Demand and Supply Management of Water as a Resource in Urban Local Bodies: A Case Study of Bhopal City

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Abstract

"The lack of fresh water and sanitation is the greatest obstacle to sustainable development and the most visible symbol of the growing gap between the rich and the poor". Increasing population and climatic variation driven by climate change has led to water scarcity across world. As cited in United Nations Environmental programme 2002, by 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity. About two-third of the world population, mainly in developing countries will face moderately to high water stress and half of the population will face problem due to water scarcity.

Urban local government institutions/municipalities are constituted for the maintenance and planned development of urban areas. The objective is to ensure that suitable levels of infrastructure and services are available to the citizens.

This piece of research work is with reference to the fact that there is a huge gap between the demand and supply of water in urban areas, which is also growing due to population and urbanization. The research work analyses the Demand & Supply situation of Water as a Resource in BMC. The hypothesis taken is that "There is no significant difference between the Demand and supply of water resource in Bhopal city".

For the purpose of the study, Bhopal town of Madhya Pradesh was chosen as the universe. It includes all the stakeholders of Bhopal Municipal Corporation i.e. the officers, public representatives, field employees and the customers

The research work has mainly relied on secondary data for the analysis. The secondary data particularly the historical data is collected from various sources e.g. Annual Budget document, Policy documents, Journals, Reports, Magazines, Newspapers, Books, BMC's website, Government Publications and Pamphlets and Brochures.

Introduction - Resource Management

In organizational studies, resource management is the the process of using a company's resources in the most efficient way possible. These resources can include tangible resources such as goods and equipment, financial resources, and labour

resources such as employees. From BMC's (water services) view point, the concerned resources are water, human resource and financial resources.

1. Demand and Supply Management of Water as a Resource

There is a huge gap between the demand and supply of water in urban areas, which is also growing due to population and urbanization. Norms for various places depending upon the level of development have been established and it is the maximum for metropolitan cities.

Sustainability and Equity

Sustainability in the urban water supply is addressed mainly through supply side augmentation.

Distant perennial sources are identified and long distance piped water transfer to the cities and towns are common. Augmentation plans are generally gigantic and engineering-oriented and has greater acceptability at all levels. The demand management is the least preferred option. However when it comes to payment of water charges, the decision is invariably with the elected government and not with the executing agency, which has to depend on the grants for O&M, for sustaining the quantity and quality.

The regular Plan programmes by the States are heavily tilted in favour of supply side management. Recycling and reuse of water, reducing the water demand through rainwater harvesting, using water-efficient household equipment, including flushing cisterns would go a long way in conserving water and reducing demand. Proper metering of water and rational tariff would reduce water demand and encourage conservation. We need to have a concept of water efficient homes in urban areas and for this there is a need to have a well-organised information campaign. Long distance piped water transfer and desalination of water in coastal areas as augmentation measures are very capital-intensive.

Demand Management is necessary to achieve sustainability. Evolving realistic water tariff so as to discourage excessive use of treated/potable water is one of the important management tools for demand management. Not much has been done on this important aspect in many urban local bodies in the country except a few larger cities that have undertaken some measures by way of installing water meters for consumers. The major reason for slow progress in this regard is that good quality meters are not available on a large scale since the meter manufacturing facility is vested with small-scale industries at present, which do not have the capacity to produce meters on a large scale.

It is not uncommon that pockets of urban areas would get higher service levels both in terms of number of hours of water availability as well as per capita availability. The UFW (unaccounted for water) due to leaking water supply systems and illegal tapping reduces water availability. The average water loss in the leaking water supply systems varies from place to place and it is generally between 20–50%. Dedicated efforts to plug the leakages are required in addition to demand management measures for achieving the sustainability and equity.

2. Demand for Water: Assured Supply of Water

The quantum of demand for water is dependent on the degree of assurance that the consumer is able to assess from the supplier. The degree of assurance is assessed in terms of the time period (days) for which the user needs to store water before the next supply of water will be released.

3. Analysis of Demand & Supply situation of Water as a Resource in BMC

As per the 2001 census the population of Bhopal city was 14.33 lakhs. Assuming that the incremental increase in a decade is @ 30%, the estimated population of Bhopal city is 18.3 lakhs. The CPHEEO norms say that the requirement of water per person per day is 135 lpcd. The demand for water as per CPHEEO norms in Bhopal city is 247.05 MLD.

