth. An accelerated programme of investment is needed in order to arrest the present decline in service provision and to address

the new water supply demand from the new urban developments that will be built to serve the additional 80,000 households which are forming annually.

Water Demand Increase

The raw water demand in the next 20 years is predicted to climb from the present 2,700 to 4,700 mld., an increase of 75%, in order to cater for both the present deficiencies and future predicted population growth.

Sources of the raw water will be from:

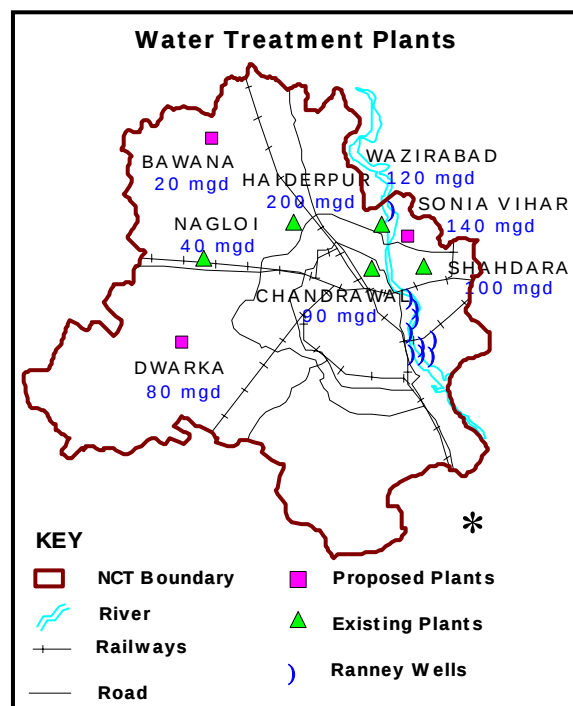
- Teri Dam – 730 MLD
- Leakage reduction in the carrier from Munak to Haiderpur - 720 MLD
- Additional water from BBMB – 180 MLD

Long term sources may include:

- Renukal Dam (Giri River, HP) 1,250 MLD
- Kishau Dam (Tons River, UP) 1,690 MLD
- Lakhawar Dam (Tons River) - 610 MLD

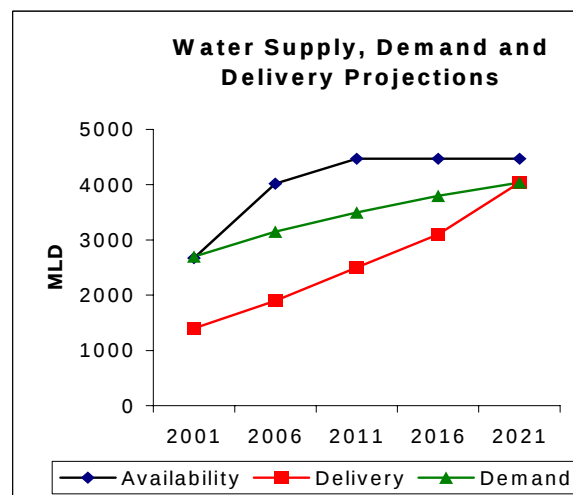
However, raw water supply to Delhi may be restricted to only 720 MLD in compliance with the agreement of May 1994 by the five riparian states.

Further exploitation of the Yamuna River basin is also possible, however, care must be taken to avoid contamination from pollution from the river due to excessive draw down.



Source: Delhi 1999 – A Fact Sheet, NCRPB

Water treatment plants are planned or are under construction to increase the supply of water for distribution to approximately 4,450 MLD. by 2010. Thus, a further treatment capacity of 250 MLD. (50 MGD), with corresponding raw water sources, would need to be developed to satisfy water supply demand in 2021.



Existing Losses - Future Supply

Much of the future demand would be satisfied if the water losses in raw water transmission and treated supply can be drastically reduced. There needs to be a water audit of the whole water supply system, from source to consumer. Bulk water meters in distribution districts need to be installed and the system properly analysed and controlled to provide more equity in supply.

Water Conservation

Methods of water re-use and conservation require to be investigated further. This should include the re-use of treated wastewater for irrigation of horticulture thus allowing a sustainable level of groundwater to be used for domestic use. Rainwater harvesting and storage by householders and institutions should be encouraged for non-drinking purposes.

Investments

Table 9.1.5 indicates the major investment requirements at base 2000 prices.

