BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION NO. 593/2025

IN THE MATTER OF:

Newspaper report titled "Delhi Mumbai Kolkata Chennai. Why Our Metros Are Going Under" appearing in the Times of India (Kolkata) dated 13.11.2025

INDEX

Filed by:

(Central Ground Water Authority & Ministry of Jal Shakti)

27/05/2026

बिनोद कुमार ढोडियाल / Vinod Kumar Dhaundiyal
प्रशासक / Administrator
केन्द्रीय भूमि जल प्राधिकरण / Central Ground Water Auth
जल संसाधन, नदी विकास एवं गंगा संरक्षण
Deptt of Water Resources, River Development & Ganga Rejuv
जल शक्ति मंत्रालय / Ministry of Jal Shakti
भारत सरकार / Government of India

Place: New Delhi

Date: 27/5/2026

Through

GIGI.C. GEORGE
Advocate
Standing Counsel (UOI)
NATIONAL GREEN TRIBUNAL
Email: gigicgeorge.adv42@yahoo.in
M-981062531

(1)

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEW DELHI

ORIGINAL APPLICATION NO. 593/2025

IN THE MATTER OF:

Newspaper report titled "Delhi Mumbai Kolkata Chennai. Why Our Metros Are Going Under" appearing in the Times of India (Kolkata) dated 13.11.2025

REPLY ON BEHALF OF RESPONDENT NO. 1 & 2 (CENTRAL GROUND WATER AUTHORITY AND MINISTRY OF JAL SHAKTI)

MOST RESPECTFULLY SHOWETH:

1. That the present reply is being filed on behalf of Respondent No. 1 i.e. Central Ground Water Authority (CGWA) and Respondent No. 2 i.e. Ministry of Jal Shakti, Government of India, in compliance with the order dated 17.02.2026 passed by this Hon'ble Tribunal.
2. That the issues highlighted in the newspaper article titled *"Delhi Mumbai Kolkata Chennai. Why Our Metros Are Going Under"* involve complex hydrogeological, geotechnical, urbanization and land-use related factors. The land subsidence in metropolitan cities may arise due to multiple causes including rapid urbanization, construction loading, soil consolidation, coastal geomorphology, underground infrastructure development, reduction in natural recharge, excessive groundwater abstraction and climate-induced hydrological variations.
3. It is submitted that Respondent No. 1 and Respondent No. 2 are continuously undertaking groundwater monitoring, groundwater resource assessment, aquifer mapping, groundwater recharge and groundwater regulation activities across the country through the Central Ground Water Board (CGWB) and Central Ground Water Authority (CGWA).
4. It is further submitted that CGWA regulates groundwater development and management as per Govt. of India, Ministry of Jal Shakti notified Guidelines dated 24.09.2020 followed by amendment dated 29.03.2023.
5. The dynamic groundwater resources of the country are being assessed annually jointly by the Central Ground Water Board and the respective State Governments/UT Administrations. The assessment includes estimation of Total Annual Ground Water Recharge, Annual Extractable Ground Water Resource and Annual Ground Water Extraction. The Stage of Ground Water Extraction is computed accordingly and assessment units are categorized as Safe, Semi-Critical, Critical and Over-Exploited.

6. The information of the metropolitan cities with respect to ground water resource assessment and population analysis, status of stage of extraction, groundwater draft and recharge, source of water supply to the cities etc. is annexed herein and marked as **Annexure-I**.

7. It is respectfully submitted that Respondent No. 1 and Respondent No. 2 have undertaken several regulatory and management measures for groundwater conservation and sustainable management throughout the country including metropolitan cities.

8. The Central Ground Water Authority regulates groundwater abstraction through grant of NOCs in accordance with the Guidelines notified by the Govt. of India, Ministry of Jal Shakti.

9. The guidelines, inter alia, mandate :

(a) Rainwater harvesting and artificial recharge measures;

(b) Installation of digital flow meters with telemetry;

(c) Submission of annual groundwater extraction data;

(d) Restriction of groundwater abstraction in Over-Exploited areas;

(e) Penalty and Environmental compensation for violations, etc.

10. CGWB is also undertaking aquifer mapping and aquifer management studies under the National Aquifer Mapping and Management Programme (NAQUIM).

11. Artificial recharge and rainwater harvesting structures are being promoted through various schemes and technical advisories.

12. Dynamic Ground Water Resource Assessment is being undertaken annually jointly with States/UTs for scientific management and categorization of assessment units.

13. Groundwater monitoring is being carried out through a network of monitoring wells and piezometers across the country.

14. That the Government of India has undertaken several initiatives for groundwater recharge and sustainable water management through various schemes and community participation. Under the Ministry of Jal Shakti, Jal Shakti Abhiyan, launched in 2019, promotes rainwater harvesting, construction of artificial recharge structures, watershed development, renovation of traditional water bodies, afforestation, and reuse of water

across rural and urban areas. Further, under Pradhan Mantri Krishi Sinchayee Yojana and MGNREGA, large numbers of check dams, farm ponds, percolation tanks, recharge pits, contour bunds and water harvesting structures are being created to enhance groundwater recharge and improve water-use efficiency. The Government has also launched the Amrit Sarovar Mission for rejuvenation and development of water bodies across districts, thereby augmenting local groundwater resources. In addition, the Central Ground Water Board has prepared Aquifer Management Plans and recommends construction of artificial recharge structures in various States to improve groundwater sustainability.

Furthermore, Government of India has launched a nationwide water conservation initiative "Jal Sanchay Jan Bhagidari" with the objective of promoting community participation in rainwater harvesting, groundwater recharge, and sustainable water management. The campaign emphasizes "Jan Bhagidari" as a key component for ensuring long-term water security across rural and urban areas. Under the initiative, activities such as construction and rejuvenation of ponds, check dams, recharge pits, traditional water bodies, rooftop rainwater harvesting systems, and desilting of tanks are undertaken with active involvement of local communities, Panchayati Raj Institutions, NGOs, educational institutions, and various stakeholders. The initiative also focuses on awareness generation through mass campaigns, shramdaan activities, and public outreach programmes to create a sense of ownership among citizens towards conservation of water resources and enhancement of groundwater recharge.

15. Compared to 2017, the National ground water status in 2025 shows that the total ground water recharge has gone up from 432 Billion Cubic Meters (BCM) to 448.52 BCM - an increase of 16.52 BCM. Safe assessment units have increased from 62.6% in 2017 to 73.14% in 2025 while over exploited assessment units have declined from 17.2% to 10.8% over the same period.

16. It is respectfully submitted that groundwater depletion and land subsidence are highly localized and scientifically complex issues requiring detailed geotechnical and hydrogeological investigation on a case-to-case basis. The newspaper report itself refers to satellite-based observations. Such observations require detailed validation with

ground-based hydrogeological, geological and geotechnical data before any conclusive attribution exclusively to groundwater extraction can be made.

17. Respondent No. 1 and Respondent No. 2 are continuously coordinating with State Governments, local authorities and technical agencies for sustainable groundwater management and implementation of recharge and conservation measures.

18. It is submitted that the issue of land subsidence in metropolitan cities involves multiple stakeholders including urban local bodies, planning authorities, water supply agencies, groundwater regulatory authorities and State Governments.

19. Respondent No. 1 and Respondent No. 2 shall continue to undertake groundwater monitoring, groundwater regulation and technical support measures in accordance with applicable laws, policies and scientific assessments.

PRAYER

In view of the facts and submissions made hereinabove, it is most respectfully prayed that this Hon'ble Tribunal may graciously be pleased to:

a) Take the present reply on record;

b) Pass such further order(s) as this Hon'ble Tribunal may deem fit and proper in the facts and circumstances of the present case.

Filed by:

(Central Ground Water Authority & Ministry of Jal Shakti)

27/05/2026

बिनोद कुमार ढोडियाल / Vinod Kumar Dhaundiyal
प्रशासक / Administrator
केन्द्रीय भूमि जल प्राधिकरण / Central Ground Water Authority
जल संसाधन, नदी विकास एवं गंगा संरक्षण
Deptt of Water Resources, River Development & Ganga Rejuv...
जल शक्ति मंत्रालय / Ministry of Jal Shakti
भारत सरकार / Government of India

Place: New Delhi

Date: 27/05/2026

Through

GIGI.C. GEORGE
Advocate
Standing Counsel (UOI)
NATIONAL GREEN TRIBUNAL
Email: gigicgeorge.adv42@yahoo.in
M-981062531

Annexure-I

Information of the metropolitan cities with respect to ground water resource assessment and population analysis, status of stage of extraction, groundwater draft and recharge, source of water supply to the cities

DELHI

Central Ground Water Board (CGWB), under the Ground Water Management and Regulation (GWMR) Scheme, a Central Sector Scheme, undertakes activities related to groundwater monitoring, groundwater resource assessment, aquifer mapping, aquifer management planning, artificial recharge and technical support for groundwater conservation and management throughout the country including NCT of Delhi.

1. **Analysis with respect to Population of the city and GWRE of over the years :**GWRE of NCT Delhi with respect to Projected Population (Projected) is shown in figure. Stage of Ground Water extraction reflects improvement suggest the implication of increasing rainfall, ceasing of illegal bore wells, recharge interventions under various scheme.