As per BMC sources available water sources in Bhopal are:

Table 1: Water Sources in Bhopal

S.No.	Source	Distance from city(Km)	Abstraction of Raw water (MLD) (2010-11)
1.	Upper Lake	Within city limit	45
2.	Kolar Dam	30	34.5
3.	Local underground water	Within city limit	22.7

From the data in Table 1 it is clear that total water available for Bhopal city is approx. 102.2 MLD. If we calculate the water available per person it comes out to (102.2/18.5) 55.2 lpcd. As per CPHEEO norms the requirement of water per person per day is 135 lpcd.

When we see the reality we find that 60% of the water is lost on transit due to various reasons, which means that only 22.09 MLD water is actually distributed. Now if we calculate the water available per person it comes out to (22.09/18.5) 11.9 lpcd.

Thus, total Demand is 247.05 MLD and Supply available is just 102.2 MLD.

Hence we see that there is a wide gap between the Demand and Supply of water.

Analysis of Demand & Supply situation of Water as a Resource in BMC

- As per BMC sources available water sources in Bhopal (Refer Table 6.1) total water available for Bhopal city is approx. 102.2 MLD. If we calculate the water available per person it comes out to (102.2/18.5) 55.24 lpcd. As per CPHEEO norms the requirement of water per person per day is 135 lpcd.

- When we see the reality we find that 60% of the water is lost on transit due to various reasons, which means that only 22.09 MLD water is actually distributed. Now if we calculate the water available per person it comes out to (22.09/18.5) 11.9 lpcd.

- Thus, total Demand is 247.05 MLD and Supply available is just 102.2 MLD.

♦ Hence we see that there is a wide gap between the Demand and Supply of water.

Hypothesis Testing

Hypothesis : There is no significant difference between the Demand and supply of water resource in Bhopal city

Water sources in Bhopal City (Supply and Demand)

(Amount in MLD)

Year	Supply of Water	Demand of Water
2007-08	189.3	234.07
2008-09	102.3	239.88
2009-10	102.3	245.565
2010-11	102.2	247.05
Total	**496.1**	**966.562**

$$\bar{x}_1 = \frac{\Sigma x_1}{n} \qquad \bar{x}_2 = \frac{\Sigma x_2}{n}$$

Where $n_1 = n_2 = 4$

$\bar{x}_1 = 124.03$, $\bar{x}_2 = 241.65$

$$S_1^2 = \frac{(\Sigma xi - \bar{x})^2}{n_1 - 1}$$

$$S_2^2 = \frac{(\Sigma xi - \bar{x})^2}{n_2 - 1}$$

Where $S_1^2 = 5681.1$

$S_2^2 = 105.083$

Value of F statistic is

then, $F = \frac{S_1^2}{S_2^2} = \frac{5681.1}{105.083} = 54.06$

$F_{a,(n\ 1-1,\ n2-1)}$:

$F_{.05\ (4-1,\ 4-1)} = 9.28$

$F_{.05\ (3,3)} = 9.28$

Since 54.06 > 9.28, F falls in the rejection region.

Thus the hypothesis is rejected.

- ***Therefore we conclude that there exists a substantial difference between the Demand and Supply of water resource in Bhopal city.***

Latest Developments

1. With the increase of the limits of Municipal Corporation, Bhopal, now 85 wards have been made. So with the newly included area for water supply the scheme has been planned for the strengthening of water distribution in the former Municipal area.
2. Under JNNURM and Citizen Plan, the work of laying the water distribution system in the entire 70 wards of Bhopal city is being done.
3. Under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) Scheme, water supply schemes IN Bhauri area and changing of Kolar Gravity and feeder main has been proposed.
4. In order to prevent the water supply problem, the Government of Madhya Pradesh has sanctioned Rs.52.10 crore based on Kerva Reservoir Water Supply scheme. 85% of the said work has been completed and it is targeted to complete the entire work by June, 2018.
5. It is proposed to supply water from all the 144 available tanks in Bhopal city, out of which, water supply has been started from about 118 tanks. Upon completion of the plan, it will be possible to supply 475 MLD of water for the estimated population of 27.5 lac of Bhopal city for the year 2025 which will be sufficient as per norms for use of 150 liter per person per day.
6. The Corporation has developed MAS – Municipal Administrative System. It is a centralized, online and integrated information system where Self Assessment of Property Tax, Payment of Property Tax / water tax, Registration of Death / Birth. In the second phase services like Trade Licensing, Transfer of Title, Tax Assessment, Sanitary Certificate, Advertisement Licensing, Payment of Water / Utility Bills, New Water Connection Application, Building Permission services are being provided online.
7. BMC has also started the facility of Tele samadhan call center for grievance handling which helps in tracking the complaints and fast disposal of the complaints.
8. Project UDAY, Narmada Water Phase IV has also been completed and Narmada water is being supplied to the citizens of Bhopal.

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