

SUPPLY & DEMAND OF WATER IN KOLKATA CITY:

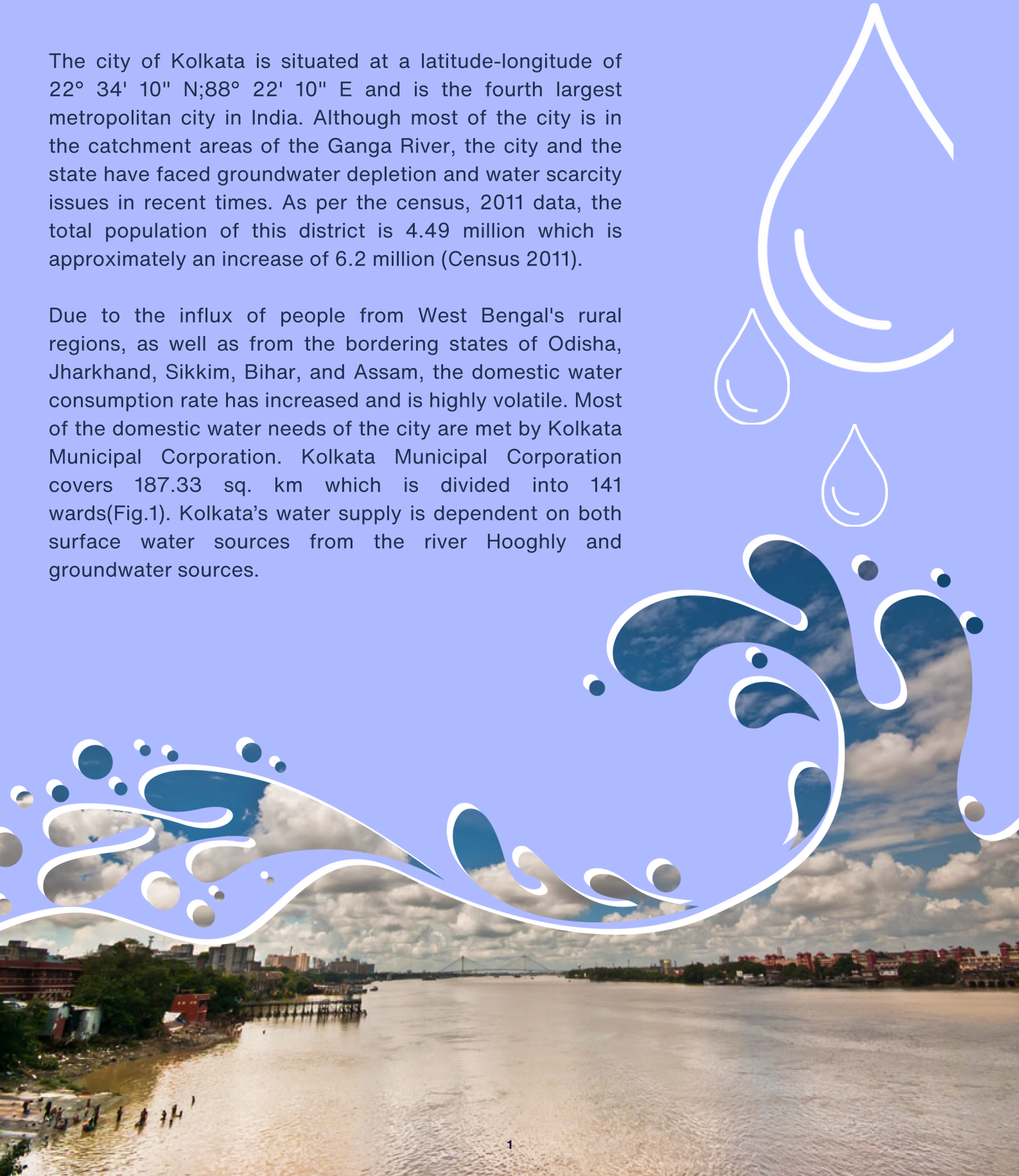
A DOMESTIC SECTOR PERSPECTIVE



INTRODUCTION

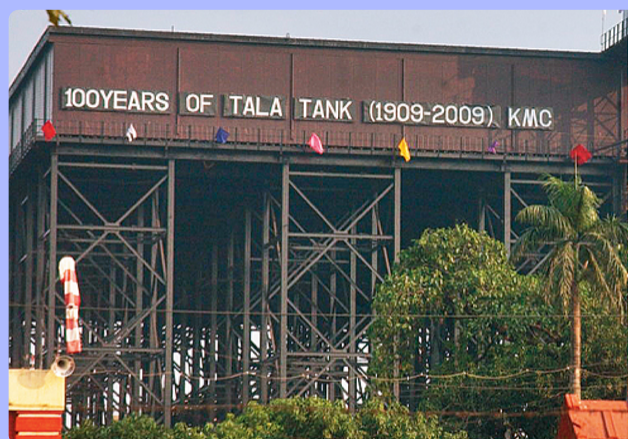
The city of Kolkata is situated at a latitude-longitude of 22° 34' 10" N; 88° 22' 10" E and is the fourth largest metropolitan city in India. Although most of the city is in the catchment areas of the Ganga River, the city and the state have faced groundwater depletion and water scarcity issues in recent times. As per the census, 2011 data, the total population of this district is 4.49 million which is approximately an increase of 6.2 million (Census 2011).

