

## CHAPTER 5

### Water Heritage of Delhi - Hope for Revival

*Avishkar Tiwari*

M A, Conservation, Preservation and Heritage Management, GGSIP University, Delhi

#### Abstract

Water resources exploited by the city are not able to meet the consumption requirements. Delhi's condition during monsoon season is peculiar as well as almost every year it experiences water logging due to improper urban planning, unorganized development and lack of storage area. It's ironic that Delhi faces water scarcity and flood every year. It clearly represents that city lacks rain water harvesting mechanism. A historic city may never experience water crises if they engage more closely with contour and existing water bodies while planning urban schemes. To tackle this situation, there is a need for an integrated approach where priority should be assigned to effective governance, capacity building of regulating institutions, formation of strong regulations and its enforcement.

*Keywords: Water harvesting, Water management, Scarcity, Water Heritage, Urbanism*

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#### Introduction

Erstwhile Delhi was known as the city of lakes. During the medieval period the city was renowned for its exquisite architectural water bodies. Both natural and manmade water bodies, dotted throughout the city, ensured that the water level in the city maintained. But unplanned urbanization over the last 5 decades created an imbalance in the city which resulted in drying up of approximately 300 lakes. Delhi had limited water resources and was used to meet the domestic, agricultural and industrial requirements. Rapid growth of population disturbed this equilibrium between demand and supply of water. Improper disposal of sewage and water pollution further worsened the situation.

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This paper offers a historical and geographical perspective on the development of urban water management in pre-colonial Delhi, the present status of water management, present condition of water heritage and unseen potential of precolonial water system to fulfil the thirst of this modern Delhi.

**Current scenario**

Delhi is one of the largest cities in India with 1483 square kilometers. It is situated on the right bank of the river Yamuna and shares its border with Haryana and Uttar Pradesh. Yamuna runs by eastern side of Delhi and its length is about 33 kilometers while the width is 48 kilometers. Topography of Delhi is divided into three parts, the plains, the Yamuna flood plains and the ridge. Floodplain offers great opportunity of agriculture and harvesting of ground water. Ridge of Aravali range extend towards the western sides of Delhi and offers scope for large scale rainwater harvesting opportunity.

Delhi has the highest population density in India. Currently there are 18.6 million residents of this metropolitan city. Being a national capital and place with the highest number of jobs opportunities in the country, it attracts lakhs of immigrants every year. Day by day increasing population leads to an increase in the consumption of water. But supply is more or less stagnant. Government keeps on working over mega infrastructure projects and larger treaties to full fill the water requirement of the city, but continuous growth in demand is always ahead of supply. Over exploitation of water resources lead to depleting groundwater level and water shortage in the city.

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Once a city which housed more than 1000 smaller and larger water bodies now faces a shortage of drinking water to fulfill the thirst of its residents.

Delhi Jal Board (DJB) is the main regulating authority for production, and distribution of drinking water and also for collection, treatment and disposal of domestic sewage in the capital. Currently city demands approximately 1050 million gallons of water per day. According to the data provided by the Delhi Jal Board, city will require at least 1174 MGD (million gallons per day) by 2021. Currently, Delhi Jal Board provides 940 MGD of water to 82 percent of the household. On an average DJB supplies 50 gallons per capita of filtered water through 11350 kms of pipelines and 105 underground reservoirs.

Source of water in Delhi can be classified into 4 major categories: - Yamuna river, Ganga river, Bhakra dam and groundwater.

Yamuna River	40%
Ganga River	25%
Bhakra Dam	25%
Ground water	10%

Table 1 – Source of Raw water for Delhi      Source – Water policy for Delhi

Among these conditions of groundwater is very alarming. Every year groundwater level is depleting by 0.5 to 2 meters. Consumption of groundwater in Delhi can be divided into three sectors: - irrigation, domestic sector and industrial sector.

Irrigation	40%
Domestic sector	50%

Industrial sector	10%
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Table 2 – Ground water consumption in Delhi

Source – Water policy for Delhi

According to the Delhi Jal Board, only 78 percent of the household living in planned societies and colonies having water availability throughout the year, without having any major issue. As per Census (2011), there are 6343 slums in Delhi with approximately 1 million households. Out of which only 51 percent have regular water supply in their areas. These households in the capital depends upon following sources of drinking water.