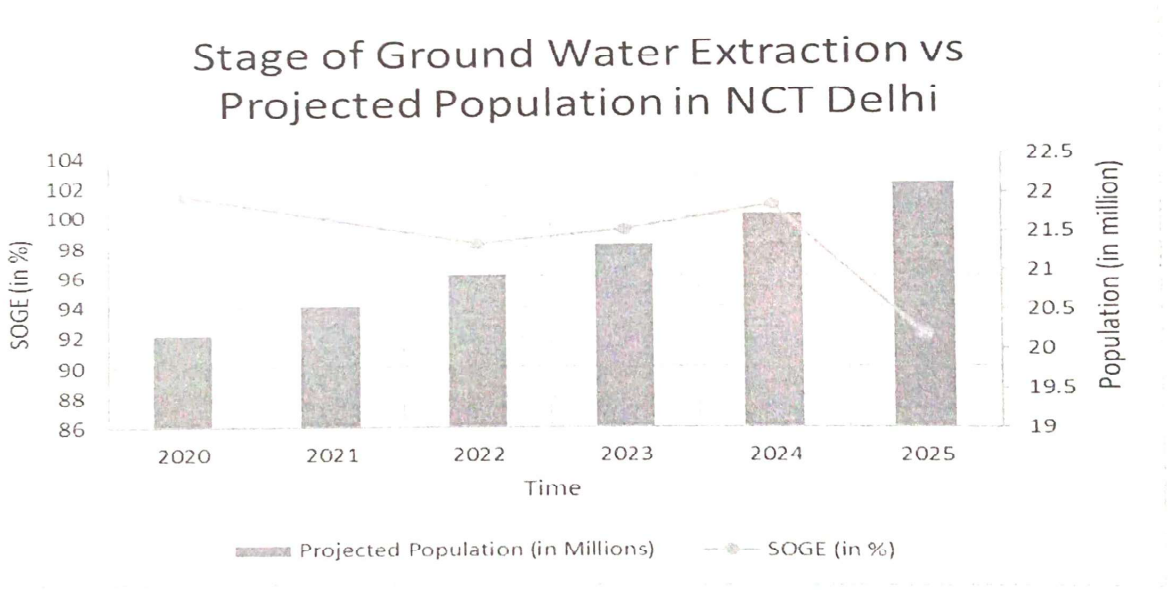


Figure 1Graph Showing change GWRE against projected population

2. **GWRE of the city, it's stage of Extraction, GW draft, and recharge etc**

Dynamic Ground Water Resources of the country are being assessed every year from 2022 jointly by Central Ground Water Board (CGWB) and State Governments. For the assessment year 2025, the assessment has been completed for all the 36 States/ UTs including NCT of Delhi

and the National Compilation on Dynamic Ground Water Resources of India, 2025 has been released.

The assessment of groundwater resources involves estimation of Total Annual Ground Water Recharge, Annual Extractable Ground Water Resource and Annual Ground Water Extraction for all purposes. The 'Stage of Ground Water Extraction' is then computed as the ratio of 'Annual Ground Water Extraction' with respect to 'Annual Extractable Ground Water Resource' and is expressed in percentage. Based on the Stage of Extraction (SoE), the assessment units (block/ mandal/ taluk) are categorized as Safe (SoE <= 70 %), Semi-Critical (SoE >70 % and <=90 %), Critical (SoE >90 % and <=100%) and Over-Exploited (SoE >100 %).

District wise resources details along with their categorization as per Annual Groundwater Resources Assessment 2025 (GWRA 2025) has been presented in Table below.

Sl. No	District	Total Annual Ground Water Recharge (Ham)	Annual Extractable Ground Water Resource (Ham)	Total Extraction (Ham)	Stage of Ground Water Extraction (%)	Categorization (Over-Exploited/Critical/Semi-Critical/Safe/Saline)
1	Central	2566.99	2310.29	1747.05	75.62	Semi critical
2	East	1668.32	1501.49	1447.79	96.42	Critical
3	Nazul Land	571.42	514.28	337.92	65.71	Safe
4	New Delhi	3028.98	2726.07	3359.65	123.24	Over exploited
5	North	4724.52	4252.06	3789.81	89.13	Semi critical
6	North East	1813.6	1632.23	1730.39	106.01	Over exploited
7	North West	3873.46	3486.13	2259.86	64.82	Safe
8	Shahdara	1650.6	1485.55	1666.96	112.21	Over exploited
9	South	4527.25	4074.53	4213.53	103.41	Over exploited
10	South East	2664.13	2397.71	2115.95	88.25	Semi critical
11	South West	7379.79	6641.81	5888.2	88.65	Semi critical
12	West	3835.3	3535	3271.12	92.54	Critical
	Total (In Ham)	**38304.41**	**34557.15**	**31828.23**	**92.10**	**Critical**
	Total (In BCM)	**0.38**	**0.35**	**0.23**	**92.10**	**Critical**

3. **Hydrograph analysis of CGWB monitoring wells within the city with graphical correlation of DTEL with rise in population of city :** Minimum Water level in NCT Delhi during the period of 2020 to 2025 varies from 0.21 mbgl to 0.53 mbgl while the Maximum

water level during the same period is recorded as 64.1 to 68.69. The variation of depth to water level with projected population mentioned in table and shown in the figure.

Year	Max WL (m bgl)	Min WL (in bgl)	Projected Population (in Millions)
2020	64.1	0.41	20.193
2021	65.67	0.12	20.57
2022	67.64	0.43	20.96
2023	67.41	0.53	21.36
2024	68.26	0.21	21.75
2025	68.69	0.22	22.146

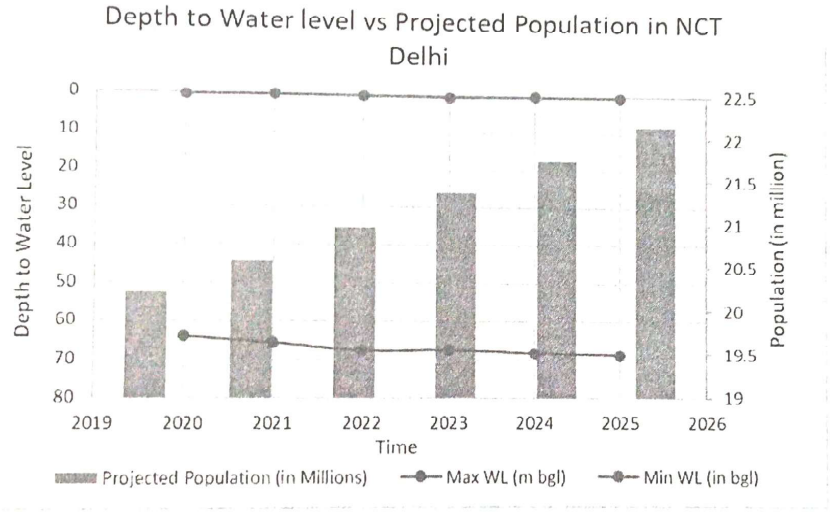


Figure 2 Variation of DTWL with projected population

4. **Source of water supply to city, whether Surface water or Ground water; it's location from the city :** Delhi Jal Board supplies about **1000 MGD** of water (865 MGD surface water and 135 MGD groundwater) against a demand of **1250 MGD** for a population of nearly **21.5 million**, resulting in a deficit of around **250 MGD**. Surface raw water is received from the **Ganga (254 MGD)** and **Yamuna & BBMB (612 MGD)**. The system includes **12 Water Treatment Plants, 11 Ranney Wells**, and around **5,900 functional tube wells**. (Economic Survey Report, 2025-26)

i. **Surface Water source:** Yamuna & BBMB water is supplied through Delhi branch of Western Yamuna Canal & river Yamuna Course for Wazirabad, Chandrawal, Haiderpur, Nangloi, Bawana, Dwarka & Okhla water treatment plants. Ganga Water is supplied through Ganga Canal for Bhagirathi & Sonia Vihar water treatment plants.

ii. **Ground water sources**: The Ground Water in NCT of Delhi are being abstracted through 11 no. of Ranney Well and few high discharge tubewell in Yamuna Flood plain and localised tubewells across Delhi to tune of 135 MGD.

5. **Local hydrogeology, any fence diagram ; whether it's a hard rock or soft rock; and impact of groundwater extraction, if any :** The aquifer system in Delhi is characterized by a northeast–southwest trending quartzite ridge (hard rock) and thick alluvial deposits (soft rock) occurring on both sides of the ridge. Sand deposits are predominantly found on the eastern side near the Yamuna River, whereas clay is more common in the northern and north western regions. In the southwestern and southern parts of Delhi, silt and silt mixed with kankar are widely distributed. Within the alluvial formations, sand and silt with kankar constitute the main potential aquifer zones, while in the quartzite terrain, groundwater occurs mainly in weathered and fractured zones. Delhi Quartzite forms the bedrock of the region. It is exposed at the surface in certain areas, while in other parts of the National Capital Territory (NCT) of Delhi it is covered by alluvial sediments. The thickness of the alluvial cover increases progressively away from the quartzite outcrops. The basement topography of NCT Delhi is highly irregular due to the folding of geological formations during the Precambrian and later geological periods, resulting in the development of subsurface ridges and valleys. Fence Diagram, based on resistivity survey is depicted in figure below;

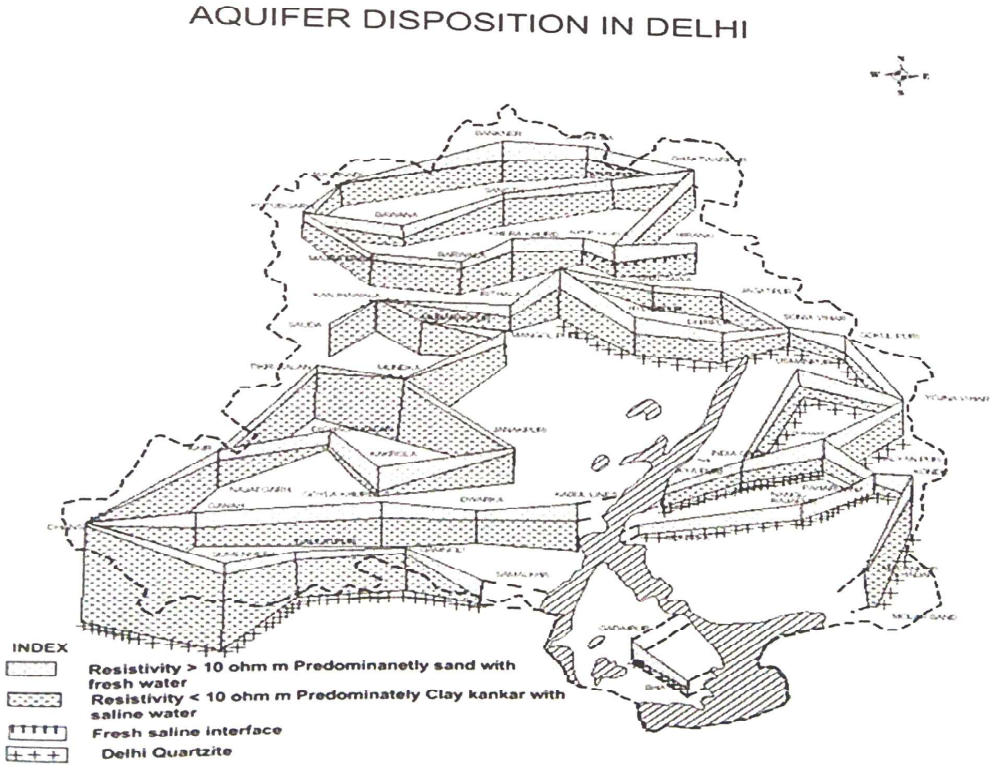


Figure 3 Aquifer disposition of NCT Delhi based on Resistivity data

Total Ground water extraction for Assessment year 2019-2020 (domestic, industrial and irrigation) is **0.29 BCM** and Stage of Ground water extraction is **101.4 %.** For Assessment year 2024-2025 (domestic, industrial and irrigation) is **0.32 BCM** and Stage of Ground water extraction is improved to **92.10 %.**