Due to the influx of people from West Bengal's rural regions, as well as from the bordering states of Odisha, Jharkhand, Sikkim, Bihar, and Assam, the domestic water consumption rate has increased and is highly volatile. Most of the domestic water needs of the city are met by Kolkata Municipal Corporation. Kolkata Municipal Corporation covers 187.33 sq. km which is divided into 141 wards (Fig.1). Kolkata's water supply is dependent on both surface water sources from the river Hooghly and groundwater sources.



EARLY HISTORY OF WATER SUPPLY

- Based on early records of water bodies, "Lal Dighi" is considered a vital water resource that is used for Towns' household usage (Hati *et al.*, 2020).
- In the mid-19th century (1864-70), a small water treatment plant was built on Palta to purify and distribute the water (KMCGOV, 2023 b).
- Tala water tank of Kolkata Municipal Corporation was built in 1909 and has the capacity to hold 9 million gallons of water and is the largest overhead reservoir in the world (Hati *et al.*, 2020).



SOURCE OF WATER SUPPLY

The Hooghly River is the main source of water in Kolkata (KMC, 2023). The Hooghly River serves as the city's primary source of potable surface water, which is provided by the historic Palta Water Works, which has been renamed as the Indira Gandhi Water Treatment Plant. The Palta Water Works was the first intake point built between 1864 and 1870 for the generation and supply of water, covering a vast area of 480 acres.

According to a Times of India Report, the summer heat waves in April 2023 had increased water demand in the city, and the usual KMC supply was unable to bridge the gap between supply and demand (TOI, 2023 b).

SURFACE WATER SOURCES

Major sources of surface water supply in the city are rivers and storage reservoirs (Hati *et al.*, 2020). The Hooghly River is Kolkata's primary source for surface water supply. The Palta water station filters water from the Hooghly River and distributes it to seven essential water storages (Fig.2). Apart from the Palta water station, there are Garden Reach Waterworks and Jorabagan treatment plants. The details of water supply are as given in table.1.

KOLKATA'S WATER SUPPLY STATISTICS AT A GLANCE

Total daily potable water supply in million litres	1350
Average supply hours	8 hours
Per Capita water availability in litres	234*
Unfiltered water through street hydrants (in nos.)	2000
No. of connections Domestic	2,45,019
Coverage of household connection	92.7%
Percentage of household covered by surface water	82.7%
Percentage of household connection by groundwater	10%
Treated surface water supply in Million Gallons per Day	271
Groundwater supply Million Gallons per Day	25
Expected water demand in 2026 in Million Gallons per Day	402

(Source: Haiti *et al.*, 2020,* TOI 2023)

Rainfall is a significant source of the city's surface and groundwater. Approximately 1241 mm of annual rainfall is normal in Kolkata's monsoon periods (CGWB, 2022 a). For storage purposes, Tala water tanks are considered the highest water capacity holders in Kolkata. In this reservoir, approximately 9 million gallons of water can be stored. Apart from Tala reservoir, Garfa, Kalighat, Behala, Kasba, and Subadh Mallik Square are the most important water reservoirs in Kolkata.

SUBSURFACE WATER SOURCES

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SUBSURFACE WATER SOURCES

Officially, groundwater sources contribute 15% of Kolkata's main water consumption and in reality around 25-30% of household water demand is met by groundwater. In the pre-monsoon season for 2021, groundwater ranged from 6.55 to 20.48 metres below ground level (mbgl), and in the post-monsoon season, it ranged from 6.3 to 18.26 mbgl (CGWB, 2022). Most of the tube wells and borewells of Kolkata municipal corporation, are situated in the northern part of the city.

