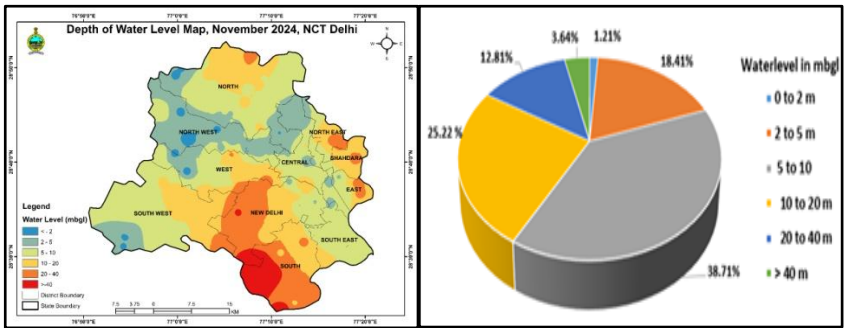
GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
CENTRAL GROUND WATER BOARD



GROUND WATER LEVEL BULLETIN

NOVEMBER 2024

STATE UNIT OFFICE, NEW DELHI

GROUND WATER LEVEL SCENARIO DURING NOVEMBER – 2024 IN NCT, DELHI HIGHLIGHTING THE FINDINGS, STATUS OF GROUND WATER LEVEL IN DIFFERENT AQUIFERS AND ITS SEASONAL, ANNUAL AND DECADAL COMPARISON

CENTRAL GROUND WATER BOARD
STATE UNIT OFFICE, DELHI

1.0 INTRODUCTION

Ground water is among the Nation's most precious natural resources. Measurements of water levels in wells provide the most fundamental indicator of the status of this resource and are critical to meaningful evaluations of the quantity and quality of groundwater and its interaction with surface water. Water-level measurements are made by Central Ground Water Board four times a year manually but the measurements in November are quite crucial as they provide the overall impact of post monsoon ground water behavior and ground water withdrawal for drinking and domestic purpose which counts nearly 75% of its drinking and domestic demands during this period only. Recently CGWB has installed Automatic Water Level Recorders in selected Piezometers to get the real time water levels of NCT, Delhi.

2.0 STUDY AREA

The State Unit Office of Central Ground Water Board Delhi has jurisdiction over the National Capital Territory (NCT) of Delhi, covering an area of 1483 Sq.km and lies between 28°24'15'' & 28°53'00'' North Latitudes and 76°50'24" & 77°20'30" East Longitudes, covered under Survey of India Topo-sheet Nos. 53D and 53H. The NCT of Delhi is surrounded on three sides by two States, i.e., on North, West and South by Haryana and in the East by Uttar Pradesh. NCT of Delhi is divided into 11 Revenue District and one non-revenue unit along river Yamuna, named as Nazul Land. As per District Census Hand Book, 11 districts of NCT of Delhi are further subdivided into 3 Tehsils for each district and there are total 33 Tehsils, with 112 villages, 110 Census Town and 3 Statutory Towns.

The rock formations exposed in the National Capital Territory of Delhi are mainly quartzite of Alwar series of the Delhi Super group that are inter-bedded with thin micaceous schist bands. Proterozoic rocks occur along the ridge, extending from Harchandpur (Haryana) in the South to Wazirabad (Delhi) in the North. Quaternary sediments directly overlie the Proterozoic rocks.

The Delhi Quartzite ridge acts as the recharge zone. The Quaternary deposits in the form of aeolian and alluvial deposits constitute the major repository of ground water in the area. In the East of the ridge, the thickness of unconsolidated sediments gradually increases away from theridge, with the maximum reported thickness being 170 m.