6. Findings of NAQUIM study carried out in city :

- **Aquifer Mapping and Ground water Management Plan of NCT, Delhi**

The study on Aquifer Mapping and Ground Water Management Plan of NCT Delhi revealed that groundwater in Delhi occurs mainly in alluvial formations and weathered/fractured quartzites, with the Yamuna floodplain and Delhi Ridge acting as major recharge zones. Groundwater levels show a declining trend in most parts of Delhi due to over-extraction, while shallow water levels occur along the Yamuna floodplain. Water quality issues such as high nitrate, fluoride, salinity and heavy metal contamination were observed in several districts, mainly due to anthropogenic activities and industrial pollution. The study also found that nearly 15 out of 27 tehsils are over-exploited in terms of groundwater extraction. Freshwater aquifers are limited in thickness and are often underlain by saline groundwater. Modelling studies predicted further decline in groundwater levels by 2030 in many urbanized areas. The report emphasized the need for rainwater harvesting, artificial recharge, regulated groundwater withdrawal and protection of recharge zones for sustainable groundwater management in Delhi.

- **Aquifer Management Plan, Bhalswa Landfill Site, NCT of Delhi**

The study revealed that groundwater around the Bhalaswa Landfill Site is highly contaminated due to leachate seepage from the landfill area. High concentrations of salinity, nitrate, fluoride, chloride and heavy metals were observed in several groundwater samples, along with severe bacteriological contamination. Groundwater flow in the area is generally towards the Yamuna River, increasing the risk of pollutant migration. The study also found the presence of saline groundwater at deeper levels beneath shallow aquifers. It recommended artificial recharge, controlled groundwater withdrawal and scientific landfill management to prevent further groundwater pollution.

- **Aquifer Management Plan, Okhla Landfill Site, NCT of Delhi**

The study on groundwater contamination around the Okhla Landfill Site revealed that groundwater quality in the area is affected due to leachate seepage from the landfill. High levels of electrical conductivity, nitrate, chloride, fluoride and heavy metals were observed in several groundwater samples. The study also found that fresh groundwater occurs in thin layers and is underlain by saline groundwater at deeper levels. Groundwater flow is generally towards the Yamuna River, increasing the risk of pollutant migration. The report recommended artificial

recharge, rainwater harvesting and regulated groundwater withdrawal for sustainable groundwater management.

- **Aquifer Management Plan, Nazafgarh Drain, NCT of Delhi**

The study revealed that groundwater quality along the Najafgarh Drain corridor is affected by high salinity, nitrate contamination and localized heavy metal pollution. Unlined stretches of the drain facilitate interaction between drain water and shallow aquifers, leading to seasonal deterioration in groundwater quality, especially during post-monsoon period. Urbanisation, leaking sewers, dairy clusters and industrial activities were identified as major pollution sources. The report recommended source control measures, regulated groundwater withdrawal, no-extraction buffer zones and use of treated STP water for sustainable groundwater management

7. **Other specific study conducted by the CGWB:**

- **Water Logging Study in Jungpura - Pragati Maidan Area, New Delhi**

The report titled *"Final Report on Jungpura–ITO Water Logging Area"* prepared by the Central Ground Water Board investigates persistent water logging problems in the Pragati Maidan–Jungpura region of New Delhi through detailed hydrogeological, groundwater level, and geophysical studies using Electrical Resistivity Tomography (ERT) and Vertical Electrical Sounding (VES). The study found that the area is underlain by Quaternary alluvial deposits consisting mainly of silt, clay, sand, and kankar over quartzite bedrock, with shallow groundwater levels ranging from 1.5 to 7.73 mbgl. Excessive rainfall in recent years, high soil infiltration rates, low hydraulic gradients, undulating silty clay layers, and subsurface ridges have caused groundwater accumulation in three depression zones around Pragati Maidan, Jungpura, and Sarai Kale Khan, resulting in severe water logging and basement flooding. The geophysical investigations revealed thick clay and silt layers restricting deep percolation and slowing groundwater movement. The report concludes that water logging is primarily due to groundwater recharge exceeding discharge under regulated pumping conditions in Delhi. To mitigate the problem, the study recommends intensive dewatering through shallow tubewells, improvement of stormwater drainage, and diversion of excess runoff to the Yamuna River. It proposes the construction of about 39 shallow tubewells initially for dewatering up to 6 m depth, with the possibility of increasing the number to around 100 based on groundwater response and future modelling studies

- **Remedial Measures for Water Logging Issues and Revival of Abundant Tube wells in NDMC Area**

The report titled ***"Remedial Measures for Water Logging Issues and Revival of Abundant Tube Wells in NDMC Area"*** prepared by the Central Ground Water Board examines the causes of persistent water logging in the NDMC area of Delhi and proposes suitable remedial measures.

The study reveals that groundwater levels in most parts of NDMC have been steadily rising since 2017 due to above-normal rainfall, reduced groundwater pumping, and subsurface geological conditions that restrict deep percolation and cause groundwater accumulation in low-lying areas. Hydrogeological investigations indicate that the area consists mainly of alluvial deposits over quartzite bedrock, with groundwater flowing towards the eastern part of the study area where stagnation occurs. The report identifies 37 major water-logging locations and recommends artificial recharge structures, storm water recharge systems, and revival of defunct tubewells to manage excess groundwater. Out of 124 non-working tubewells examined, 57 were recommended for revival in areas where groundwater levels are shallow and showing rising trends, with the objective of reducing water logging through sustainable groundwater pumping and utilization.

S. No. 1 2

MUMBAI

1. **Analysis on Population vs Ground Water Resources Assessment (GWRA):** For Mumbai City is being carried out from the assessment years 2024 and 2025 on yearly basis covering Mumbai and the talukas of Andheri, Kurla, and Borivali in Mumbai Suburban. In the assessment process, of all methods (Population, Power consumption etc.) the Groundwater extraction component has been assessed using the Unit Draft Method based on the number of groundwater abstraction structures.
   Since, only 2 years GWRA is available, therefore clearer trend with population may emerge through upcoming assessments.

2. **GWRA**: The results of the Ground Water Resources Assessment for the years 2024 and 2025 are summarized below:

S. No.	Assessment year	Name of District	Total Annual Ground Water Recharge (Ham)	Annual Extractable Ground Water Resource (Ham)	Total Extraction (Ham)				Stage of Ground Water Extraction (%)
					Irrigation	Industrial	Domestic	Total	
1	2024	Mumbai	1555.42	1477.65	0	60.77	619.37	680.14	46.03
2		Mumbai sub.	7153.36	6795.68	0	82.27	1787.66	1869.91	27.52
		Total	**8708.78**	**8273.33**	**0**	**143.04**	**2407.03**	**2550.05**	
1	2025	Mumbai	1555.42	1477.65	0	60.77	619.37	680.14	46.03
2		Mumbai sub.	7836.16	7263.56	0	82.27	1787.66	1869.91	25.74
		Total	**9391.58**	**8741.21**	**0**	**143.04**	**2407.03**	**2550.05**	

**** Source: - GWRA-2026, INGRES portal***

Above table reveals that ~ 25.5 MCM (million cubic meter) ground water has been calculated to be extracted to fulfill Industrial and domestic need during the year 2025.

3. **Hydrograph analysis**: As per the NAQUIM2.0 report for the said districts, analysis of groundwater level trends (2014 to 2023) analysed for 19 monitoring stations indicates a rising trend in only one well during the pre-monsoon period, whereas 17 wells exhibit rising trends during the post-monsoon period.
   **** Source: - NAQUIM2.0 Report, Mumbai & Mumbai Suburban (2025***

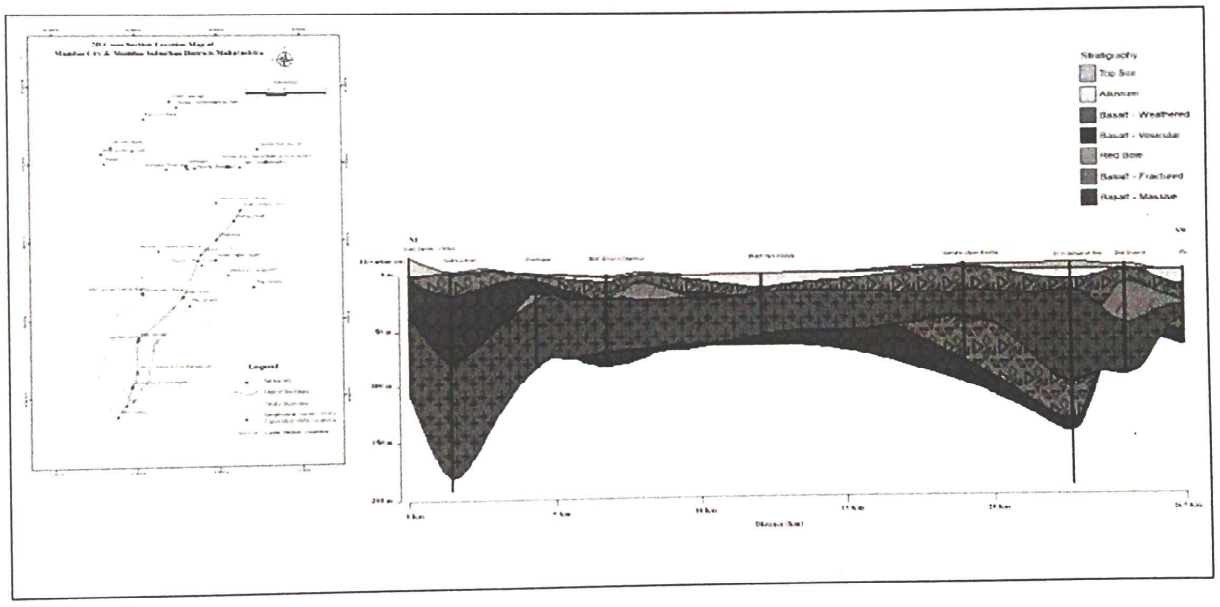
4. **Source of water Supply: The surface water as** drinking water for Mumbai is sourced from seven impounded reservoir and supplied after treatment. The supply sources are given in the table below.

