

URBAN WATER CHALLENGES IN INDIAN MEGA CITIES: CASE OF NCT DELHI

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Abstract : This study was undertaken to analysis the water crisis in Indian scenario. Water is one of the fundamental human need but due to the scarcity of available resources, it has also become a critical national asset. With the rapid increase in population has led to water scarcity in many Indian cities including New Delhi, Kolkata, Chennai, Hyderabad, Bangalore and many more. This paper will analyze the challenges faced by Indian cities to cope up with the water scarcity. Also, it will explain those issues with help of the case study of New Delhi. This Paper also highlights the required strategy to have more sustainable ways to tackle the problem of water.

IndexTerms – Water crisis, scarcity, Mega cities.

I. INTRODUCTION

Water is a fundamental human need and has become a critical national asset. The rapid increase in population has led water sector to face the challenges of bridging the demand supply gap. India is facing a serious water resource problem and as trends suggest, it is expected to become 'Water stressed' by 2025 and 'water Scarce' by 2050.

Water security implies affordable access to clean water for agricultural, industrial, and household usage and is thus an important part of human security. Water along with food and energy forms a critical part of the 'new security agenda' and redefines the understanding of security as a basis for policy-response and long-term planning. Water security for India implies effective responses to changing water conditions in terms of quality, quantity, and uneven distribution. Unheeded it can affect relationships at the inter-state level and equally contribute to tensions at the intra-provincial level.

II. GLOBAL WATER SCENARIO

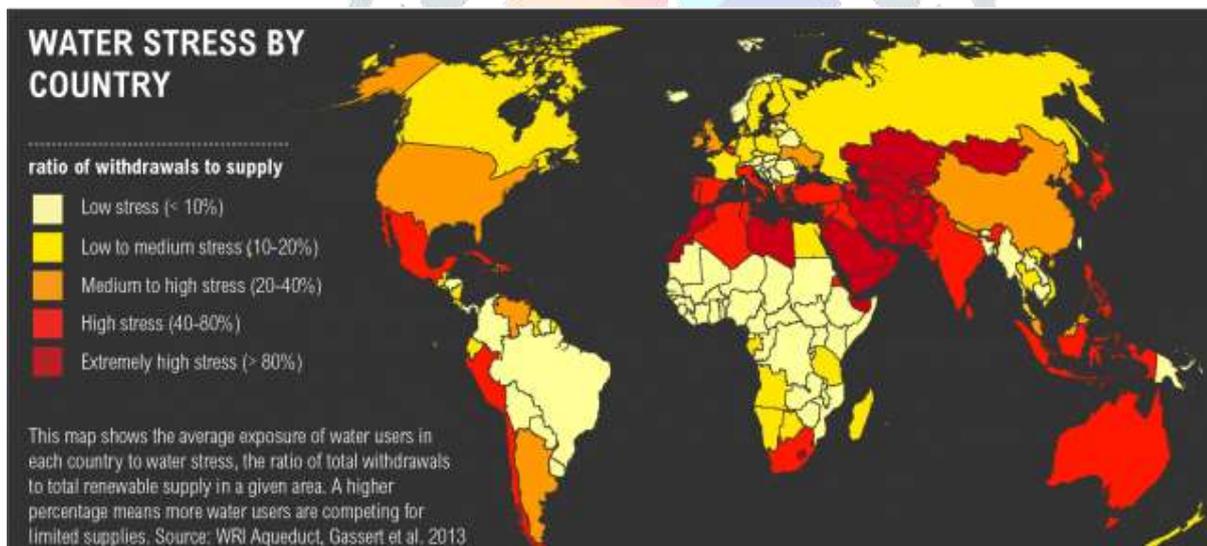


Figure 1: Water Stress in Global scenario (Source: World Resources Institute, India)

Above infographics states the water stress faced by different countries of the world in terms of ratio of withdrawals to supply. This will lead to a global conflict to fulfill the needs of the hour. The Consequences of increasing global water scarcity will largely be felt in the arid and semi-arid areas, in rapidly growing coastal regions and in the megacities of the developing world. (Srinivas,2015)

