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# Water for Indian Cities: Government Practices and Policy Concerns

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**Abstract**

*The demand for basic infrastructure and services in Indian cities has increased phenomenally due to rapidly growing populations. Such unmet demands often adversely affect the quality of urban life, the economic productivity, as well as the process of sustainable development. The main purpose of this brief is to highlight the problems involved in improving access to water supply in Indian cities faced with a severe water shortage crisis. A case study approach is followed, and the status of water supply service is described for three large cities of India, namely Delhi, Mumbai and Kolkata. The author argues that there exists an immediate need to build up the water infrastructure and institutions, and points out that the challenge for stakeholders lies in speeding up the reform process and in the replication/implementation of efficient water governance practices.*

## Introduction

Migration from rural areas and small towns to cities is quite common in India. Such movement is generally associated with the level of economic and social development of a place. Employment and education among males and marriage among the females are important reasons for migration. All-India data show that during the decade 1991-2001, more than 20 million persons moved from rural to urban areas, and nearly 15 million moved from one town to another (Census of India, 2001: 15). As a result of this movement, city populations have grown phenomenally over the years. During 1991-2001, the proportion of in-migrants[1] to the total population of Delhi urban agglomeration[2] (UA) was 16.4 %. It was 15.1 % in the case of Greater Mumbai UA, 13.4 % in Bangalore UA, 8.7 % in Hyderabad UA, 6.6 % in Chennai UA and 6.2 % in Kolkata UA (Census of India, 2001: 18). In addition to migrants, there is a sizeable working population living in the adjoining areas which moves in and out of the city on a daily basis. Due to a high concentration of population in cities, there is a huge demand for infrastructure and services, such as housing, public transport, electricity, water supply, sanitation, sewerage, drainage and solid waste management.

### Access to drinking water

Several indicators have been identified to understand the availability and quality of drinking water in an area. A basic indicator included in the Indian Census is the 'proportion of population/households having access to safe drinking water'. Although the definition of 'safe drinking water' has been spelled out, there is strong criticism by analysts on the high proportions of the population being considered under the 'safe drinking water' category. In this respect, it is argued that while sources of safe drinking water have been

listed, sufficient steps are not being taken by the service providing agencies to test the quality of water obtained from such sources at frequent intervals. Sample surveys are also conducted from time to time covering the whole of the Indian Union (with the exception of some remote areas) to collect information on the source and condition of drinking water. Some indicators on which national/state-level data are collected include: 'households (HHs) having their principal source[3] of drinking water within/near their premises', 'HHs having sole access to their principal source of drinking water', 'HHs sharing a public source', 'HHs served by tap/piped water/tubewell/ handpump', 'HHs getting sufficient drinking water from their principal sources', 'HHs satisfied with the quality of drinking water served by their principal sources', 'HHs using supplementary sources[4] of drinking water', 'HHs boiling and filtering drinking water before consumption', 'HHs storing their drinking water', 'HHs dipping in a vessel without a handle to take drinking water out of the main storage container', etc.

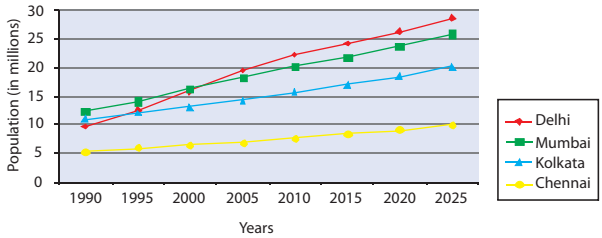
The Jawaharlal Nehru National Urban Renewal Mission[5] (JNNURM) Directorate has identified a list of nine service level benchmarks in respect of water supply services in order to review the performance of service delivery agencies. The indicators are: 'coverage of water supply connections'; 'per capita supply of water'; 'extent of metering of water connections'; 'extent of non-revenue water'; 'continuity of water supply'; 'quality of water supplied'; 'efficiency in redressal of customer complaints'; 'cost recovery in water supply services'; and 'efficiency in collection of water supply-related charges'.

