A REVIEW ON DOMESTIC USE OF WATER IN PUNE MUNICIPAL CORPORATION

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Abstract

The storage capacity of drinking water is also low. Demand of water in various fields is increasing and annual precipitation is decreasing so it is very difficult to supply 24*7 water to fulfil population water demand. Therefore it is concentrated on the water supply aspects related to the transmission and distribution of the treated water drinking water supply and drinking water requirement within the PMC service area. PMC is responsible for procurement, treatment, transportation and distribution of water to the population residing within the Corporation's boundary. Existing water supply for a population of 3.1 million is 1123 MLD while the water requirements for a projected population of approximately 8.5 million in 2041 is 1957.8 MLD. At present PMC, is equipped to supply 1,318 MLD of treated water from 9 Water Treatment Plants (WTPs) and ground water abstraction from 399 dug wells & 4,820 bore wells. The per capita availability of water is 194 LPCD which is more than the suggested UDPFI standard guidelines of 135 LPCD. In spite of this, there is no equitable distribution of water supply which varies from 138 LPCD to 358 LPCD.

Keywords: Water supply, Population Projection, SWOT Analysis, etc.

INTRODUCTION

The government of Maharashtra has promoted industrialization across Pune region. Due to such policy, automobile, engineering, electronic, information technology and biotechnology industries have grown very fast. Such industries have created huge employment opportunities in the region. Therefore immigration of indigent rural labour and qualified professionals from other states took place. Therefore in the region, drinking water problem has been rise and drinking water is not supplied on equitable basis and coverage is low. The reasons are topography, faulty and old pipeline, inadequate distribution system, transmission and distribution losses of water etc.

The storage capacity of drinking water is also low. Demand of water in various wards is different. It depends on number of population, industrial and commercial units and institutions. The supply of water is depending on transmission and distribution losses, leakages, stock of water, duration and pressure of water and elevation of region, etc. If the demand of water is not matching

with supply in wards then it results into unequal distribution of drinking water. Reliable drinking water is becoming a scarce commodity in far flung areas of the region. Pune city is transmuting from big city to mega city. Now urban infrastructure is required to sustain the growth of city and water supply cannot be ignored. Therefore drinking water must be provided for 24/7 with adequate and equitable basis.

PMC has undertaken other important interventions aimed at increasing the availability of potable water through the following projects that are presently in the stage of construction, financing or design:

- The Bhama Askhed project which will provide 200 MLD of treated water to the Northeastern side of Pune, - The 2500 mm raw water conduit from Khadakwasla Dam to Parvati, presently under construction and its future continuation with 2200 mm pipeline up to Cantonment;
- The construction of new treatment plants at Warje (capacity 200 MLD), at Vadgaon (250 MLD) and at Parvati (500 MLD) and related raw water conveyance system.

Therefore it is concentrated on the water supply aspects related to the transmission and distribution of the treated water drinking water supply and drinking water requirement within the PMC service area. As established in the terms of Reference this paper includes the detailed analysis of the present infrastructures and the definition of the new infrastructures required to meet the city water demand up for a 30 year period. The study therefore also covered the elaboration of the population projections and the related water demand as well as the requirement of water in the selected areas of the distribution network.

Realities in a Nutshell	
• Coverage with piped water does not always require major urban water utilities to seek funds from external sources.	• Shortage of water is not the reason for intermittent water supply.
• Coverage of piped water is 94 % rather than 100.	• Coverage of metered connections is only 29.71 %. This has an adverse implication of low revenue collection for the water supply department. High number of unmetered water connections has further led to no judicious use of water.
• NRW is 30 to 35 % if it reduces below 20% of production then is economically justified.	• The private sector will not always bring much needed funds for development to the table and improve water utility efficiency.
• In answer to rapid urbanization, it is not necessary to go farther and farther afield to find more water sources.	•Intermittent water supply is not OK.
• Water utilities suffer when the money trail runs through governments.	• Per capita water uses average 194 litres which is more than UDPFI guidelines.
• Households in PMC do not need 200 l/p/c/d.	• Hourly water supply is 6 inspite of 24 hours in a day
• Almost one-third of the total sewage generated remains untreated and is disposed off into the Mula-Mutha River. Thus, the river water gets polluted and this leads to waterborne diseases.	• 6% wastewater is only recycled or reused