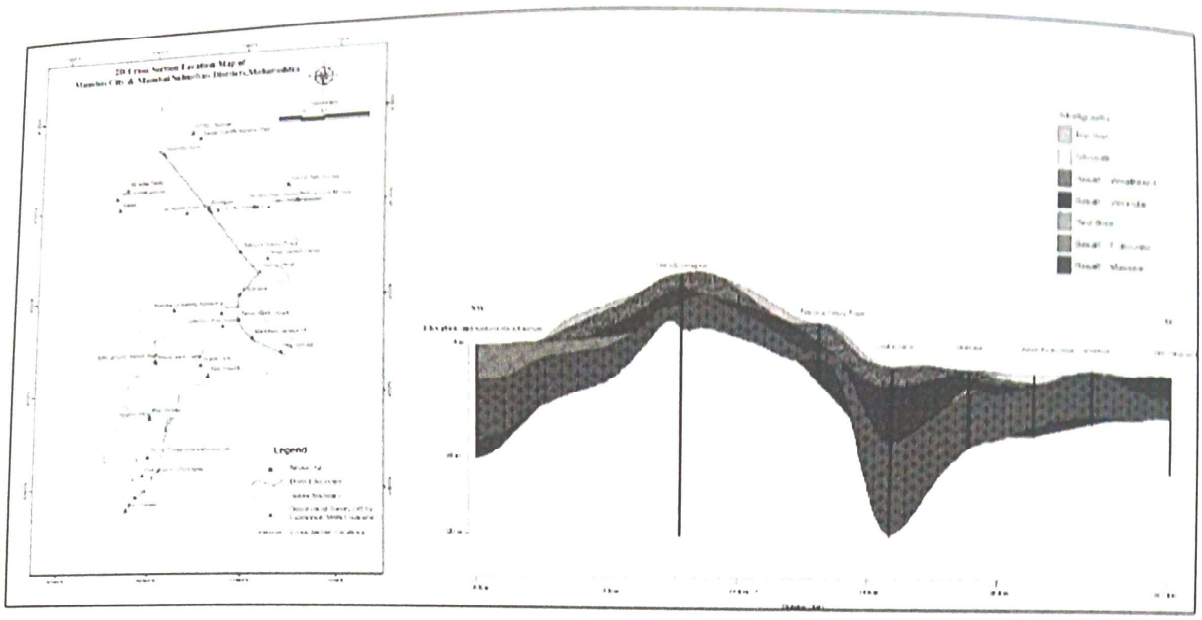
(13)

S. No.	Source	Yield in MLD*	Distance from City	Treatment Plant
1	**Tulsi lake**	14	City Limit	Tulsi
2	**Vihar lake**	100	City Limit	Vihar
3	**Tansa lake**	448	100 km from City	Bhandup Complex
4	**Modak Sagar**	1769	100 km from City	Bhandup Complex
5	**Upper Vaitarna Middle Vaitarna**		173 km from City	Bhandup Complex
6	**Bhatsa Dam**	2039	100 km from City	Bhandup Complex and Panjarapur
Subtotal		4370	-	-	
Enroute + Losses		-395	-	-	
Total Supply to City		**3975**	-	-	

**** Source: - NAQUIM2.0 Report, Mumbai & Mumbai Suburban (2025)***

5. **Local Hydrogeology and Fence diagram:** Mumbai city is predominantly a hard rock area underlain by the **Deccan trap basalt** of Upper Cretaceous to Lower Eocene age consisting of massive and vesicular basalt with occasional intetrappean beds. The occurrence of these layers is shown in cross sections below:





** Source: - NAQUIM2.0 Report, Mumbai & Mumbai Suburban (2025)*

The groundwater occurs mainly in fractures, joints etc. within basalt under unconfined and semiconfined conditions. A Total of 09 (nine) Exploratory drilling wells revel that the thickness of weathered zone is down to ~25 m bgl. The discharge of the wells varied from 0.037 to 13 lps (Sambhaji Raje Park, Mulund East).

**LPS: (Litre per second)*

From the NAQUIM2.0 study, the aquifers are classified as shallow and deeper as given below:

Aquifer Group	Depth Range (m bgl)	Lithology	Aquifer Type	Discharge Range (LPS)
Aquifer I (Shallow Aquifer)	0-30	Basalt (weathered & shallow fractured)	Unconfined to semi-confined	0.037 - 0.43
Aquifer II (Deeper Aquifer)	30-172	Basalt (fractured & jointed)	Semi-confined to confined	0.21 - 13.0

**** Source: - NAQUIM2.0 Report, Mumbai & Mumbai Suburban (2025)***

During pre-monsoon, 2025 water levels measured from 25 monitoring dug well stations varying between 0.21 m and 8.33 m bgl. In 56% of monitoring stations in the said districts, water level shows as shallow than 2 m bgl. During post monsoon period water level, observed from 25 monitoring dug well stations, shown rise water level in ranged from 0.20 to 7.90 m bgl.

(15)

6. **Findings of NAQUIM 2.0 study carried out in Mumbai & Mumbai Suburban (2025):**

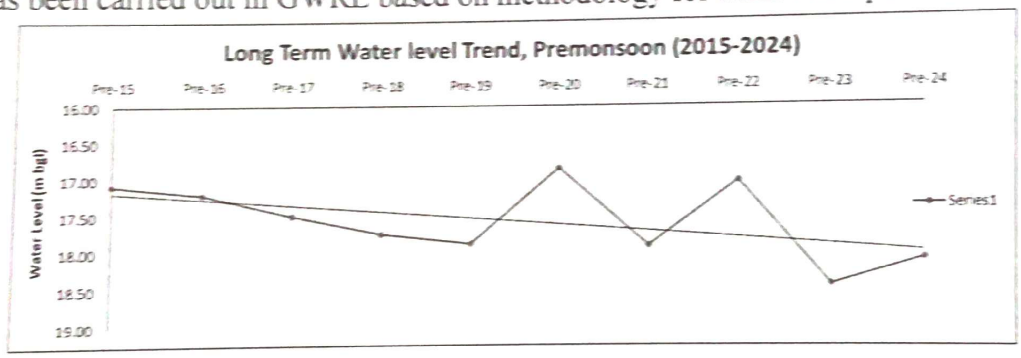
- NAQUIM 2.0 studies conducted over Mumbai City and Mumbai Suburban districts (603 sq. km) revealed that the area is hydrogeologically sensitive due to rapid urbanization, extensive paved surfaces, coastal setting and tidal creek influence, resulting in reduced groundwater recharge and increased runoff/waterlogging.
- The major aquifers comprise weathered, fractured and jointed Deccan Trap basalts and alluvium, with shallow groundwater conditions prevailing in most parts of Mumbai; however, declining groundwater trends are also observed in parts of Mumbai City.
- Groundwater quality is generally within BIS limits and predominantly of Ca–Mg–HCO_3 type, but localized nitrate contamination, high electrical conductivity and saline groundwater were observed in coastal and urban pockets including Fort, Mahim, Shivaji Park and Mulund East.
- NAQUIM2.0 study recommended implementation of rainwater harvesting, recharge wells, conversion of unused dug wells into recharge structures, regulation of groundwater abstraction in saline-prone areas, and continuous groundwater quality monitoring for sustainable groundwater management in Mumbai.

KOLKATA

1. Kolkata is a coastal confined assessment unit with salinity issues and has been categorized as a saline assessment unit under GEC-2015 methodology; therefore, the Dynamic Ground Water Resources of Kolkata City have not been assessed. Consequently, population data has not been computed in the INGRES system.

2. **GWRE of the city, it's stage of Extraction, GW draft, and recharge etc. :** The block of Kolkata Municipal Corporation (KMC) has been flagged as "*Saline*" and groundwater resource assessment of this assessment unit has not be done during 2022, 2023, 2024 and 2025.

3. **Hydrograph analysis of CGWB monitoring wells within the city. Any graphical correlation of DTEL with rise in population of city**
Reply: Long Term Hydrograph analysis for 10 yrs (2015-2024) of monitoring wells within the city is shown in **fig.1**, however, no correlation of DTWL with rise in population of city has been carried out in GWRE based on methodology for confined aquifer of GEC-2015.



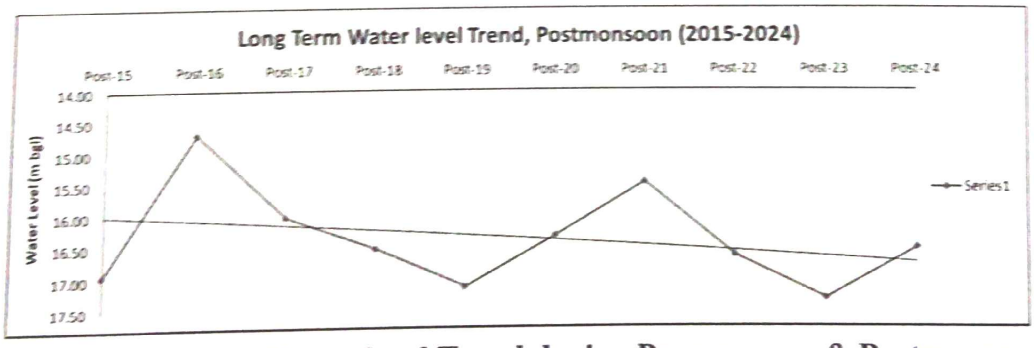


Fig.1: Long Term Water level Trend during Premonsoon & Postmonsoon in KMC

4. **Source of water supply to city, whether Surface water or Ground water; it's location from the city :**The principal source of water supply to Kolkata is surface water drawn from the *Hooghly River*. The water is collected and treated primarily at the Palta Water Works near Barrackpore, *situated about 25–30 km north of the city*. Surface water supply to the Kolkata Municipal Corporation (KMC) area was initially established from the Palta pumping station in 1869 with a supply capacity of about 27 million litres per day. To meet

(17)

increasing urban demand, additional pumping stations were later developed at Garden Reach, Jorabagan, and Watganj. At present, nearly 1412 million litres/day of treated Hooghly River water is supplied within the KMC area (NAQUIM, 2019-2020).