A recent study conducted by WHO and UNICEF (2010: 43) reveals that in 2008, 96 % of India's urban population was using an improved drinking-water source[6]. Of this total, one-half (48 %) had piped supply on premises and the remaining used other improved sources. According to the study, about 4 % of the population was using drinking-water from unimproved sources. The data compiled by the Census of India (2001) showed that 90 % of the households in urban India had access to safe drinking water facilities. Most Indian States fell under the 70 – 99 % category but percentages in many north eastern States and in Kerala were less than 60 %. A sample survey conducted by the National Sample Survey Organisation (1999: ii) during January to June 1998 revealed that 91 % of the urban households in the country were served by tap, tubewell or handpump. The survey also showed that almost one-half (46 %) of the urban households reported boiling (11 %) and filtering (35 %) of drinking water before consumption.

## The case studies

Indian cities are home to millions of people. In 2001, there were 35 UAs/cities, each having a population of more than one million.

**Fig.1**
**Growth of Population in Four Largest Cities/UAs of India, 1990 to 2025**




Together, these accounted for 38 % of the country's total urban population. While most of these had just crossed the one million mark at the time of 2001 Census count, three (namely Greater Mumbai, Delhi and Kolkata UAs) recorded a population of more than 10 million. Their population (in million) was 16.4, 13.8, and 13.2 respectively. It is estimated that by 2025 the number of persons living in each of the three mega cities/UAs would be more than 20 million (UN, 2009). As per the UN population projections, other Indian cities/UAs are not expected to cross the 10 million mark by 2025 (Fig. 1). The three UAs are also included in the list of 30 largest UAs in the world ranked by population size. For the year 2025, Delhi and Mumbai have been ranked 2nd and 3rd after Tokyo, while Kolkata's rank is 8th after Sao Paulo, Dhaka, Mexico City, and New York-Newark.

The Delhi Jal[7] (Water) Board (DJB) is responsible for the discharge of functions of water supply, sewerage and sewage disposal, and drainage within the National Capital Territory of Delhi[8]. It functions as per the provisions of the Delhi Water Board Act, 1998. The agency currently produces about 820 million gallons per day (MGD) of water, 85 % of which is

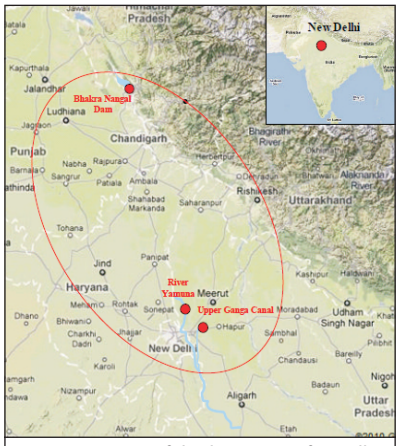



**Fig. 2:** Sources of drinking water for Delhi

obtained from surface sources[9] (such as river and canal; Fig. 2) and the remaining is extracted from under the ground[10]. Before supplying to the consumers, raw water undergoes conventional treatment for which treatment plants are established at six different locations in the city[11]. Water for treatment plants is carried through dedicated trunk mains. The water produced at treatment plants and in the distribution system is frequently checked in laboratories to ensure potable supply. After treatment, water is taken to underground reservoirs and then distributed to different parts of Delhi. Most of the city is covered by a piped network. Up to April 2009, more than 17 lakh piped water connections had been provided. At other places (including slums/unauthorised colonies), water requirements are met through hand pumps, stand posts, tankers (supplies water free of cost), and private motorised wells/tube wells. DJB levies two charges (i.e., a service charge and a volumetric charge per kilolitre) on domestic water consumers to recover costs incurred in the production and supply of water. As per the prevailing rates, a household consuming up to 10 kilolitres (kl) of water has to pay Rs. 82 a month; Rs. 180 for consuming up to 20 kl and; Rs. 470 for consuming up to 30 kl. The monthly water tariff also includes a sewerage maintenance charge levied @ 60 % of water volumetric charge.