3.0 BEHAVIOUR OF WATER LEVEL

In the Southwestern, Western and Northern parts of the area, the thickness of sediments is more than 300 m except at Dhansa where the bedrock has been encountered at 297 m below land surface. In Chhattarpur basin, the maximum thickness of sediments is 116 m. The aeolian deposits are mainly comprised of loam, silty loam and sandy loam. The bedrock is overlain by these deposits. Older alluvial deposits consist mostly of interbedded, lenticular and inter fingering deposits of clay, silt, and sand along with kankar. These deposits overlay the aeolian deposits and are in turn overlain by the newer alluvium, which occurs mostly in the flood plains of river Yamuna (***Figure 1***).

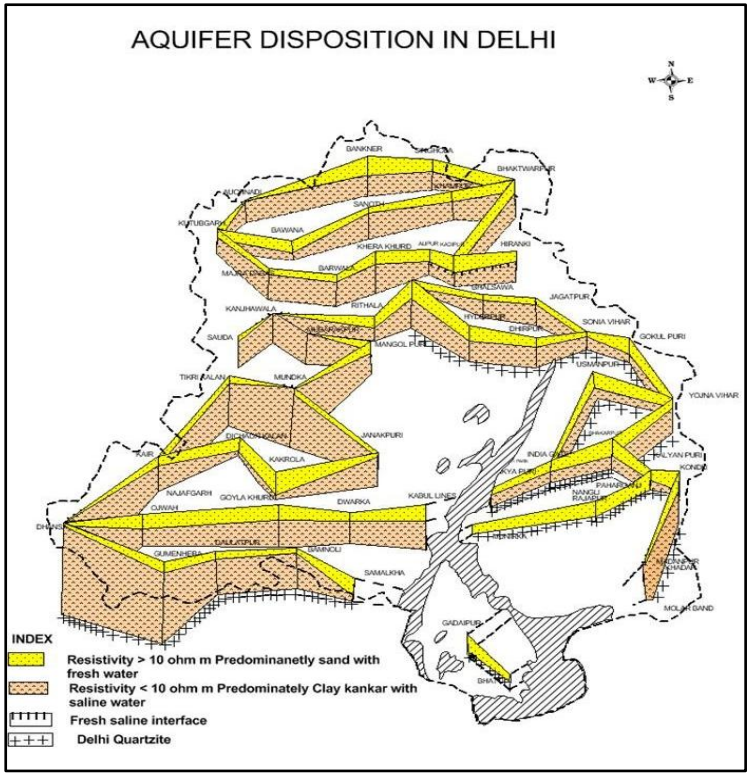


Figure 1 : Panel Diagram showing Aquifer Disposition in NCT of Delhi

To meticulously evaluate the quantitative shifts in groundwater resources, a comprehensive analysis was conducted by comparing water level data from November 2024 with that of May 2024, November 2023, and the decadal mean for November (2014-2023). This comparison enabled the calculation of Seasonal, Annual, and Decadal Mean Water Level Fluctuations. The ensuing discussion elucidates the behavioral dynamics of groundwater levels in November 2024, providing a critical examination of changes relative to the referenced temporal benchmarks.

3.1 RAINFALL

(source: https://mausam.imd.gov.in/newdelhi/mcdata/seasonal_report.pdf)

The rainfall data collected and compiled from monthly weather reports from Indian Meteorological Department were used to analyze the rainfall for the period of June 2024- September 2024. Monsoon withdrew from Delhi on 2nd October 2024 against its normal date of withdrawal 25th September (1971-2019). In the year 2024, the southwest monsoon (SWM) made its onset over Delhi on 28th June, 2024 against its normal onset date of 27th June (1961-2019). In last 124 years, the earliest onset of southwest monsoon was in 2008 when it arrived in Delhi on 15th June and most delayed onset was in 1987 when it arrived on 26th July. In Delhi, seasonal rainfall (June to September) in the monsoon 2024 was in the category of Large excess (departure of 61%) with actual rainfall 1029.9 mm against its normal value (1971-2020) of 640.4 mm. This year, Delhi received 7th highest seasonal rainfall in the monsoon season since 1901.