As per Central Ground Water Board survey data up to December 2012, the Kolkata Municipal Corporation operated 264 large-diameter tube wells and about 10,000 hand-pump fitted small tube wells within the KMC area. In addition, around 5,840 private tube wells were operational. Total groundwater withdrawal in Kolkata was estimated at nearly 305.2 million litres per day (MLD), including extraction from municipal, private, and hand-pump tube wells. The withdrawal of ground water by KMC owned tube wells from 1986 to 2021 is as follows (Table-1)

Table – 1: Ground water withdrawal in KMC area

Year	No. of Ground Water Structures (KMC owned)		Total Ground Water Withdrawal (million litres per day)
	Deep Tube Well	Shallow Tube Well (Hand pump fitted)	
1986	232	5000	121.50
1991	285	10500	184.95
1993	308	11877	202.72
1998	325	12000	209.70
2006 onwards	264	10000	144.30

(source: NAQUIM Report- 2019-2020)

5. **Local hydrogeology, any fence diagram ; whether it's a hard rock or soft rock; and impact of groundwater extraction, if any :** Kolkata Municipal Corporation (KMC) area forms part of the lower Gangetic Basin and is underlain by a thick sequence of Quaternary alluvial deposits laid down by the Bhagirathi–Hooghly River system and its tributaries. Therefore, the hydrogeological formation is predominantly *soft rock/alluvial aquifer (soft rock).*

The subsurface geology mainly comprises alternating layers of sand of various grades, silt, clay, gravel, and occasional pebbles deposited in a deltaic environment. In general ground water in KMC area occurs under confined to semi-confined condition. A generalized fence diagram of the area indicates multi-layered aquifer systems with alternating clay aquitards and sandy aquifers extending to considerable depths **(fig.2).** In Kolkata, groundwater is extracted mainly from 1st confined aquifer. Presence of unconfined aquifer is patchy and uneven without regional extension.

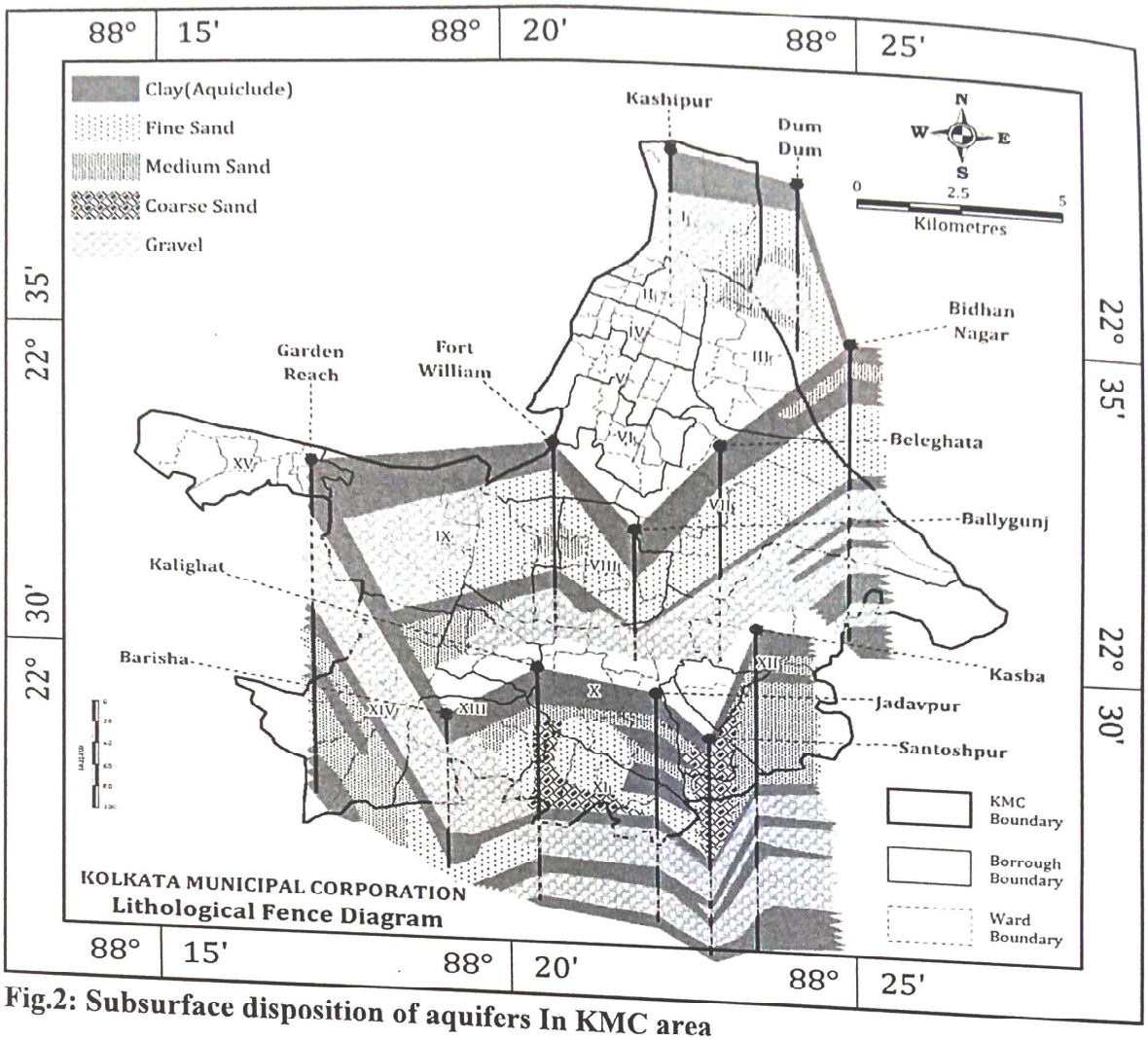


Fig.2: Subsurface disposition of aquifers In KMC area

6. **Findings of NAQUIM study carried out in city :** Findings of the NAQUIM study conducted in Kolkata during the Annual Action Plan (AAP) 2019–20 are summarized below:

- The principal fresh groundwater aquifer occurs within 60–180 m bgl across most parts of Kolkata, while brackish aquifers are present in western sectors such as Garden Reach–Barisha and Kashipur. In Santoshpur, aquifers up to 300 m depth are predominantly brackish.
- Piezometric studies indicate a major groundwater depression trough around Park Street, Rajabazar, and Fort William due to excessive and concentrated groundwater abstraction. Long-term monitoring shows groundwater level decline of about 7–11 m during 1958–2003.

(79)

- Groundwater chemistry is broadly divided into bicarbonate type in western Kolkata and chloride type in eastern Kolkata. Eastern parts show high chloride concentration (280–620 mg/L) and TDS exceeding 1000 mg/L.
- In Tangra–Topsia–Tiljala areas were found to be contaminated with chromium and cobalt from tannery effluents, adversely affecting wetlands and agricultural fields. Sporadic arsenic contamination (0.054–0.71 mg/L) of geogenic origin has also been reported.
- Groundwater in marshy areas such as Ballygunge, Tollygunge, Kasba, Behala, and Garia is hydraulically connected with ponds and drains and is affected by biogenic pollution.
- The study observed localized improvement in groundwater regime in some areas due to reduced abstraction; however, the overall aquifer system remains stressed and requires further reduction in groundwater withdrawal.

7. Apart from NAQUIM study carried during AAP- 2019–2020, two other important studies were carried out by Central Ground Water Board, Eastern Region, in the Kolkata Municipal Corporation (KMC) area:

i. *Micro-level Study of Ground Water Resource Management, Depletion and Pollution in South KMC Area, Kolkata* (AAP-2002–2003)

ii. *Hydrogeology and Ground Water Development and Management in Kolkata Municipal Corporation Area, West Bengal* (AAP-2006–2007)

CHENNAI

1. Analysis with respect to Population of the city and GWRE of over the years : Population growth in Chennai has significantly increased groundwater demand during 2020–2025. The estimated urban population across Chennai firkas reached about 69 lakh in 2025. Highly urbanized firkas such as Ashok Nagar, Purasawalkam, Vepery, Korattur, and Aminjikarai recorded high groundwater extraction due to increased domestic and commercial water demand. The average stage of groundwater extraction in 2025 was about 134.27%, indicating that groundwater withdrawal exceeded annual recharge and many firkas became over-exploited. Rapid urbanization, loss of lakes and wetlands, and increased dependence on borewells further reduced groundwater recharge. Comparison of groundwater assessment data from 2020, 2022, 2024, and 2025 shows a gradual rise in groundwater stress across Chennai, clearly indicating that population growth and urban expansion have contributed to groundwater depletion. Sustainable measures such as rainwater harvesting, artificial recharge, wastewater reuse, and regulation of groundwater extraction are essential for long-term water security.

2. GWRE of the Chennai city, it's stage of Extraction, GW draft, and recharge : The groundwater resource assessments for Chennai from 2020 to 2025 demonstrate a significant expansion in both the scope of monitoring and the volume of extraction. The Total Annual Ground Water Recharge nearly doubled from 5,236.67 ham in 2020 to a peak of 10,586.17 ham in 2022, eventually settling at 9,796.45 ham in 2025. This increase in recharge is primarily attributed to rainfall, which accounted for 7,643.81 ham in the most recent assessment. However, despite the rise in Annual Extractable Ground Water Resources to 8,917.30 ham by 2025, the Current Total Annual Ground Water Extraction remains consistently higher at 10,854.47 ham, driven largely by domestic and industrial consumption (10,685.17 ham) rather than irrigation (169.30 ham).