The Municipal Corporation of Greater Mumbai (MCGM) is responsible for the "construction and maintenance of works and means for providing a supply of water" to the residents of Mumbai[12]. The civic agency functions according to the provisions of the Mumbai Municipal Corporation Act, 1888. The quantum of water produced is about 860 MGD (or 3,250 MLD), all of which is obtained from six different surface sources[13]. Two sources are situated within city limits and the remaining lie at a distance of more than 100 kms. (Fig. 3). All sources (i.e., lakes) have been created by constructing dams on rivers (namely Mithi, Alwandi, Vaitarna and Bhatsa). The water is transferred to the city by pipe lines. Some sources such as Upper Vaitarna are situated at a higher elevation and thus water is conveyed to the city entirely by gravity.

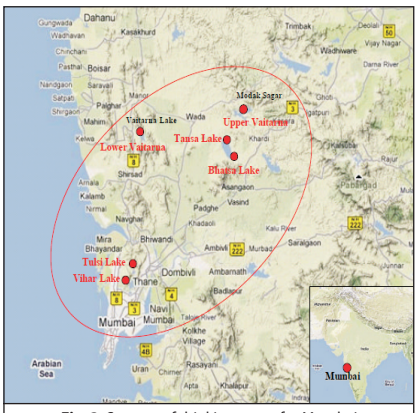


**Fig. 3:** Sources of drinking water for Mumbai

For the treatment of water, plants[14] have been established and the treated water is first stored in master reservoirs and then transferred to service reservoirs located in various parts of the city from where all consumers are served by piped supply. Furthermore, water samples from the distribution network and taps are routinely collected and tested to ensure a good quality of supply. The Corporation is empowered to levy a water tax, a water benefit tax, and/or a water charge for meeting the expenditure incurred on capital works for making and improving the facilities of water supply and for maintaining and operating such works. Presently, households with metered connections are charged @ Rs. 3.50 per thousand litres of water. This rate is Rs. 2.25 in case of slum settlements. The rate increases if the consumption of water exceeds 150 lpcd. Unmetered connections are charged @ 12.5 % of annual rental value of property. MCGM uses accrual-based double entry sytem of accounting for maintaining accounts.

The Kolkata Municipal Corporation (KMC) Act, 1980 empowers the civic agency to discharge functions in relation to water supply. Accordingly in Kolkata, the Municipal Corporation is in charge of "construction and maintenance of water-works and providing, by itself or by any agency, means for supply of water for public and private purposes". To meet the requirements of the city population[15], 93 % of water is obtained from surface source (namely river Hooghly which flows more than 15 kms. along the western edge of Kolkata; Fig. 4) and the remaining is extracted from under the ground by installing tube wells. The total production from the two sources is about 291 MGD. Facilities have been created for the treatment of raw water, and the installed capacity of treatment plants is 393 MGD[16]. There are about 15 pumping stations with reservoirs established at different places in the city for providing piped supply of water. The municipal Act empowers the corporation to levy a fee for the supply of water to households. KMC supplies water free of cost to most domestic consumers. It charges only for bulk supply. Presently, the rate for bulk supply of

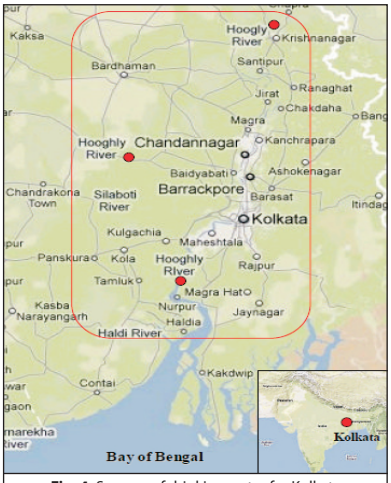


**Fig. 4:** Sources of drinking water for Kolkata

water to domestic users through meters is Rs. 7 per kilolitre.