Piped drinking water	81.3%
<ul style="list-style-type: none"> <li>● Treated drinking water</li> <li>● Untreated drinking water</li> </ul>	75.2%
	6.1%
Covered well	0.1%
Hand pump	5.3%
Tubewell	8.4%
Tank, Pond, Lake	1.2%
Other sources	3.7%

Table 3 – Source of drinking water for household

Source – Water Policy for

Delhi

This clearly explains the present scenario of requirement and consumption of water in Delhi. Situation is very alarming and in coming days it is going to be worst. Because demand will keep increasing due to population growth and measures being taken by authorities to meet the demand are temporary in nature. Till now steps taken to meet water requirement of the city are mostly in the

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form of new water agreements with other states to increase the percentage of water flow from their dams and canals, establishment of water treatment plant to treat the sewage water for reuse. But very least work has been done on replenishment of groundwater in Delhi, which can be a long term solution to end the problem of water. It should be our solemn responsibility to recharge groundwater and conservation of water in general toward our future generations. In 2005, the Government started a scheme for repair, renovation and restoration of water bodies with the objective of comprehensive improvement and restoration of traditional water bodies. But this plan mostly remained on paper. In 2019, the Government of India started *Jal Shakti Abhiyan* in all the states and union territories for conservation and management of water resources to tackle water crisis. In 2019, Delhi government decided to turn back Delhi into City of lakes by initiating a program to revive the 201 water bodies in the city.

**Water heritage**

In terms of water management, ancient and medieval Delhi was way ahead of modern Delhi. Now we have access to various upgraded technology but back in date all they had was knowledge of natural terrain, their town planning and their strong motive of sustainable use of natural resources. On the basis of oral history there were more than 1000 water bodies in Delhi. Almost every house had their own well or shared well between 3-4 families. Every village had a small pond like structure locally called *Johar* for rainwater harvesting. Traditionally Yamuna River, water tanks, ponds, lakes, *Johar*, wells, stepwells, *Baolis* and canals were the source of water in Delhi. Various rulers between 13<sup>th</sup>-18<sup>th</sup> centuries AD took the task of construction and repair of lakes, ponds and baolis in Delhi. They constructed Wells and stepwells in forts, mausoleums and parks. They also designed hydraulic systems to carry water against the slope. But behind all these artificial construction one thing was very clear in their mind: to take advantage of natural landscape of Delhi. They utilized the natural slopes, where all the rainwater was naturally flowed towards the depression and recharged the ground water level.

History of construction of artificial water sources begins with construction of Surajkund Lake by Suraj Pal Tomar in 10<sup>th</sup> century AD on southernmost side of Delhi. This is the earliest evidence of construction of artificial waterbody in the capital. After establishment of the Delhi sultanate various water bodies were constructed and repaired to meet the requirement of the city.

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Delhi sultanate and their water architecture align themselves along the ridge to capture its runoff. In 1231 AD Sultan Iltutmish built Hauz -I-Samshi, also known as Samshi talab at Mehrauli. This lake was cleaned and repaired by Alauddin Khilji. According to Tarikh-I-Alifi during the reign of Alauddin Khilji this lake was mostly dry. He restored it and erected a tomb in the middle. Once it was spread over 100 hectares, now it shrunk due to draining of sewage and illegal construction on its catchment area. Alauddin Khilji also constructed Hauz Khas water tank to fulfil the demand of water for his newly established city Siri. This lake was spread over 47 acres and used to recharge herself with surplus monsoon surface runoff. It was constructed with understanding of contour of soundings. It was recharged with perennial and seasonal water streams. These streams collected water from natural slope. Few of those streams are still running through Indian Institute of Technology (IIT) campus. Water flowing down from present day Mehrauli to Aurobindo Marg and from Dhoola Kuan was directed into Hauz Khas tank. Presently this lake is breeding field for mosquitoes and algae. Sewage from R.K Puram, Munirka village, Hauz Khas village, Mehrauli and Vasant Kunj is drained.

Construction of water bodies during the reign of Tughlaq dynasty overshadowed the work of earlier dynasties. Tughlaqs undertook construction and conservation of water on a large scale. Each and every ruler of the dynasty contributed more than their precedent. They constructed numbers of tanks, Baolis and Wells. Tughlaqs constructed several Bunds to channelise small streams flowing from the ridge to guide towards lakes. During the period of Ghiyasuddin Tughlaq a large lake was fed from runoff from southern ridge. Water flow was checked by two earthen dams during monsoon season. Water was channelled along contour into water tanks near Adilabad and Jahapanah. Mohammad bin Tughlaq shifted his capital from Delhi to Daulatabad then again shifted back to Delhi. This time he established a new capital called Jahapanah. To meet the water requirement of new city he constructed most advanced water structure of his time - Satpula Bridge. This bridge was constructed to tap the local streams and convert it into the lake. Now this lake has been dried up due to construction which blocked the flow of water. Dried up lake became a playground for local children. Muhammad bin Tughlaq was succeeded by his cousin Firoz Shah Tughlaq. He is known for his public reforms. He constructed several structures for public welfare, commenced 1200 gardens in Delhi, also restored 30 gardens formed by Alauddin Khilji and also worked upon several hydraulic structures. He was a major conservationist of his time: - restored Hauz khas tank and