The data highlights a persistent state of water stress in the region:

- The Stage of Ground Water Extraction has gradually declined from 143.22% in 2020 to 121.72% in 2025, yet it still significantly exceeds the sustainable threshold of 100%.
- The number of Ground Water Assessment Units (Firkas) increased from 30 to 51 in 2023, reflecting a more comprehensive monitoring effort.
- Within these 51 units, 46 are currently classified as Over-Exploited, and 3 are Semi-Critical, bringing the total number of OCS (Over-Exploited, Critical, and Semi-Critical) units to 49.
- Conversely, the number of units categorized as Safe has dwindled from 3 in 2020 to just 2 in 2025.

(21)

Comparison of Previous assessment (2020 TO 2025)

Description	Unit	Ground Water Resource Assessment				
		2020	2022	2023	2024	2025
Total Annual Ground Water Recharge	ham	5236.67	10586.17	10143.65	10217.89	9796.45
a. Recharge from Rainfall	ham	4,492.62	8624.40	7914.34	8083.42	7643.81
b. Recharge from Other Sources	ham	744.05	1961.77	2229.31	2134.47	2152.64
Annual Extractable Ground Water Resources	ham	4717.75	9668.10	9220.55	9296.52	8917.30
Current Total Annual Ground Water Extraction	ham	6756.72	12858.12	11753.26	11609.99	10854.47
a. Current Annual Ground Water Extraction for Irrigation	ham	241.05	258.50	258.50	175.90	169.30
b. & c. Current Annual Ground Water Extraction for Industrial & Current Annual Ground Water Extraction for Domestic	ham	6,515.7	12599.64	11494.76	11434.09	10685.17
Stage of Ground Water Extraction	%	143.22	133.00	127.47	124.89	121.72
Total number of Ground Water Assessment Units (Firka)	Nos.	30	30	51	51	51
a. Number of Over-Exploited Ground Water Assessment Units (Firka)	Nos.	26	26	46	46	46
b. Number of Critical Ground Water Assessment Units (Firka)	Nos.	0	0	0	0	0
c. Number of Semi-Critical Ground Water Assessment Units (Firka)	Nos.	1	3	3	3	3
Total number of OCS Ground Water Assessment Units (Firka)	Nos.	27	29	49	49	49
d. Number of Saline Ground Water Assessment Units (Firka)	Nos.	0	0	0	0	0
e. Number of Safe Ground Water Assessment Units (Firka)	Nos.	3	1	2	2	2

3. Hydrographs of Chennai City

Hydrographs of the CGWB monitoring wells in Chennai were analysed for the 10-year period from 2015 to 2025. A total of 21 monitoring locations, namely Sholavaram, Ponneri, Pallavaram, Maduranthagam, Guduvancherry, Taramani, Padappai, Guindy, Puzhal, Minjur, KK Nagar, Chepauk, Chengalpattu, Besant Nagar, Aminjikarai, Alwarpet, Alamathi, Agaram, Adyar, Acharapakkam and Chitlapakkam, were assessed. The analysis revealed a rising trend in groundwater levels at 11 locations, namely Pallavaram, Maduranthagam, Guindy, Puzhal, Minjur, KK Nagar, Chengalpattu, Aminjikarai, Alwarpet, Alamathi, Agaram and Chitlapakkam. A falling trend in groundwater levels was observed in the remaining 10 locations.

(23)

Ground Water Level Report

Location:Adayar (Part 2)

District :01.Chennai

Well no. :AA 11014

Well type :Dug Well

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	2.25	2.55	2.96	3.2	3.25	3.65	3.55	3.5	3.55	4.05	3.4	0.78
2016	1.81	2.49	2.91	2.95	2.98	2.39	2.55	2.85	2.9	2.33	2.72	2.93
2017	2.44	2.87	2.91	2.95	2.98	3.6	3.88	3.88	3.68	2.35	1	0.51

Ground Water Level Report

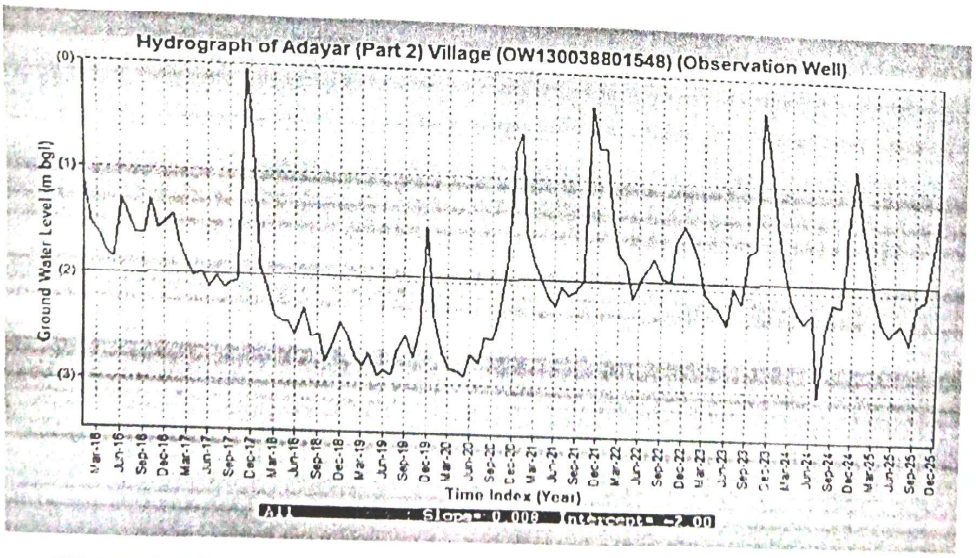
Location:Adayar (Part 2)

District :01.Chennai

Well no. :OW130038801548

Well type :Dug Well

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	1.15	1.52	1.63	1.78	1.85	1.30	1.44	1.62	1.62	1.30	1.56	1.49
2017	1.43	1.69	1.90	2.00	1.96	2.10	2.00	2.10	2.06	2.04	0.04	0.68
2018	1.89	2.09	2.36	2.41	2.43	2.54	2.28	2.56	2.52	2.80	2.64	2.42
2019	2.53	2.75	2.84	2.71	2.92	2.87	2.91	2.67	2.52	2.75	2.43	1.48
2020	2.34	2.70	2.84	2.87	2.91	2.70	2.78	2.52	2.55	2.32	1.79	0.74
2021	0.58	1.52	1.77	1.94	2.10	2.19	2.00	2.09	2.04	1.95	0.30	0.69
2022	0.70	1.36	1.68	1.77	2.10	1.90	1.82	1.72	1.90	1.93	1.56	1.40
2023	1.54	1.70	2.04	2.15	2.18	2.34	1.97	2.13	1.65	1.60	0.30	0.88
2024	1.38	1.74	2.07	2.22	2.30	2.20	3.05	2.38	2.10	2.14	1.45	0.82
2025	1.32	1.70	2.03	2.28	2.42	2.35	2.29	2.49	2.10	2.05	1.59	1.24



(23)

Ground Water Level Report -----4

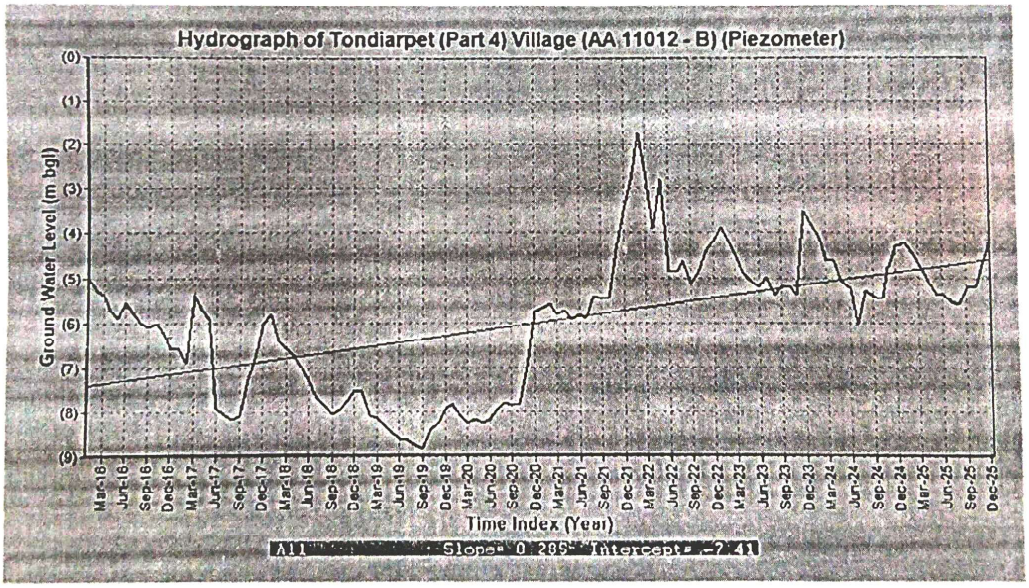
Location:Tondiarpet (Part 4)

District :01.Chennai

Well no.:AA 11012 - B

Well type:Bore Well

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	5.02	5.27	5.37	5.73	5.9	5.55	5.77	6.01	6.09	6.02	6.23	6.58
2017	6.56	6.89	5.37	5.73	5.9	7.93	8.05	8.18	8.1	7.25	6.68	6
2018	5.82	6.4	6.58	6.75	6.98	7.28	7.69	7.86	8.07	7.96	7.74	7.51
2019	7.56	8.1	8.14	8.31	8.45	8.6	8.62	8.74	8.84	8.4	8.26	7.96
2020	7.83	8.1	8.26	8.18	8.27	8.16	7.98	7.79	7.86	7.87	7.02	5.76
2021	5.68	5.57	5.81	5.73	5.92	5.8	5.9	5.4	5.48	5.47	4.39	3.5
2022	2.82	1.73	2.6	3.91	2.8	4.08	4.08	4.6	5.13	4.87	4.42	4.18
2023	3.88	4.2	4.48	4.9	5.07	5.2	4.98	5.38	5.22	5.19	5.37	3.5
2024	3.83	4.11	4.6	4.59	5.1	5.25	6.03	5.3	5.4	5.47	4.75	4.3
2025	4.22	4.45	4.7	5.07	5.38	5.38	5.52	5.58	5.18	5.2	4.70	4.25