III. INDIAN WATER SCENARIO

Many reports mentioned about high-water stress and scarce in urbanized Indian cities. Although facts state that 24% of the total global ground water is being used by India. Also, 12% of the global total exported in India. As per World Bank Report 2019, Water taken from aquifers exceeds the amount that is restored naturally increased by 22% between 2000 and 2010 and as a result India's rate of ground water depletion has increased by 23% during the same period. Now, the water stress scenario in India can be easily seen from these facts. And All this leads India on 120th rank amongst 122 countries in the water quality index with 70% of water being contaminated. Around 600 million Indians are undergoing extreme water stress. (NITI Aayog, Water index scores of states between 2015-16 and 2016-17).

The recent acute shortage in Delhi NCR has fueled concerns that a potential water crisis is awaiting India's large cities, which are grappling with the pressure of rapid population growth, depletion of water resources and adverse effects of climate change.

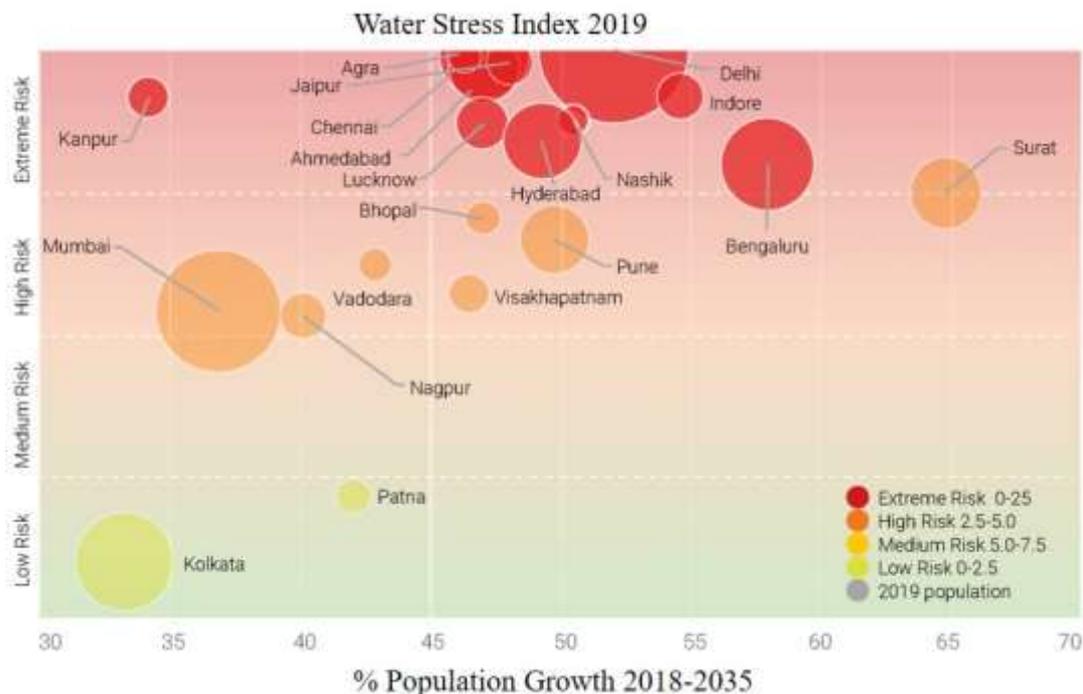


Figure 2: Water Stress Index 2019, India

(Source: UN Department of Economic and Social Affairs, Population Division 2018)

Above Water stress index mapping of major cities of India shows that cities such as Delhi, Bengaluru, Hyderabad, Chennai, Jaipur, Lucknow, Ahmedabad are under extreme risk whereas Mumbai, Nagpur, Pune, Surat, Bhopal are under high risk. Indian cities are running out of water which creates an internal pressure to the populations and leading towards the scarcity scenario.