## Issues and challenges

An appraisal of the water supply situation in the three largest Indian cities reveals a number of problems (Table 1). Notable among these are: A huge water demand and supply gap; poor operation and maintenance of water supply systems; huge water losses mainly caused by leakages in transmission and distribution lines; significant proportion of non-revenue and unaccounted flow of water; large number of non-functional and defective meters; noteworthy intra-urban disparities; inadequate supply of safe drinking water to poor communities; insufficient quantities supplied; intermittent supply; poor quality of water, depleting ground water levels; low tariff for domestic connection/inappropriate pricing; lack of attention given to rationalisation of tariffs; low cost recovery; poor financial management and accounting systems; inadequate manpower and institutional capacity; lack of reliable data/information; lack of private sector involvement; lack of bankable projects to attract institutional financing and external funding; and numerous technical problems, including old pipe networks/trunk mains; lack of dedicated service connections; insufficient capacity to treat waste water; use of substandard material (such as valves, pipes); frequent pipe bursts, poor maintenance of reservoirs; and lack of apparatus for volumetric measurement.

**Table 1: Status of water supply in select Indian cities**

| Indicators | Delhi | Mumbai | Kolkata |
|---|---|---|---|
| Demand-supply gap (MGD) | 230 | 317 | 290 |
| Water loss | Production loss at treatment plants, high leakage in the distribution system (40 %), theft, insufficient leak detection | Leakages, theft, plant losses | Leakage in transmission & distribution line, illegal connections, theft, metering inaccuracies |
| Non-revenue water (%) | 52 | 20-25 | 97 |
| Unaccounted flow of water (%) | 42 | 20 | 42 (based on a study of 62 wards) |
| Coverage/households connected to pipe network (%) | 72 | 100 | 88 |
| Metering of connections (%) | 55 (many non-functional & defective meters) | 100 (only 54 % are working) | 0.08 % (functional metered connections as % to total connections); 200 metered connections for bulk users |
| Per capita supply (lpcd) | 191(intra-urban disparities) | 180 (unequal supply) | 133 (imbalances in distribution) |
| Average supply/day (hours) | 2 to 3 | 2 to 4 | 10 |
| Cost recovery (%) | 42 | 95 % of the population clear their bills regularly | 90 (for billed connection) |

**Note:** Data provided in the table are approximate values, and are obtained from various sources listed at the end of the brief.

There is another set of problems such as the unplanned growth taking place in cities and frequent changes in city development plans which adversely affect the performance of service providing functionaries who do not find sufficient space to provide more service reservoirs and pipe lines. In Delhi, there are encroachments on mains by unauthorised colonies. If a problem occurs on the water mains, the agency is not permitted to resolve it since the repair work would involve removing some of the houses. Thus, in such situations alternate pipe lines have to be laid which involves unnecessary spending. Yet another problem observed in the case of Delhi is uncertainties in receiving a sufficient supply of water from the neighboring states of Haryana and Uttar Pradesh. In one instance, the supply received from the Upper Ganga Canal was blocked by the local community that vehemently campaigned for reservation of seats. In Mumbai, the staff is liable for inter-departmental transfers. This results in considerable wastage of time, since the new functionaries have their own priorities. In the case of Kolkata, it is reported that water politics affects equitable distribution of supply. Despite having piped connections, numerous households in the city do not receive a supply for extended periods of time. It is alleged that the "councilors are not interested in supplying potable water to middle class areas and their focus is only on slums where they have a larger chunk of their vote bank" (*The Times of India*, 2010). Furthermore, such problems also occur due to party politics. In this respect it is noted that councilors affiliated to the largest political party in local governments often ignore the preferences of those in minority.

## Conclusion

Coping with the needs of a large urban population is a challenging task for the city governments/service delivery agencies. A brief assessment of the water supply situation in the three largest cities of India presented in this report confirms this fact. As more and more people migrate to cities, the demand for water as well as the pressure on civic agencies is likely to grow. While this movement of people can be gradually restricted to a large extent by laying greater emphasis on balanced development of regions in the country, there exists an immediate need to build up the water infrastructure and institutions to meet the current

needs of the growing economy and increasing population.