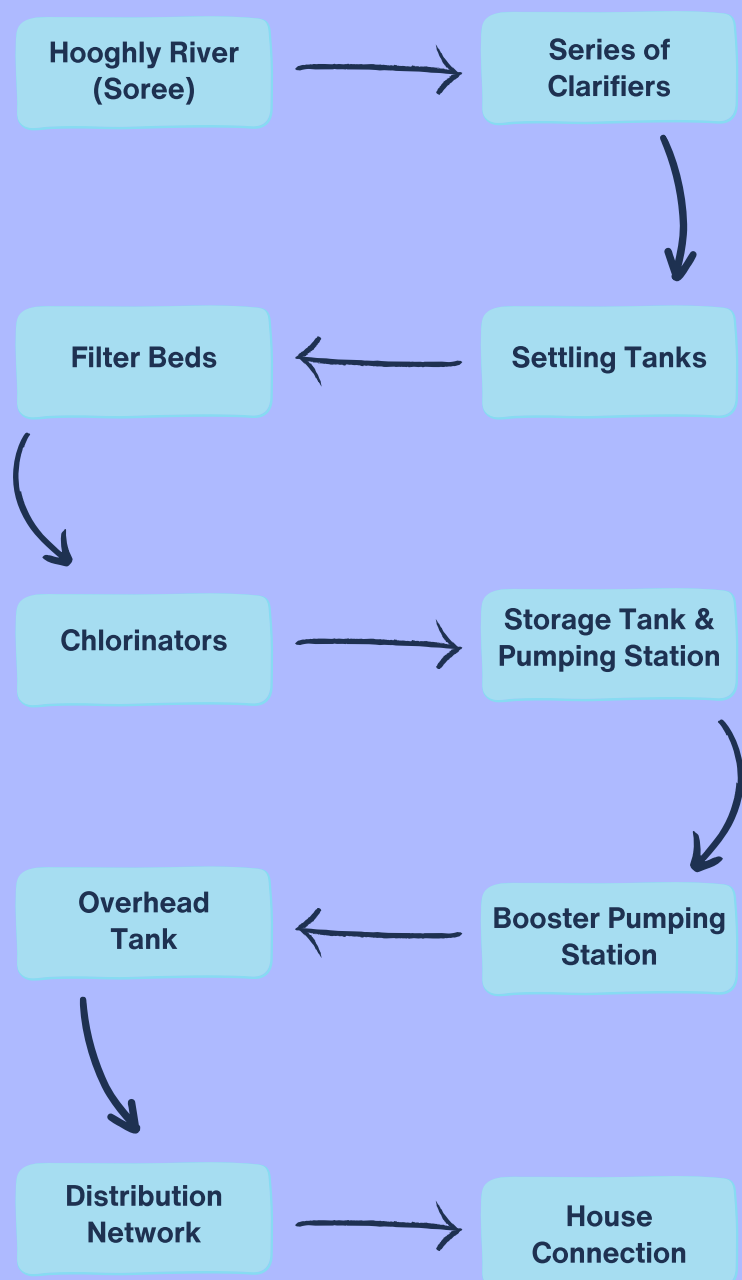


Fig.2. Basic flow diagram of Palta and Garden Reach Water Treatment Plant
(Source: Haiti *et al.*, 2020)

CHALLENGES



Groundwater level fluctuations are severe in Kolkata (John, Das, & Das, 2022), and it is the semi-confined and confined aquifers exist in the state which faces major water table fluctuations. Areas like Jadavpur, Tollygunge, Haridevpur, Sealdah, Bowbazar, and many other places have faced severe drinking water crises during the summer season of 2023. Apart from this, increase in salinity, nitrates, organic matter and heavy metal contamination also pose threats to groundwater resources. Higher arsenic contaminations have been reported in various regions of Kolkata (CGWB, 2022). According to CGWB data, Tangra, Topsia, and Tiljala regions water is contaminated by Chromium and Cobalt (CGWB, 2022b). Arsenic variations range from 0.054 ppm to 0.71 ppm, which is very harmful if used for drinking purposes. As per the CPCB guidelines, drinking water should not exceed 0.01 ppm of arsenic (CPCB, 2023).

Lack of proper wastewater treatment causes adverse health risks to the users of surface water resources. Waste disposal, bathing, and cleaning result in the degradation of the water quality of rivers and other surface water sources. During the festival seasons, the immersion of idols and other things affects the river's water quality. Leakage of fresh water supply pipes or sewer/effluent pipelines, is also considered a major issue for water management. Leachates and runoff from landfill sites also contaminate water resources. Apart from sewer lines, non-point sources of water pollution from different residential clusters also pose a threat to surface water resources in Kolkata.



MAJOR CAUSES FOR THE WATER CRISIS

- Rapid population growth in KMC regions
- Unplanned urbanisation in numerous parts of the city
- Surface water pollution in various parts of the Hooghly River
- Over-abstraction of water withdrawal by private owners that are not monitored



RECOMMENDATIONS

- The government needs to establish water meters to monitor the wastage of water caused by domestic or commercial purposes. This meter also helps to measure the water flow in different places.
- All industries need to implement wastewater recycling to improve water conditions and decrease river pollutants.
- Baseline study followed by installation of rainwater recharge structures to harvest rainwater efficiently.
- Regular checking of distribution pipelines; replacing all older pipes to avoid leakage and wastage of water distribution.
- Need to increase local awareness about water issues by conducting physical and virtual campaigns.
- The government needs to focus on water wastage regulations and implement stricter penalties.
- Inventorying private water sources and monitoring water abstraction.