WATER SUPPLY AND REQUIREMENT

PMC is responsible for procurement, treatment, transportation and distribution of water to the population residing within the Corporation's boundary. Existing water supply for a population of 3.1 million is 1123 MLD while the water requirements for a projected population of approximately 8.5 million in 2041 is 1957.8 MLD. At present PMC, is equipped to supply 1,318 MLD of treated water from 9 Water Treatment Plants (WTPs) and ground water abstraction from 399 dug wells & 4,820 bore wells. The per capita availability of water is 194 LPCD which is more than the suggested UDPFI standard guidelines of 135 LPCD. In spite of this, there is no equitable distribution of water supply which varies

from 138 LPCD to 358 LPCD.

A total of 30% connections are metered out of which almost all the commercial connections are metered (Source: Water supply and Sewerage Department), whereas the transmission losses and NRW account for 30% of the total water supply against the standard of 20% and resulting in low water pressure. Old and defunct water supply network along with undulating terrain are responsible for transmission losses and NRW. Water supply is intermittent; typically, water is supplied twice a day.

Population and Water Demand

Population projections were elaborated based on the past Census results and adopting various statistical methods. The following values, after comparison with results of similar studies, were finally adopted for the population in Pune.

Population Projections by Conventional Methods

Three methods of population projection have been followed; Arithmetic increase method, Geometrical increase method, Incremental increase method.

First, decadal increase is calculated for each method and then correspondingly population is projected for future.

The population projections are carried out by using conventional methods, recommended by the CPHEEO Manual on Water supply and Treatment. These are described below-

Table no. 1 - Summary of all conventional methods

Year	A Arithmetical Increase	B Geometrical Increase	C Incremental Increase	(A+B)/2	(B+C)/2
2017	3,416,470	3,788,427	3,474,660	3,602,449	3,631,544
2022	3,667,335	4,459,055	3,807,356	4,063,195	4,133,206
2032	4,169,066	6,177,472	4,563,670	5,173,269	5,370,571
2042	4,670,797	8,558,126	5,441,214	6,614,462	6,999,670
2047	4,921,663	10,073,088	5,925,447	7,497,376	7,999,268

The water demand for the domestic use and other non-domestic utilizations was then worked out taking into account the consumption levels recommended by CPHEEO.

For estimating the water demand for Domestic use the daily value of 150 LPCD was adopted as average unit consumption. Water losses were evaluated assuming that the leakage will be gradually reduced, as effect of the proposed works, decreasing from the present assumed level of 35% at the year 2017 up to the value of 15% at the year 2027, to remain then constant at said value up to the year 2047. The obtained values of the gross water supply demand for the various years are as follows:

Water allowance: The domestic water allowance of 150 LPCD has been considered as per the provisions of the CPHEEO manual and 135 LPCD as per the provisions of the UDPFI guidelines.

System losses: The present system losses are of the order of 35%, and will be reduced to 15% by the year 2027

The Net and the Gross Domestic water demand for the Pune Municipal Corporation area, in various stages of the design period is given in Table 2.1

Table 2 – Projected domestic water demand in Pune Municipal Corporation area

Design Year	Arithmetically increase Population	Net Water demand in MLD	System losses 25 % + 5 % NRW	Gross water demand in MLD
2011	3115433	467.31	30	700.96
2017	3416470	512.47	30	768.70
2022	3637335	545.60	30	736.56
2032	4169066	625.36	30	812.96
2042	4670797	700.62	30	910.80
2047	4921663	738.25	30	959.71

(Source: Water supply system for Pune city detailed project report, SGI, February, 2014)

Above table shows projected population and domestic water demand in this calculation projected population + 150 LPCD (150 LPCD has been considered as per the provisions of the CPHEEO) I wasn't considered 135 LPCD as per the UDPFI guidelines because when we study ward wise water demand then the average water use is 194 LPCD which is too much high than UDPFI guidelines. Water use of each administrative ward is more than 135 LPCD. And also as per the study of domestic water requirement it is very difficult to manage every house hold activity in 135 litres.