Table 1: Highest Seasonal Rainfall (June- September) over Delhi in 2024

S. No	Year	Seasonal Rainfall (in mm)
1	1933	1421.6
2	1964	1190.9
3	1975	1155.6
4	2003	1052.8
5	2010	1031.5
6	2021	1169.7
7	2024	1029.9

Table 2: The rainfall recorded during Monsoon season in NCT, Delhi 2024

S. No	Month	Rainfall (in mm)	Normal (1971-2020)	Departure (in %)	No. of Rainy Days (RF >2.4 mm)
1	June	243.3	74.1	228	3
2	July	203.7	209.7	-3	12
3	August	390.3	233.1	67	17
4	September	192.5	123.5	56	08

3.2 DEPTH TO WATER LEVEL: NOVEMBER 2024

The analysis of the water level behavior in November 2024, as illustrated in ***Figure 2***, unveils critical insights into regional hydrological dynamics. The depth to water level map, serving as a pivotal tool in this evaluation, highlights significant variations in groundwater table depths across different locales.

In November 2024, the depth to the water level in Delhi exhibits a significant range, from a mere one meter below ground level in Baprola Dug Well within the Punjab Bagh tehsil in West district to a substantial 68.26 mbgl in Gadaipur Pz in the Mehrauli in South district.

Notably, the areas which are characterized by extremely shallow water levels ranging from 0 to 2 mbgl, observed in 11.03% of monitoring wells, signify localized water logging within 1.21% of the state's area. Similarly, shallow water levels between 2 to 5 mbgl are recorded in 20.59% of wells encompassing 18.41% area across Alipur, Preet Vihar, Patel Nagar, Chanakyapuri, Najafgarh, Kotwali, Nazul land, Kalkaji, SaraswatiVihar, Narela, Civil Lines, Model Town, Rohini, Defence Colony, Punjabi Bagh, and Kanjhawala tehsils.

Depth to water level ranges of 5 to 10 mbgl is exhibited by 33.09% of the monitoring wells. These wells span 38.71% of the total area and are dispersed across Alipur, Chanakyapuri, Kalkaji, Kanjhawala, Kapashera, Kotwali, Mayur Vihar, Najafgarh, Narela, Nazul land, Patel Nagar, Preet Vihar, Punjabi Bagh, Rohini and Seelampur. Moderate water levels, ranging from 10 to 20 mbgl, are observed in approximately 19.12% of wells, spanning 25.22% of the area in Chanakyapuri, Alipur, Delhi Cantonment, Narela, Vivek Vihar, Najafgarh, Dwarka, Patel Nagar, Saket, Vasant Vihar, and Civil Lines. Deep water levels, ranging from 20 to 40 mbgl, are found in 12.50% of wells, covering 12.81% of the area in Patel Nagar, Delhi Cantonment, Yamuna Vihar, Mehrauli, Rajouri Garden, Saket, Shahdara, Patel Nagar, Hauz Khas, and Alipur. Very deep water levels exceeding 40 mbgl occur in 3.68% of the wells and 3.64% of the area, including Delhi Cantonment, Vasant Vihar, Mehrauli, and Kalkaji (***Figure 3, Figure 4, Figure 5 & Table-3)***

Table 3: Number of Wells monitored and Area Covered falling in different Depth to Water Level Ranges (November 2024)

Depth to water level range (mbgl)	Wells Monitored		Area Covered	
	No.	%	Km^2	%
0 to 2	15	11.03	18	1.21
2 to 5	28	20.59	273	18.41
5 to 10	45	33.09	574	38.71
10 to 20	26	19.12	374	25.22
20 to 40	17	12.50	190	12.81
> 40	5	3.68	54	3.64
Total	**136**	**100.00**	**1483**	**100.00**