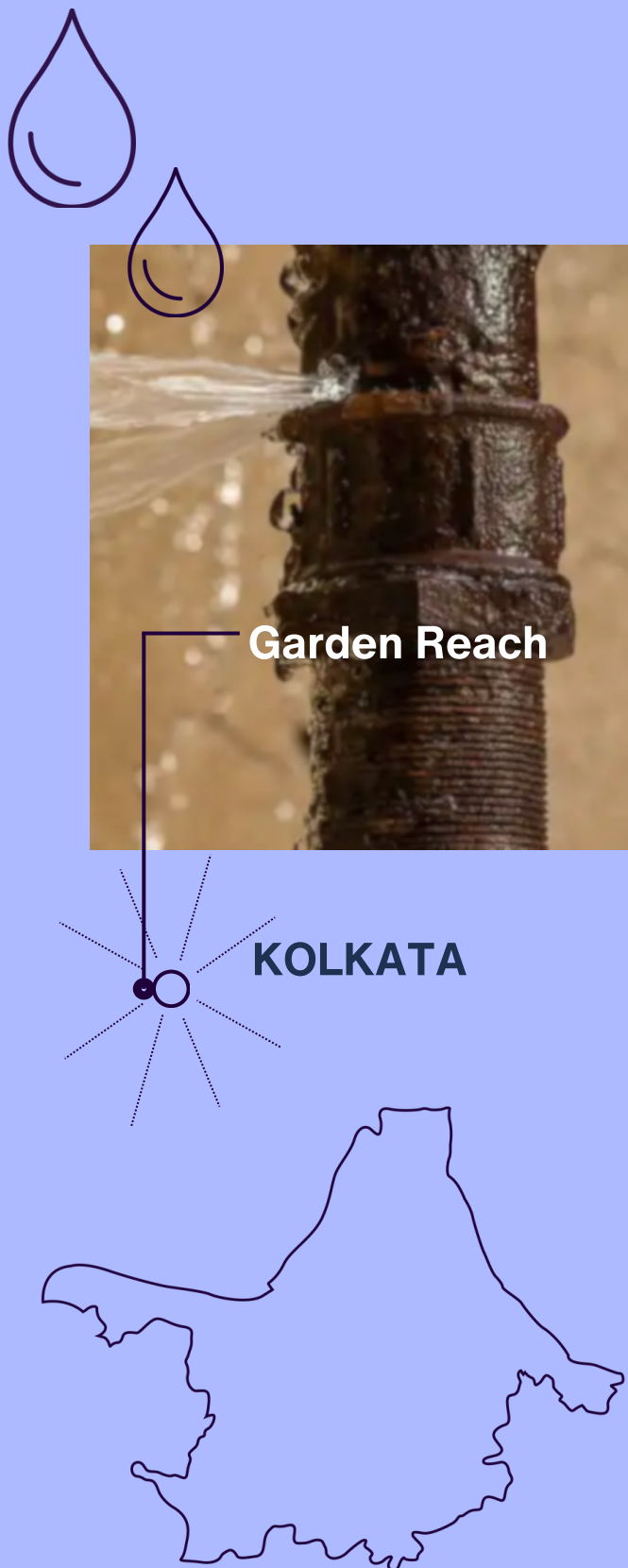
CONCLUSION

The Hooghly River serves as the source for the majority of the water used in the city. Apart from KMC supply, some people are exploring private water supplies sourced from either surface or groundwater resources, and these are not fully inventoried or quantified. The demand for water in the city is rising due to rising population and fast urbanisation.

Garden Reach and Palta Water Works have made efforts to increase the city's water supply. Water shortage in the city suggests that attempts to manage water demand are not keeping up with population expansion. As per the latest records by the Central Ground Water Board (CGWB), Kolkata along with some districts of West Bengal shows a significant decline in the water table in summer months compared to previous years.

Over-abstraction of groundwater and lesser rainwater recharge can give rise to pollution by chloride and other salts and cause risks of land subsidence. Rainwater recharge structures should be implemented along with the conservation and protection of all small and medium-sized traditional surface water resources.

According to CGWB, the city gets enough rainfall which can be utilised to establish a proper supply-demand chain. There should be long-term plans for sustainable management of water and short-term plans to withstand the present day's water scarcity and quality-related issues.



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