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Surajkund Lake, constructed great Yamuna canal for large scale irrigation purpose. For maintenance of canal, canal officers were appointed. At his new capital Firozabad (also known as Firoj Shah Kotla), constructed a Baoli in the citadel.

Mughal rule succeeded the Sultanate and they introduced Persian wheel, which brought revolution in irrigation system. They focused on various techniques of water lifting devices to tap shallow groundwater. They created plenty of pools, channels, fountains and stone chutes, irrigation wells etc. Akbar conserved earlier wells Persian wheels, water channels, pools, tanks, fountains. He also conserved Yamuna canal in 1568. Establishment of city of Shahjahanabad turned out to be the greatest contribution of Mughals in the field of urban planning and water management in Delhi. City was built on the bank of river Yamuna. Water management system of the city was comprehensive in nature. Key feature of water management system includes:

- a) Rainwater harvesting system.
- b) Wells and stepwells for households, neighborhood, garden, mosque, tomb and fort. There were around 600 wells in the city.
- c) Moats surrounding the fort and city were not only used for defensive purpose but also for drainage system.

Shahjahan restored the Yamuna canal constructed by Firoz Shah Tughlaq. He constructed Shah nahar (Delhi branch of west Yamuna canal) to meet the water requirement of Shahjahanabad for irrigation purpose. Delhi canal entered the city through Kabuli gate and sub divided into two streams. One ran toward the quarters of *Jahanara Bagh*, served royal purpose and other towards Fatehpuri Mosque, served civic purpose.

Apart from these huge lakes and canals, rulers of the Sultanate and Mughal dynasty also constructed several Baolis. It is believed that once Delhi housed approximately 100 Baolis. But presently we can hardly locate 10 of them. Oldest Baoli in Delhi is Anangtal Baoli at Mehrauli, constructed during the 10<sup>th</sup> century by King Anang Pal. This is also known as Yoginipura. Another Baoli in Mehrauli is Gandhak ki Baoli constructed by Iltutamish for Sufi saint Qutb ud din Bakhtiyar Kaki. This is 5 storied rectangular Baoli with largest well in Delhi. Water contains sulphur, that's why known as Gandhak ki Baoli. But due to lack of maintenance it is place for garbage dumping and a breeding ground for mosquitoes and algae. Ghiyasuddin Tughlaq

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constructed two Baolis along with 13 wells to meet the water requirement of his newly established capital Tughlaqabad. Those two Baolis can be located at eastern and Western portion of the Tughlaqabad fort. Due to thick vegetation both Baolis are inaccessible. There is a story of tussle between Ghiyasuddin Tughlaq and sufi saint Hazrat Nizamuddin Auliya over construction of Baolis. Both of them were constructing Baolis at the same time during 1321 AD. Thus, they required a great amount of labor at the same time. Ghiyasuddin Tughlaq forced the workers to work for him. But those workers used to dig Baoli during night for Khwaja Hazrat Nizamuddin Auliya. Furious Ghiyasuddin hiked the price of oil so that work at night can be stopped. Nizamuddin Auliya asked his disciple Nasiruddin Muhammad to use water of Baoli as oil in lamps. That Baoli is present in the premises of Hazrat Nizamuddin Dargah. He named Nasiruddin Muhammad, Chirag-Dehlavi. There is a village named after him called Chirag Delhi. Firoz Shah Tughlaq also constructed two Baolis, one at his citadel of Firoz Shah Kotla and another near Hindurao hospital at Aravali ridge, present day Kamla nehru ridge. There is another Baoli in the vicinity of Connaught place called Agrasen ki Baoli. There is no historical evidence to prove the story that legendary ruler from Mahabharata - Maharaja Agrasen constructed this Baoli. In 14th century merchants from Agrawal community repaired this Baoli. There is another Baoli in Mehrauli at present day Mehrauli archaeological park called Rajao ki Baoli. This was constructed during the reign of Sikandar Lodi. Other Baolis of Lodi period is situated in Wazirpur tomb complex at R.K Puram, which is completely dried and require immediate restoration. There is a Baoli at Red fort complex, which is prior to the period of Shahjahan.