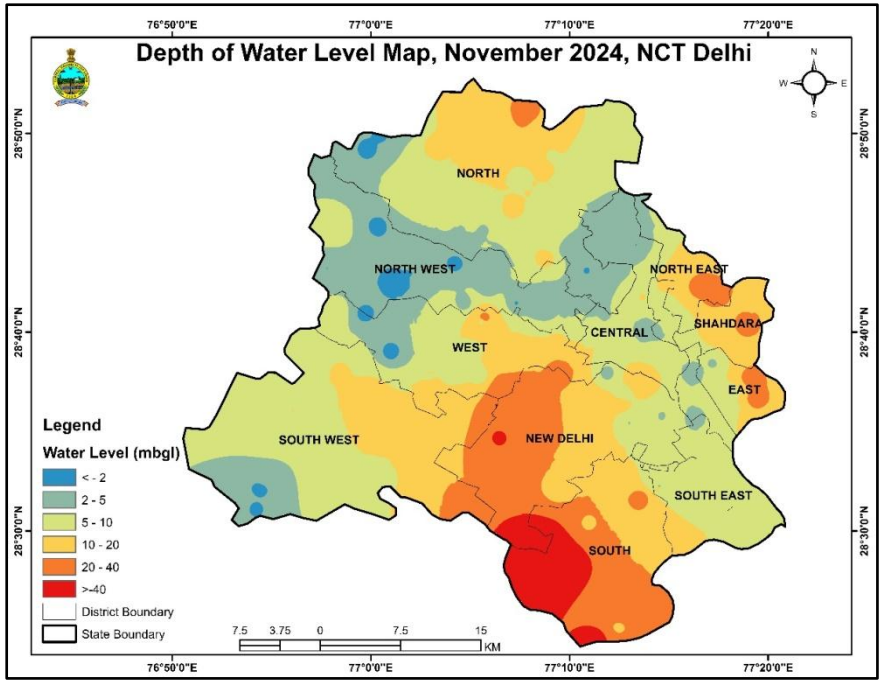


Figure 2 : Depth to Water Level Map, November 2024, NCT Delhi

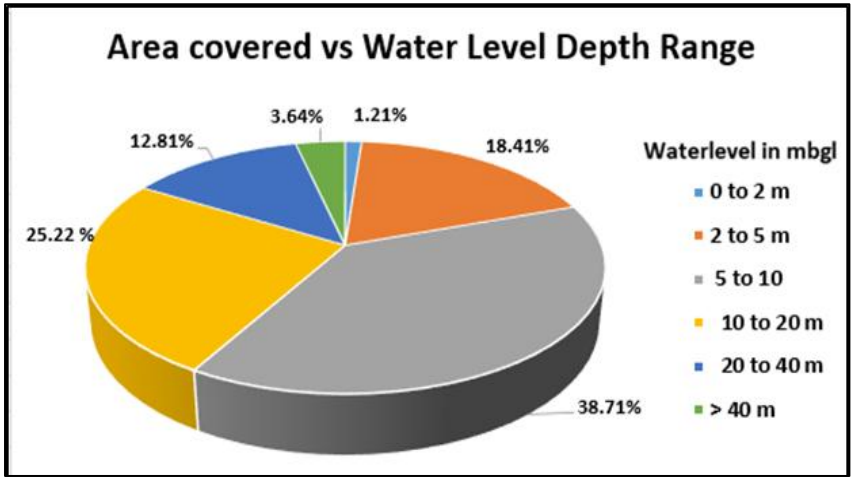


Figure 3: Area Covered Vs Water Level Depth Range (November 2024)