A large number of initiatives/reforms have been undertaken at the national, state and local levels to improve the situation of urban water supply[17]. The most significant among these is the support provided to state and local governments under the JNNURM in undertaking various fiscal, financial and institutional changes in the water sector. Furthermore, with the adoption of innovative practices such as energy efficiency, effective billing and collection, subsidies and incentives for water supply to urban poor, use of ICT, public-private-partnerships (in service operation and maintenance, distribution, billing and revenue collection), institutional capacity building, and customer service improvement, some urban centers have already begun to display excellence in urban water management. In view of the fact that the issues and prescriptions in the water sector have been largely identified, the challenge now lies in speeding up the reform process and in the replication/ implementation of good governance practices in other centres.

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Municipal Corporation of Greater Mumbai:
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**End Notes :**

1. From within the State, from other States, and from other countries.
2. An Urban Agglomeration is a continuous urban spread constituting a town and its adjoining urban outgrowths or two or more physically contiguous towns together and any adjoining urban outgrowths of such towns.
3. If a household obtained drinking water from the same source throughout the year, that source is treated as a principal source (NSSO, 1999: 6).
4. If a household, during the last one year, obtained drinking water from more than one source, then the one most commonly used was treated as the principal source and the next one was treated as the supplementary source (NSSO, 1999: 6).
5. The mission, launched by the Government of India in December 2005, supports State and local governments in undertaking fiscal, financial and institutional changes for the creation of efficient and equitable urban centres.
6. "An improved drinking-water source is one that by the nature of its construction adequately protects the source from outside contamination. Examples of improved sources are piped water into dwelling, public tap or standpipe, tubewell or borehole, protected dug well, protected spring and rainwater collection" (WHO and UNICEF, 2010: 34).
7. Jal is a Hindi word, which means water. Delhi Jal Board is a department of the Government of National Capital Territory of Delhi.
8. The total population under the jurisdiction of Municipal Corporation of Delhi in 2001 was 9.8 million, of which 19 % lived in slums. The density of population in the MCD area was 7,026 persons per sq. km.
9. Water is received through river Yamuna, Bhakra-Nangal storage and upper Ganga canal.
10. Ground water depths vary from 10 to 40 metres.
11. The names/location of treatment plants are Chandrawal, Wazirabad, Haiderpur I & II, Nangloi, Bhagirathi and Sonia Vihar.
12. The name "Bombay" was changed to "Mumbai" in 1996. The total population under the jurisdiction of Greater Mumbai Municipal Corporation in 2001 was 11.9 million, of which 49 % lived in slums. The density of population was 27,209 persons per sq. km.
13. Names of water sources are Vihar, Tulsi, Vaitarna (upper and lower), Tansa and Bhatsa. In the case of Mumbai, it is perceived that ground water resources are inadequate (not more than 110 MLD) and are also contaminated.
14. Names of major treatment plants are Bhandup, Panjrapur, Vihar and Tulsi.
15. As per 2001 Census, Kolkata had a total population of 4.58 million, of which 33 % lived in slums. This figure excludes a daily floating population of about 5.5 to 6 million. The density of population was 24,499 persons per sq. km.
16. Names of water treatment plants are Palta/Indira Gandhi, Jorabagan, Watgunj, and Garden Reach.
17. As per the Constitution of India, "Water" falls within the legislative jurisdiction of the State Governments and States/city-level agencies are vested with the constitutional right to plan, implement, operate and maintain water supply projects. The Central Ministries (namely Ministry of Water Resources, Ministry of Environment and Forests, Ministry of Urban Development, and Ministry of Housing and Urban Poverty Alleviation) are responsible for formulation of policies, strategies and guidelines, and provides financial assistance and technical expertise for development of urban water supply and sanitation sector in cities and towns.
18. The three base maps of Delhi, Mumbai and Kolkata appearing in the brief are obtained from the Google Maps web site, and are used by the author for representational purpose only.

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