Table 9.1.5: Water Supply – Major Investments for Short, Medium and Long Term

Programme	Investment (Rs Million)	Comments
SHORT TERM (2001 – 2006)		
Technical Assistance to DJB including capacity building for better system management.	50	Preparation of short term investment programme including water audit with location and condition surveys.
Leak detection and network rehabilitation programme	1,200	DJB unit to be strengthened to accelerate rehabilitation work
Expansion of trunk / distribution network to un-served and growth areas	2,600	Planned in relation to water availability from treatment plants
630 mld (140 MGD) Sonia Vihar Water Treatment Plant including transmission mains	4,200	Finalisation of design. Raw water to be from Tehri Dam
Ranney Wells 450 mld. (100 MGD) including transmission mains	200	Deep aquifer wells in the Yamuna flood plain within the existing resource
Raw water parallel conduit from Munak to Haiderpur	5,800	Water losses reduced and quality preserved if closed or piped
Sub-Total	14,080	(US\$ 320 million)
MEDIUM TERM (2007 – 2011)		
Design consultancy to DJB	20	Preparation of medium term investment programme including continuation of condition surveys.
Leak detection and network rehabilitation programme	800	DJB unit to be strengthened to accelerate rehabilitation work
Expansion of trunk / distribution network to un-served and growth areas	3,600	Planned in relation to water availability from treatment plants
180 mld (40 MGD) Okhla Water Treatment Plant	2,800	Pending agreement on availability of raw water
270 mld (60 MGD) Dwarka Water Treatment Plant	4,200	Subject to availability of raw water
Sub-Total	11,420	(US\$ 260 million)
LONG TERM (2012 – 2021)		
Design consultancy to DJB	20	Preparation of long term investment programme.
Leak detection and network rehabilitation programme	1,400	DJB unit to be strengthened to accelerate rehabilitation work
Expansion of trunk / distribution network to un-served and growth areas	7,200	Planned in relation to water availability from treatment plants
Yamuna water sharing from Renukal Dam, Kishau Dam, and Lakkhawar Dam Investment may be required after 2010	20,000	Long lead in period and require extensive planning for development and water sharing agreements.
Sub-Total	28,620	(US\$ 650 million)
TOTAL (indicative cost in Rs million)	54,120	(Approx. US\$ 1230 million)

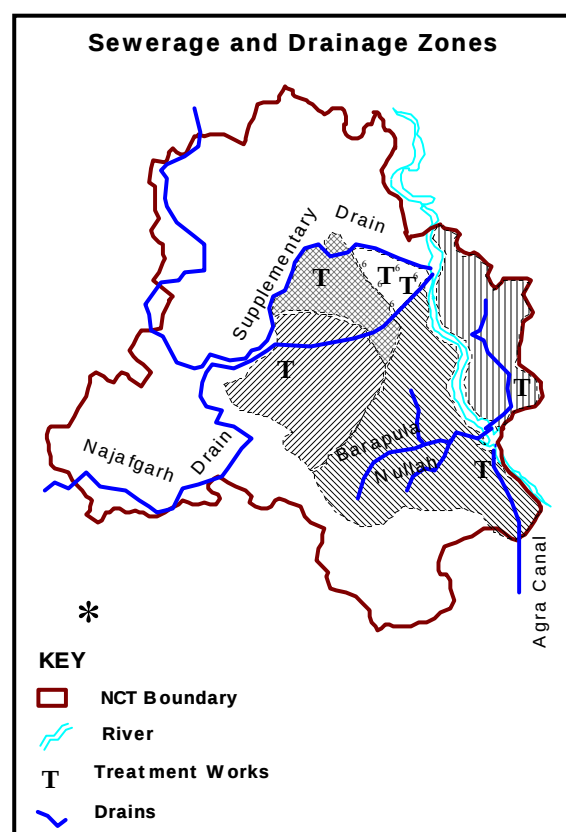
Source: DJB / DUEIIP

9.2 Wastewater Management

9.2.1 Present Deficiencies

About 45% of the total population currently have no sewerage service. In many of these communities, especially those which are in-unauthorised colonies and of the urban poor, human waste is disposed of using individual or communal on-site sanitation or open defecation. Wastewater is disposed of to the ground, to open channels or direct to the surface water drains, which ultimately either discharge to the Yamuna or transport the wastewater for irrigation, generally, outside the city.

The problem is made worse by the poor condition of the sewerage system, where many sewers are blocked with large quantities of silt or have collapsed and the sewage diverted to the surface drainage network. As a result most of the sewage treatment plants (STPs) are operating below design capacity and the stormwater drains act as surrogate sewers causing extensive pollution in the river, with the associated environmental and public health impacts.



9.2.2 Objectives and Long Term Goals

The authorities not only have the task of planning and catching-up on the deficiency of appropriate sanitation or sewerage in the city but also planning and providing infrastructure for future urbanisation within the NCT.

The Long Term Goals must be to ensure:

- equal access to appropriate sanitation and drainage - for all
- the environmental and health impacts of poor sanitation are greatly reduced
- the Yamuna river meets its prescribed quality classification, and
- protection of the city from flooding

To achieve these long term goals will require the objectives of :

- providing systematic repair and preventative maintenance of the sewerage and drainage networks
- investment in better solid waste management (see following section)
- expanding the existing wastewater collection to serve all areas and planning for growth
- upgrading and constructing sewage treatment plants
- providing local wastewater treatment where primary sewers are not available
- providing appropriate sanitation where sewerage is not practical
- urban planning to provide public spaces for peak flood water retention
- on-channel storage on main drains to attenuate flood flows.