**Figure no. 1 Projection of Water Supply**
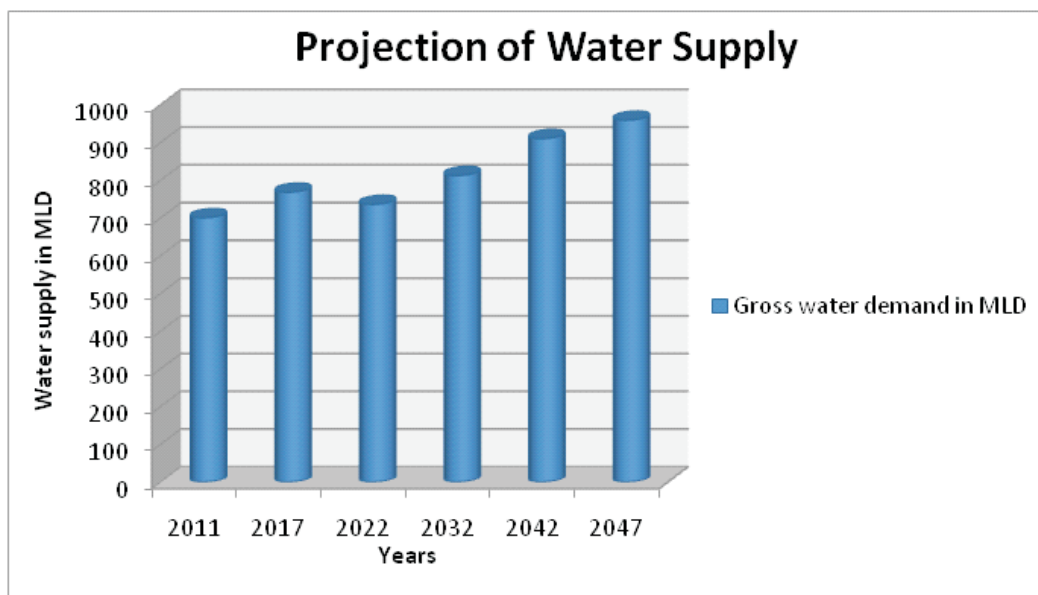
(Source: City Sanitation Plan of Pune, 2012)

Total coverage of water connections in Pune city is 94% which indicates 6% of the households do not have water supply connections. Approximately 6900 properties are served through the tankers.

Table No. 3: Water use of Pune Municipal Corporation 2012-2013.

Sr. No.	Water Supply	MLD	In %
1.	Water losses / Leakages	281	25
2.	NRW	56	05
3.	Gram Panchayat	24	2.14
4.	PMC	732	65.18
5.	CB	30	2.7
6.	**Total Water Supply (Losses+NRW+GP+PMC+CB) =**	**1123**	**100.02**