The Union Ministry of Water Resources has estimated the countries water requirements to be around 1093 Billion cubic meters for the year 2025 and 1447 Billion cubic meters for the year 2050. With projected population growth of 1.4 billion by 2050, the total available water resources would barely match the total water requirement of the country. In 1951, the annual per capita availability of water was 5177 cubic meters, which reduced to 1342 cubic meters by 2000. The facts indicate that India is expected to become 'water stressed' by 2025 and 'water scarce' by 2050. The National Commission for Integrated water Resource Development (NCIWRD) has estimated that against a total annual availability of 1953 Billion cubic meters (inclusive of 432 billion cubic meters of ground water and 1521 Billion cubic meters of surface water) only 1123 Billion cubic meters (433 Billion cubic meters ground water and 690 Billion cubic meters surface water) can be put to use, i.e., only 55.6 per cent. The high-level of pollution further restricts the utilizable water thus posing a serious threat to its availability and use.

IV. LEARNING FROM INTERNATIONAL CASE STUDIES

Singapore and Hongkong are the best examples around the globe to illustrate how to tackle the water scarcity.

Singapore is a small city state which has total area of 725 km² and a total population of 5,638,700 (in 2018). It receives 2400mm/year of rainfall. When Singapore gained independence in 1965, it faced high water risks which lead to dependency on water transfer from Malaysia. It also suffers from severe water pollution and frequent flash flooding. So, Singapore faces severe constraints due to its restricted land area to catch and store rainfall and with limited natural aquifers. After that Singapore government established Public Utilities Board which introduces Four National taps concept of water management with aim of reducing water supply risk through diversification while maintaining affordability. The Four national taps were importing water from Johor, Malaysia, Introducing urban stormwater harvesting, recycling of wastewater and desalination. With these four national taps, Singapore finally ends with solution to water scarcity.

Hongkong is a metropolitan area with population of 7,371,730 (in 2018) having a total area of 1080km² and it receives a rainfall of 2398mm/year. Water Security was of extreme importance to Hongkong as it was having limited internal surface water resources, no appreciable groundwater storage and a high population density and rising water consumptions was the major concern. In 2008, the water supplies Department (WSD) under the development bureau of the Hongkong government announced

the total water management strategy which will run to 2030 and underlines the need to manage water demand and diversify water resources. The Programme incorporates the demand and supply side measures, water efficiency incentives, active leakage control and new water resources. In addition to the programme, three additional sources of water were identified. They were promoting desalination, recycling, and reusing the wastewater and recycling of grey water. As a result, even Hongkong has a solution to its problems.

V. Case of NCT Delhi

As most of the Indian cities are more densely populated with high rate of urbanization deprived of basic amenities which affects the living standards. New Delhi, officially known as the National Capital Territory (NCT) of Delhi, is the capital of India and home to about 17 Million people. It is the largest Indian urban agglomeration with high population density. As of 2012, New Delhi was having 6343 slums with approximately 1 million people. As per Census of India, 83% of Delhi population are using treated tap water as a primary portable source of water and half of the slum population do not have a proper water source which reflects the insufficiency and overreliance on unreliable sources. As per Delhi Jal Board, it covers about 82% of household through piped water supply and ensured average availability of 50 gallons per capita per day of filtered water. Delhi has a wide network of water supply network comprising 11,350 km of pipelines and 105 underground reservoirs. In most of the Indian cities, the high rise in population growth has led to many challenges which is difficult to cope up with.

These are:

- Lack of Alternative sources
- Insufficient Water Supply System
- Demand Supply Gap
- Water Insecurities
- Recycling and reuse of wastewater
- Lack of Governing Structure
- Critical Analysis of Existing water scenario in Delhi
- Lack of Alternative Sources

Delhi which has a population of 17 Million is more dependent on River basins and reservoirs. A 2014 report by Delhi Parks and Gardens Society states that at least 200 among more than a thousand water bodies in Delhi comprising lakes, ponds, moats that existed far back in the 20th century have been encroached upon and lost due to inaction and possible connivance of multiple agencies that owned the land that these water bodies existed on. As of now, 1109 water bodies existed in which 969 is traceable and 40 are non traceable whereas Delhi Parks and Garden society report, Delhi has only 629 water bodies. Decrease in number of water bodies in Delhi are due to following reasons:

- Due to encroachments, there is interrupted water flows from catchments to water bodies
- Water bodies are drying because of poor and erratic rainfall
- Water bodies are getting disconnected because of intervening embankments due to urbanization
- Siltation and sludge deposition in water bodies
- Rural ponds are often marked for acquisition by the Government for various infrastructure
- Ponds have been engulfed in Abadi areas
- The remoteness and inaccessibility of water bodies led to poor quality

All these reasons have led in declining of water bodies in Delhi which is creating a demographic pressure on the existing sources.