9.2.3 Policy Framework

To achieve these objectives, future policies will have to include :

- the Delhi Jal Board to have autonomy to raise sewerage tariffs to become financially self-sufficient
- the establishment of an independent regulator to ensure service delivery targets are met and to set fair and

affordable rates in consultation with consumer associations

- sewerage tariffs to cover the cost of sewage collection, treatment and operations
- ensuring properties are connected to the sewerage network where provided
- promoting environmental health awareness and good hygiene practices especially to the urban poor.

9.2.4 Institutional Framework

It is clear that the DJB has been unable to keep pace with the rapid urbanisation of the city. Much of this is due to the legal constraint imposed on providing infrastructure services to un-authorised colonies. But also, the DJB has not been sufficiently equipped with either the appropriate technical skills or equipment for implementing, operating and maintaining an efficient and responsive sewerage undertaking.

To meet these challenges the institutional framework will require:

- expansion of Private Sector Participation (PSP) to increase efficiency through incentive and performance management
- computer aided design and management information systems for planning
- better information on condition and operation for maintenance of the sewerage systems
- appropriate equipment and training for de-silting and renovating sewers
- improved public relations, information and transparency of operations
- consumer involvement at all levels from planning to implementation
- encouragement of NGOs to facilitate on-site sanitation of un-sewered areas
- provision of appropriate sanitation facilities through community partnerships

The encouragement of PSP financing and higher cost recovery will free scarce public funds for other important social investments, in particular, poverty alleviation and slum improvement programmes. A first step for PSP might be to encourage private developers to provide their own sewerage and treatment facilities, which they would operate and maintain.

However, the drainage and sewerage authorities have also been hampered by the poor collection and indiscriminate disposal of solid waste within the city. Much of the waste generated daily finds its way into the sewers and drains, causing blockages. For improvements in the sewerage and drainage systems to be effective, it is an essential requisite that the municipal authorities also make improvements in their solid waste management operations.

9.2.5 Investment and Action Programme

A long term goal is to ensure that the Yamuna river achieves its status as a Class B river, with bathing water standards. For this a number of existing sewage treatment plants will need to be up-graded.

However, the priority must be to ensure that the wastewater collection system is first expanded to cover the maximum practical area of the city and is properly operated and maintained.

With 45% of the present population of Delhi without adequate sewerage or sanitation facilities, there is desperate need to reverse this situation. However, it is essential that any expansion of the sewerage system is planned and undertaken in conjunction with the expansion of the water supply network. Sewers need a reliable water supply system for effective operation. Even so, experience has shown that sewer design must make provision for regular and easy access for inspection and de-silting for which costs, funds must be allocated in the operation and maintenance budget.

The following table 9.2.5 indicates major investment requirements at base 2000 prices:

Table 9.2.5: Wastewater – Major Investments for Short, Medium and Long Term

Programme	Investment (Rs Million)	Comments
Short Term (2001 – 2006)		
Technical Assistance to DJB including capacity building for better system management.	50	Preparation of short term investment programme including location and condition survey of existing sewerage.
De-silt and renovate existing sewerage system	4,500	Proposals made to Yamuna Action Plan for funding trunk sewers
Facilitate on-site sanitation / community toilets to urban poor	750	Planned as part of the Environmental Improvements to Urban Poor Program
Expand sewerage system to connect un-served areas	1700	Planned in relation to water supply and existing STP capacity
Trans-Yamuna STP 250 mld. (55 MGD)	2,700	Existing STP at full capacity.
Okhla STP 155 mld. (35 MGD)	1,650	
<i>Sub-Total</i>	<i>11,350</i>	<i>(US\$ 260 million)</i>
Medium Term (2007 – 2011)		
Design consultancy to DJB	20	Preparation of medium term investment programme including continuation of condition surveys.
Facilitate on-site sanitation / community toilets to urban poor	650	Planned as part of the Environmental Improvements to Urban Poor Program
Expand sewerage system to connect un-served areas	1,400	Planned in relation to water supply and existing STP capacity
Keshopur STP 295 mld (65 MGD)	3,200	
Rithala STP 250 mld (55MGD)	1,600	
Coronation Pillar STP 90 mld (20MGD)	980	
Additional sewage treatment for urban growth areas 400 mld (90 MGD)	4,800	Developed in conjunction with water supply expansion and urbanisation
<i>Sub-Total</i>	<i>12,650</i>	<i>(US\$ 295 million)</i>
Long Term (2012 – 2021)		
Design consultancy to DJB	20	Preparation of long term investment programme.
Expand sewerage system to connect un-served areas	2,400	Planned in relation to water supply and existing STP capacity
Up-grade existing STPs to satisfy Yamuna classification and as source of raw water	9,880	Introduction of tertiary treatment and expansion of effluent re-use
Additional sewage treatment for urban growth areas 800 mld (180 MGD)	9,600	Developed in conjunction with water supply expansion and urbanisation
On-channel storage and flood control gates on main drains	100	Long term requirement to cater for increased urban run-off
<i>Sub-Total</i>	<i>22,000</i>	<i>(US\$ 500 million)</i>
TOTAL (indicative cost in Rs million)	46,000	(Approx US\$ 1,065 million)

Source: DJB / DUEIIP