Figure no. 2 PMC Water use 2012-13

Pune Municipal corporation Water use 2012-13
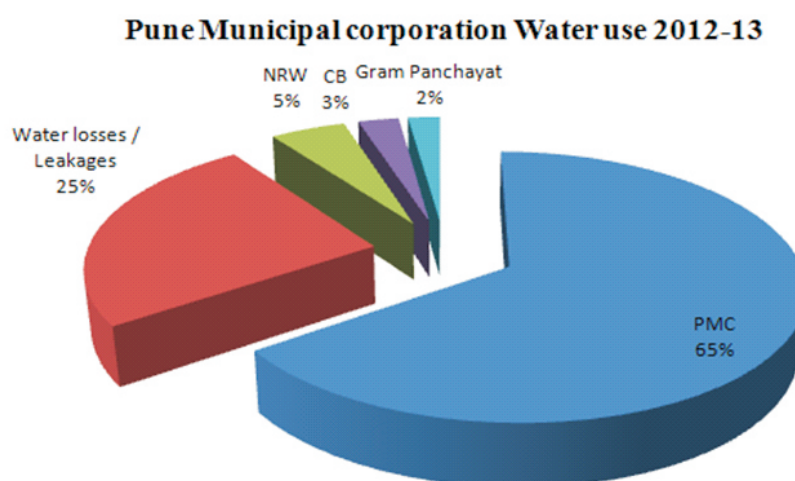
Per Capita Water Supply and Continuity of water

Referring to the City Sanitation Plan (2012) of Pune, average per capita water supply in city is 194 LPCD, which is more than the suggested standard of UDPFI guidelines of 135 LPCD. Per capita water supply varies from 138 LPCD to 238 LPCD. Continuity of water supply is also unequal in all wards. On an average city received 6 hours water supply. Yerawada and Dhanakwadi constitute the fringe areas of the city and are underprivileged in terms of provision of water supply, which is evident from the table below; which indicates that in Yerwada continuity of water is as less as 2 hours per day and in the areas of Dhankwadi ward viz. Tilak road, Sahkaar Nagar and Hadpsar areas it is only 4 hours per day. Some areas in Yerwada ward are located at a relatively higher elevation, where water is supplied from 'Cantonment water works' which is sited on relatively lower elevation than Yerwada ward thus, resulting in poor continuity of water in Yerwada ward, besides this, the water supply pipelines are running through undulating terrain of the city thereby increasing the transmission losses. The ward 'Dhole Patil Road' gets the continuity of water as much as 20 hours per day which is highest in the city because this ward is located in the central part of the city, at the lowest elevation of the city, making the water flow by gravity in addition to being located near the 'Parvati water works' which reduces the transmission losses.

Table 4: Ward-wise Per Capita Supply and Continuity of Water

Sr. No.	Administrative ward name	Per Capita Water Supply (LPCD)	Continuity of water supply
1	Aundh	149	5
2	Warje, Karve road	166	6
3	Kothrud	192	7
4	Ghole Road	139	7
5	Yerawada	200	2
6	Sangamwadi	219	4
7	Dhole-Patil Road	219	20
8	Kasaba Peth	260	5
9	Bhavani Peth	358	8
10	Sahakar nagar	222	4
11	Tilak Road	157	4
12	Hadapsar	140	4
13	Bibewadi	157	5
14	Dhankawadi	138	4
	Average	**194**	**6**

(Source: Water Supply and Sewerage Department, 2012)

Figure no. 3 Ward wise water supply (in Litre per capita per day)
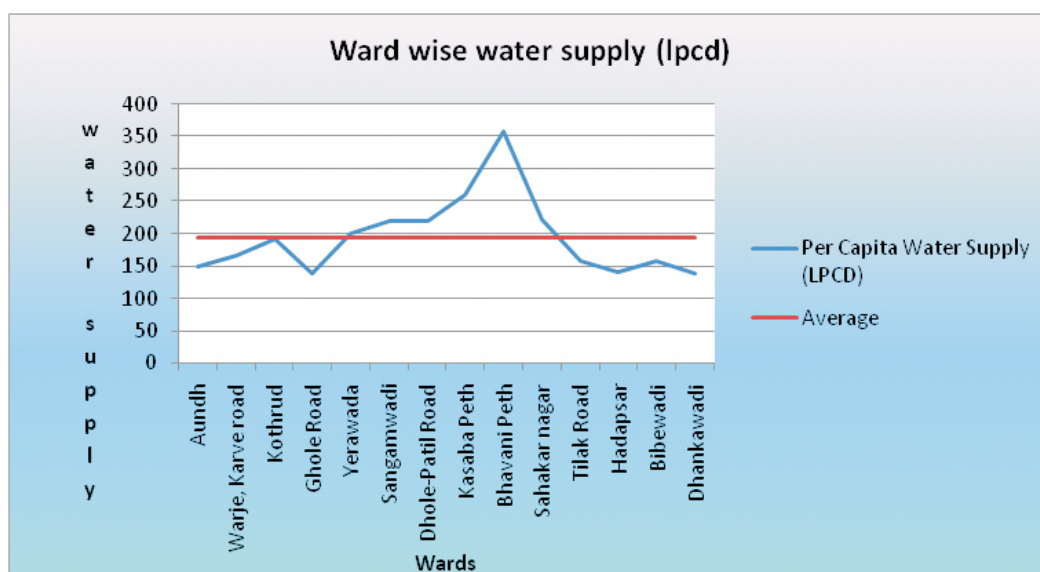
Households in selected area and water usages:

This study mainly focuses on domestic use of water in seven major Indian cities; Delhi, Kanpur, Kolkata, Ahmadabad, Mumbai, Hyderabad and Madurai. Besides analysing activity-wise and socio-economic group-wise consumption of water, the paper examines the sources of water supply, perception of households about quality of municipal water, duration of municipal water supply, and awareness about water conservation.

SWOT Analysis water supply:

Strengths	Weaknesses
- Availability of reliable water sources till 2031 - Adequacy of Potable water - Adequate coverage of water supply - Water flows by gravity from Source to treatment plant. ? Uninterrupted power supply ('Express Feeders' for all WTPs)	- Water losses 25-30% - Only 29% coverage of metered connection. 6 % of population is not connected with water supply network. - Low efficiency in collection of water supply charges. - Water supply is not equitable. - No telescopic tariff for water consumption. - Lack of awareness regarding water conservation among the citizens. - Lack of alternative sources of water after 2031.
Opportunities	**Threats**
100% metering will lead to 100% collection of water taxes thereby increasing the revenue income of Municipal Corporation. - Improvements to water supply and pressure are required in some areas of the city, predominantly the outer areas, specially the north-eastern areas. Opportunity to avail funding through the JNNURM. - Opportunity of availing 24X7 water supply should be tapped under JNNURM - Private sector participation is must	- Threat of scarcity of potable water to cater the projected population after 2031. - Undulating topography resulting in the problem of low water pressure in some areas. - Non Renewable Water - Lack of interest for willingness to pay.

CONCLUSION:

The Pune water supply system is affected by many problems which are due to the fast and chaotic development of Pune and by the consequent need-based development of the water distribution network for keeping the pace of the water demand growth in various parts of the town. This irregular development determined the progressive accumulation of the following problems and deficiencies of the water supply service:

1. The marginal parts of the town receive water in insufficient quantity and pressure and distributed over few hours per day. On the contrary some central parts of Pune are benefited by large availability and adequate pressure.

2. The water resources have been exploited up to their maximum potential and it will be more difficult to find additional water sources able to meet the water demand if growing with the current level of consumption.

3. The system is presently affected by a high level of Non-Revenue Water and water losses largely exceeding the government established target of 15%.

4. Over 70% of the consumer connections are not metered and many illegal or unregistered connections are present. The water charges of the un-metered connections are collected through a specific quota paid with the property taxes. This system does not encourage efficient and rational usage of water which is progressively becoming a scarce resource.

5. Accurate and reliable water balance is not possible being the consumption largely unmetered and given the very low number of working bulk flow meters existing along the transmission system.

6. The storage capacity of service reservoirs is lower than the balancing storage requirement. In addition, such storage is not uniformly distributed over the territory which increases the inequality of water received in various parts of the town.

7. Many service reservoirs are very old and in poor conditions of conservation. Also several reservoirs in RCC present significant damages and corrosion phenomena that have to be halted and repaired.

8. The level of PMC revenues from the water services does not cover the Operation and Maintenance costs.

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