(24)

Ground Water Level Report ----2

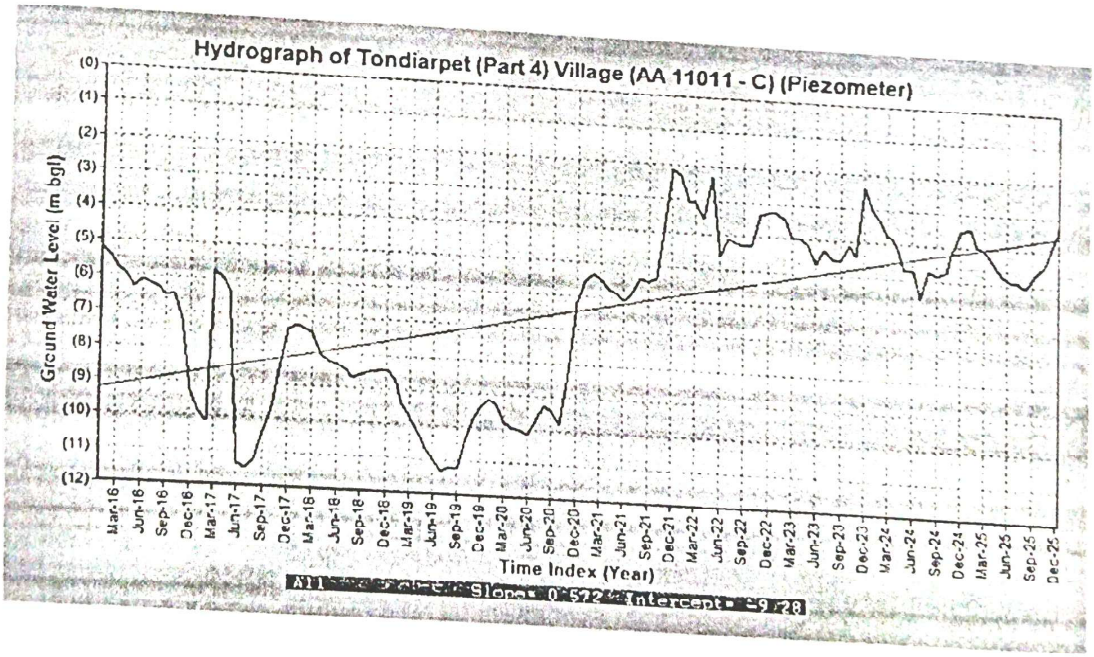
Location: Tondiarpet (Part 4)

District : 01.Chennai

Well no.: AA 11011 - C

Well type:Bore Well

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	5.25	5.45	5.77	5.95	6.3	6.09	6.2	6.32	6.53	6.44	7.2	9.28
2017	9.88	10.15	5.77	5.95	6.3	11.3	11.46	11.23	10.4	9.7	8.35	7.35
2018	7.22	7.34	7.44	8.06	8.24	8.32	8.46	8.68	8.57	8.52	8.48	8.42
2019	8.7	9.41	9.77	10.21	10.66	11.01	11.32	11.2	11.23	10.36	9.75	9.36
2020	9.14	9.33	9.78	9.94	10.01	10.13	9.65	9.28	9.43	9.79	8.28	6.19
2021	5.54	5.32	5.47	5.72	5.88	6.09	5.86	5.41	5.46	5.34	3.73	2.17
2022	2.32	3.05	3.06	3.54	2.3	4.65	4.12	4.2	4.28	4.27	3.35	3.28
2023	3.25	3.46	3.97	4	4.15	4.72	4.31	4.55	4.6	4.1	4.46	2.39
2024	3.02	3.38	3.8	4	4.74	4.75	5.53	4.71	4.85	4.73	4.06	3.53
2025	3.4	3.95	4.06	4.35	4.75	4.9	4.95	5.08	4.67	4.4	3.97	3.32



Ground Water Level Report ----1

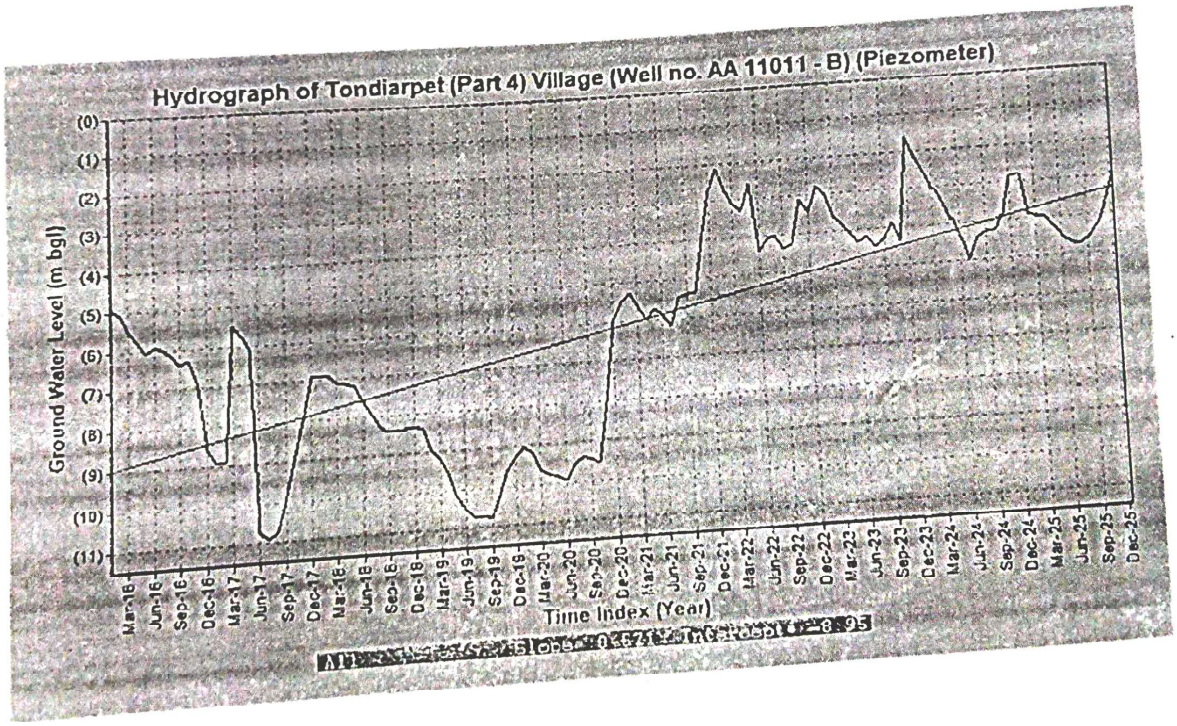
Location: Tondiarpet (Part 4)

Well no. : AA 11011 - B

District : 01.Chennai

Well type :Bore Well

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	4.92	5.07	5.47	5.75	6.07	5.9	6	6.18	6.4	6.3	7	8.59
2017	8.92	8.9	5.47	5.75	6.07	10.73	10.9	10.75	9.83	8.85	7.86	6.9
2018	6.86	6.92	7.09	7.12	7.19	7.62	7.96	8.25	8.42	8.4	8.36	8.32
2019	8.41	8.97	9.16	9.65	10.2	10.5	10.72	10.71	10.77	10.12	9.56	9.25
2020	9.03	9.22	9.66	9.77	9.81	9.92	9.53	9.34	9.41	9.53	8.05	5.96
2021	5.49	5.28	5.59	5.98	5.72	5.86	6.2	5.45	5.4	5.36	3.8	2.72
2022	2.12	2.76	3.1	3.32	2.6	4.42	4.06	4	4.35	4.24	3.1	3.45
2023	2.78	3.02	3.6	3.82	4.04	4.32	4.2	4.48	4.25	3.85	4.38	1.61
2024	2.19	2.6	3.05	3.35	3.88	4.36	4.98	4.39	4.25	4.21	3.85	2.84
2025	2.75	3.86	3.92	3.95	4.27	4.54	4.7	4.73	4.52	4.16	3.69	2.92

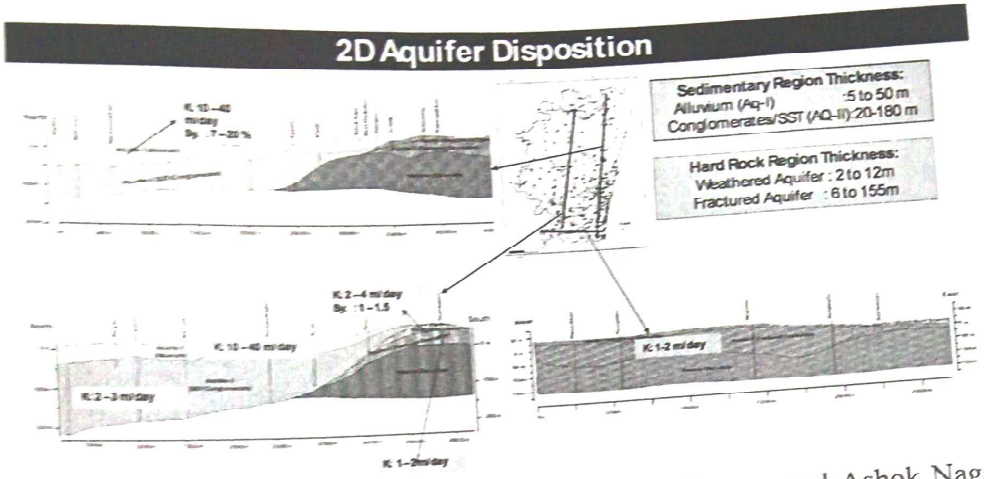


4. Source of water supply to city, whether Surface water or Ground water; it's location from the city : The water supply framework for Chennai City is sustained through a strategic integration of surface water bodies, groundwater well fields, and desalination technology. The primary supply is derived from a network of reservoirs situated between 25 km and 200 km from the city. The details are furnished below;

Surface Water	Groundwater well fields	Desalination
Surface Water Supply: 830 MLD from the following Reservoir 1. **Poondi Reservoir:** Main storage, northwest of Chennai (within 60 kms distance). 2. **Cholavaram Lake & Red Hills Lake:** North/Northwest, about 6 km from city limits. 3. **Chembarambakkam Lake:** West, roughly 25 km from the city. 4. **Veeranam Lake:** Located near Kattumannarkoil, Cuddalore district (over 200 km south). 5. **Krishna River (Telugu Ganga Project):** Water is transported from Srisailam reservoir in Andhra Pradesh, over 400 km away.	Groundwater Supply: 30 MLD Well fields are located in the north/northwest peri-urban areas, including Minjur, Panjetty, Tamaraipakkam, and the Flood Plains within 25 kms distance.	1. Minjur: Located north of the city, Capacity -100 MLD 2. Nemmeli: Located south of the city (along East Coast Road), Capacity – 260 MLD 3. Perur (Upcoming): Located south of the city (along East Coast Road), Capacity – 760 MLD

5. Hydrogeology of Chennai City: Chennai district is underlain by various geological formations from ancient Archaean to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely i) the Archaean crystalline rocks ii) consolidated Gondwana and Tertiary sediments and iii) the Recent Alluvium. The Archaean crystalline rocks of the district comprise chiefly of charnockites, gneisses and the associated basic and ultra-basic intrusives.