Apart from these historical artificial water bodies Delhi is also blessed with few natural water bodies as well. There are few other major lakes in Delhi which are historically not that significant but still they quenched the thirst of Delhi. Sardar Patel Lake at Rohini is one of them. Earlier it was 15ft deep and supported rich aquatic life. But now construction around the lake stopped the rain water to recharge the lake. Now it is hardly 2-3ft deep. It became a garbage dumping place for locals. Bhalswa Lake is another name which became a dumping ground due to the negligence of people and authority. There was a time when it was a temporary home for several migratory birds. Old Fort Lake, fed by water from Yamuna. River changed its course and lake dried up. ASI revived this lake with water from Okhla sewage treatment plant. But they have concretised the lake on the name of revival, which stops water from seeping into the ground. It is like, lake is



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alive but on ventilator. Similar story is with Naini Lake at Model town which has been revived by governing authorities. This lake is also alive on ventilator. It gets water from 3 municipal borewells, which is creating siltation and making water muddy and stinky. There is no aquatic life in this lake. Sanjay lake spread over 17 hectares at Trilokpuri is dependent on groundwater. But dumping of garbage and drainage of sewage increasing growth of algae and plants. Tikri khurd lake at Narela, spread over 10 hectares is shrinking due to systematic encroachment. Sanjay Van Lake near Mehrauli is also a drainage point of sewage from Mehrauli and Vasant Kunj. Najafgarh Lake was feeding water from Sahibi Nadi channel, a tributary of the Yamuna River. In the 19th century its area was 225 square kilometers, now it shrunk due to construction of drain and destruction of Sahibi Nadi channel.

**Hope for revival**

There was a time when Delhi was known as the city of lakes. Encroachment, garbage dumping and negligence of authorities made those lakes defunct. A survey conducted by Delhi Park and garden society, there are total 611 water bodies like Baolis, lakes, ponds, Johar, wells and traditional rainwater harvesting storage were under the jurisdiction of Delhi Jal Board (DJB), Archaeological Survey of India (ASI), Delhi Development Authority (DDA), forest department and municipal corporation. Out of which, we have completely lost 190. There is no trace of those water bodies. There are schools, temples, cremation ground, bus stand stands on the remains of those water bodies. 274 water bodies completely dried up. But there is a hope to revive these, if all the stakeholders come together and take bold steps. To end the current shortage of water in the long run we have to take lessons from the past. Instead of construction of new water source we should focus on revival of existing water bodies. Revival plan should be sustainable in nature. Makeover in the name of conservation will not work. Every year Delhi can harvest 440 million cubic meter of rain water. With the revival of these water bodies, we can store that amount of water in these and replenish the groundwater. Rain water harvesting can be done at household and colony level. Rainwater harvesting at president estate, JNU and IIT are successful examples of it. Rainwater harvesting at president estate resulted in rise of ground water up to 1-4 meters in that area. Similar efforts at JNU and IIT resulted in rise of groundwater level up to 2-3 meters in that area.

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In order to accomplish the target of revival of water bodies it is important to understand that one common solution may not work for all of them. Approach will vary on the basis of purpose, livelihood, socio-cultural practices related to each and every water body. Any action should be taken only after considering socioeconomic and environmental impact of the action. It requires the involvement of many agencies for collection of data, prepare an action plan, tackle encroachment, and unblock interrupted water flow from catchment area, desiltation, solid waste management, treatment of polluted water and maintenance of law and order during execution. Apart from centralized approach of revival of existing water bodies we should enable local community by enhancing their environmental awareness. Community should be encouraged to participate with other stakeholders to ensure the conservation and protection of water structures. Delhi government in May 2019 taken up a new initiative to utilize the floodplains of Yamuna River for storage of extra water received during monsoon. Under Yamuna water sharing treaty Delhi gets 580 million cubic meters of water flow during monsoon season. Out of which 280 million cubic meters goes unutilized due to lack of storage system. Under this new initiative government will utilize 97 square meters of floodplain to create multiple small ponds to store that extra water. This initiative has potential for development of ground water resource, because flow of water from Yamuna River naturally steps toward Delhi instead of going the other way round. For the success of this scheme, emphasis should be on long term goals and their operation. Allocation of budget should also include the further maintenance cost.

Major reason behind failure of any government scheme is behavior of people. We make government responsible for implementation of every program. We do not initiate a single step towards the people and government participation. Traditionally water was seen as a responsibility of community. Citizens collectively used to take responsibility for not only construction but also for maintenance of water bodies. This system needs to be brought back in the society.

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