VI. INSUFFICIENT WATER SUPPLY SYSTEM

Water supply system plays a vital role in providing water to every household. Map given on the righthand side says that only 50% of the total area has been covered through water networks rest 50% are dependent on the other sources such as water tanker and different sources of water bodies. This insufficient water supply system creating the demographic pressure on the existing sources. Although Delhi Jal Board has proposed to cover the rest of the area.

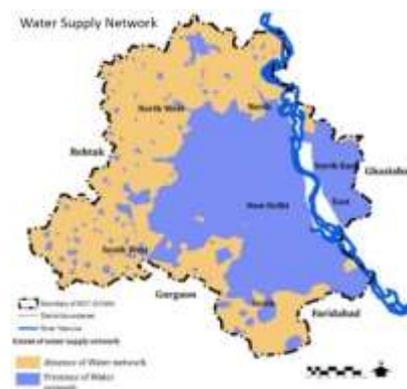


Figure 4: Water Supply Network, Delhi

VII. DEMAND SUPPLY GAP

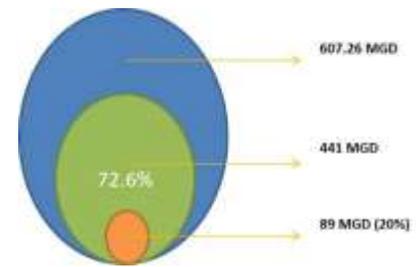
Delhi's projected census population for year is 18.75 million. Considering the CPHEEO manual and MPD-2021 norms, 230 lpcd of water supply is required. Therefore projected water demand = (Total population X 230) = 18.75 x 230 = 1140 MGD whereas actual water supply is 906MGD. So there is a gap of 234MGD which is required for the existing population. (Source: Economic Survey of Delhi, 2018-2019).

VIII. WATER INSECURITIES

Delhi has vast network supply of 14,355km out of this a significant portion is 40-50 years old. According to Delhi Jal Board, estimate total distribution loss (either theft or leakage) is 40% of the total water supplied. This means that if a new and more robust pipe network is laid, providing enough water for a continuous supply can become feasible.

IX. RECYCLING AND REUSE OF WASTEWATER

Recycling and reuse of water has been in a practice for more than 3 decades. Delhi is recycling the wastewater as such Singapore and Hongkong did for their utilization. In Delhi, Total sewerage treatment capacity of Delhi Jal Board is approx. 608MGD whereas actual treatment of wastewater which is being done is 441MGD which is 72.6% of total capacity. Out of 441MGD, only 89MGD of waste is being used by institutions like CPWD, DDA, Flood Control Department, Gammon India etc, for irrigation, horticulture, and industrial purposes.



X. LACK OF GOVERNING STRUCTURE

Delhi figures at the bottom of the table in Niti Aayog's ranking of states and Union Territories in terms of their performance on water management practices. Delhi, assessed on the index for the first time in 2019, scores the lowest with 20 points. Niti Aayog's water management index scored states on nine indicators, including restoration of waterbodies, groundwater, irrigation practices, sustainable farming, rural and urban water supply and policy and governance. Delhi needs to reconsider the institutional processes for dissemination of knowledge about water resource management.

XI. CONCLUSION

Looking at Delhi's water scenario, lot of things must be taken into consideration to have a fully functional water supply system. Indian cities are coping with all these issues to overcome with the solution to the problems. So, to conserve the urban water bodies, we need a paradigm shift from conventional approach to demand supply approach. Therefore, we need to think from a different perspective to have smart city with all these utilities and Services such as Wastewater management, solid waste management, Water Supply system, sewerage system with the help of advanced and smart technologies.

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