The crystalline rocks are weathered and jointed/fractured. The degree and depth of weathering varies from place to place and the thickness of weathered mantle varies from less than a metre to about 12 m in this district. The successful borewells drilled tapping the deeper



fractured aquifers in Saidapet, Adyar, Kasturba Nagar, Gandhinagar and Ashok Nagar revealed the existence of fracturing down to depth of 60 m below ground level.

The Gondwana shales are black to dark grey in colour and are jointed/fractured. They are encountered in a number of boreholes and their thickness varies from 24 m in Kilpauk area through 20 m in Ashok Nagar area to more than 130 m in Koyembedu area. The occurrence of sandstones encountered in some of the boreholes below alluvium in Binny Road, Poes Garden, anna Nagar and Rayapuram areas, which belong to Tertiary group.

Groundwater in Chennai district occurs in all the geological formations viz., the Archaean crystallines, Gondwanas, Tertiaries and alluvium and is developed by means of ring wells, dug wells, filter point wells, bore wells and tube wells. The alluvium covers the major part of the district. The alluvium consists of sand, silts and clays. The thickness of alluvium varies from place to place and a maximum of 28 m is encountered min north Chennai near Perambur. Kilpauk water works area has 24 m thick alluvium.

The yield of the exploratory wells at Kilpauk and Tirumangalam tapping the productive granular zones met within the alluvium is 25 lps and 6 lps for a drawdown of 7.21 and 0.22 m with a specific capacity of 206.35 and 40 lpm/m of drawdown respectively. The yield of borewells tapping the productive granular zones met within the Gondwana sediments were found to range from less than 1 to 4 lps for drawdowns varying between 8 to 9 m. The specific capacity ranged from 8 to 32 lpm/m of drawdown.

In Velacherry area there is a sheet of black clay over crystalline rocks. There are no indications of any prominent lineaments. There are number of bore wells in the city piercing the top 10 to 15

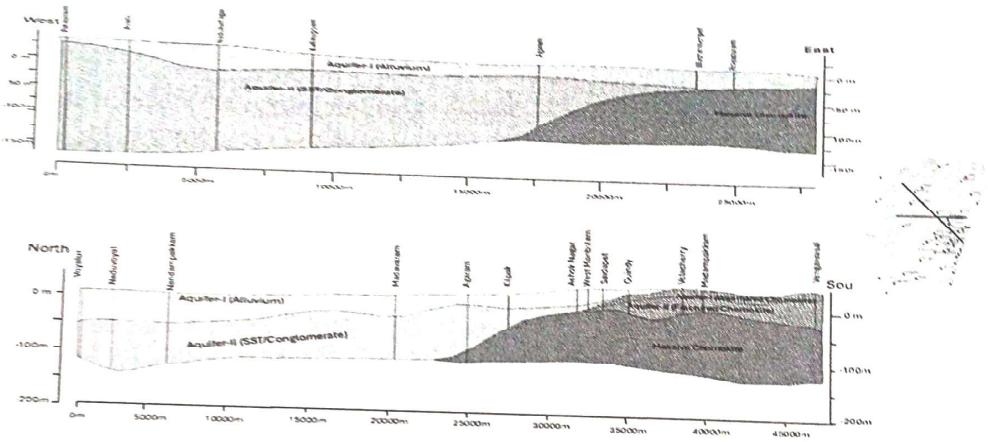
m thick alluvial cover and penetrate the crystalline rocks. The failure of many bore wells in Velacherry area may be due to absence of potential fracture down to 60 m.

6. Key Findings of NAQUIM 2.0 Studies.

Key findings of Aquifer Mapping in the Urban Area (Parts of Chennai Basin, Tamil Nadu)

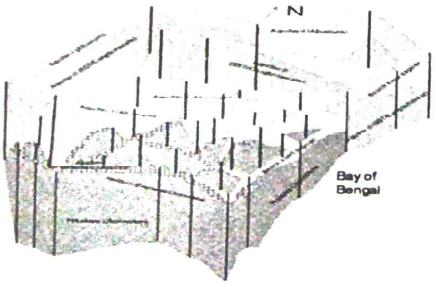
Aquifer disposition: Aquifer I (weathered Charnockite & alluvium) has a thickness of 2–60 m, while Aquifer II (fractured Charnockite & sandstone conglomerate) ranges from <5–150 m; both aquifers show an increase in thickness from south to north of the study area.

Hydraulic characteristics: Aquifer I is highly productive with yield of 68–140 m³/h and transmissivity of 1271–4180 m²/day, whereas Aquifer II has lower discharge of 2–8 m³/h and transmissivity of 1–10 m²/day, indicating comparatively poor groundwater potential.



3D Aquifer Disposition

Key Findings



Hard Rock Area

Type of Aquifer	Formation	Top of the aquifers (mbgl)	Thickness/ occurrence of fractures (m)	Range of Yield (m³/h)	Sustainability (hrs)	Aquifer parameter (Transmissivity = m2/day)	Groundwater quality EC values (µs/cm)	Suitable for Drinking
Aquifer unit - I	Weathered gneiss & Charnockites	GL	8 – 30 (Avg. -18 m)	0.8 -16	Monsoon : 3-4 hrs & non monsoon (May,Jun &July) < 1 to 2 hrs	4 to 32.3	500-790	yes
Aquifer Unit -II	Jointed & Fractured Gneiss/ charnockite	8 to 30	8 -190 (3 to 4 fractures exist)	0.9 -12	for 4-6 hours in monsoon and 1 to 3 hours in non monsoon	3.57 -45.38	320-1060	yes

Sedimentary Rock Area

Type of Aquifer	Formation	Top of the aquifers (mbgl)	THICKness/ occurrence of fiim fractures (m)	Range of Yield (m³/h)	Sustainability (hrs)	Aquifer parameter (Transmissivity = m2/day)	Groundwat er quality EC values (µs/cm)	Suitable for Drinking
Aquifer unit - I	Alluvium Laterites	GL	1-50	68-140	for 8-12 hours in monsoon and 6-8 hours in non -monsoon	1271-4180	422-1108	Yes, except sea water intruded area (EC- 6800-13k)
Aquifer Unit -II	Tertiary sandstones Gondwanas (Sandstone, Gravels)	1 to 90	8.6-219	2 -6	for 1-2 hours in monsoon and < 1 hours in non - monsoon	2- 10	100-2125	Yes, except sea water intruded area

(29)

- Hydrograph analysis shows Aquifer system gets recharged naturally. Aquifer gets saturated and reaches near ground level during November/December itself. Groundwater head more than 5 m bgl observed in the periphery area of Chennai City.
- Sea water intrusion is observed in parts of southern and northern part of Chennai city i.e. (1). North of Chennai City where the Freshwater–seawater interface extending inland up to 17.3 km at B.N. Kandigai (EC: 11,800 µS/cm; Sr: 7.799 mg/l), (2) Southern part of the Chennai city in Uthandi area where the Freshwater–seawater interface extending inland up to a maximum of 1.5 km and area affected by Seawater intrusion: 6.5 Sq.Km. In total 260 sq. km of the Greater Chennai have been zoned as seawater intruded.
- In Chennai City, the Built-up area occupies the largest share, covering 374.83 sq. km (84%) out of 446 sq. km. Most of the city are prone to water logging during monsoon
- An area of 365 Sq. Km has been identified as Potential Recharge Area,

The Government of India has undertaken several initiatives for groundwater recharge and sustainable water management through various schemes and community participation. Under the Ministry of Jal Shakti, Jal Shakti Abhiyan, launched in 2019 and continued as "Catch the Rain", promotes rainwater harvesting, construction of artificial recharge structures, watershed development, renovation of traditional water bodies, afforestation, and reuse of water across rural and urban areas. The Atal Bhujal Yojana is being implemented in water-stressed areas of seven States with focus on community-led groundwater management, preparation of Water Security Plans, demand-side interventions, and groundwater recharge measures through convergence with existing schemes. Further, under Pradhan Mantri Krishi Sinchayee Yojana and MGNREGA, large numbers of check dams, farm ponds, percolation tanks, recharge pits, contour bunds and water harvesting structures are being created to enhance groundwater recharge and improve water-use efficiency. The Government has also launched the Amrit Sarovar Mission for rejuvenation and development of water bodies across districts, thereby augmenting local groundwater resources. In addition, the Central Ground Water Board has prepared Aquifer

30

Management Plans and recommends construction of artificial recharge structures in various States to improve groundwater sustainability.

"Jal Sanchay Jan Bhagidari" is a nationwide water conservation initiative launched by the Government of India with the objective of promoting community participation in rainwater harvesting, groundwater recharge, and sustainable water management. The campaign emphasizes "Jan Bhagidari" as a key component for ensuring long-term water security across rural and urban areas. Under the initiative, activities such as construction and rejuvenation of ponds, check dams, recharge pits, traditional water bodies, rooftop rainwater harvesting systems, and desilting of tanks are undertaken with active involvement of local communities, Panchayati Raj Institutions, NGOs, educational institutions, and various stakeholders. The initiative also focuses on awareness generation through mass campaigns, shramdaan activities, and public outreach programmes to create a sense of ownership among citizens towards conservation of water resources and enhancement of groundwater recharge.