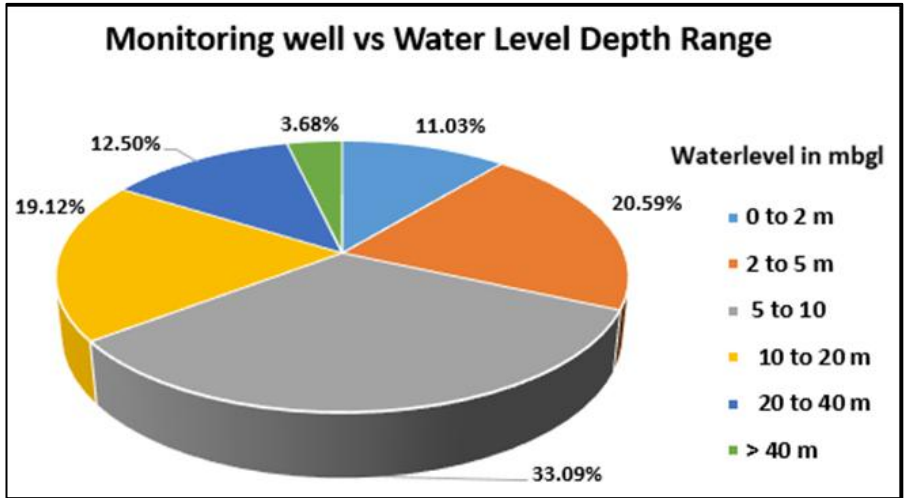


Figure 4 Monitoring Wells Vs Water Level Depth Range (November 2024)

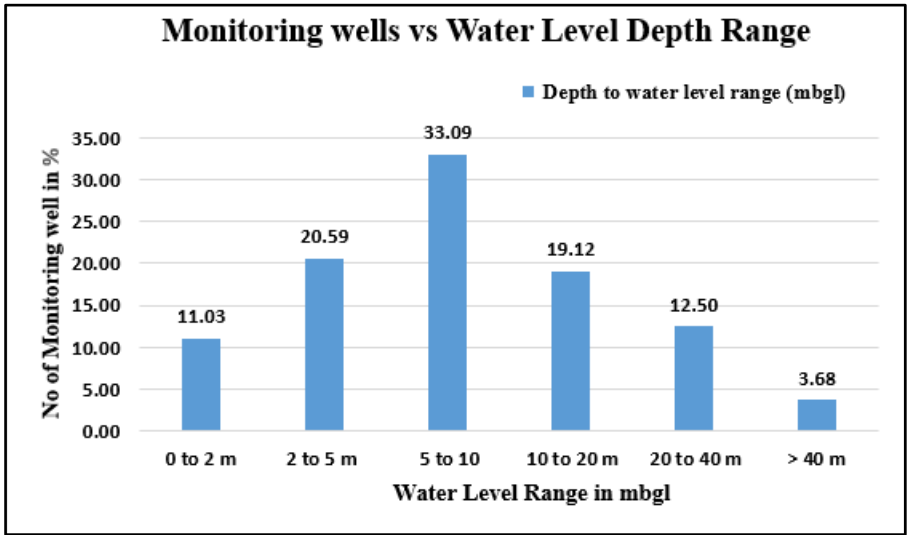


Figure 5: Monitoring Well Vs Water Level Depth Range (November 2024)

3.3 SEASONAL WATER LEVEL FLUCTUATIONS: (MAY 2024 - NOVEMBER 2024)

In November 2024, the ground water depth conditions across Delhi reveal a notable pattern, with the maximum concentration of wells falling within the 2 to 5 meters, 5 to 10 meters and 10 to 20 meters below ground level (bgl) range, totaling 73 % of the monitoring wells. This suggests that the most prevalent groundwater levels are moderately deep. Following this, there is a distribution of wells in the 0 to 2 mbgl, and 20 to 40 mbgl ranges, with the fewest wells recorded in the > 40 mbgl category. This distribution indicates that while some regions have relatively accessible groundwater at moderate depths, extremely deep groundwater is relatively rare.

The predominance of groundwater levels in the 2 to 5 mbgl, 5 to 10 mbgl and 10 to 20 mbgl ranges implies a state of moderate groundwater availability across much of Delhi. However, the decreasing number of wells in both shallower and deeper depth ranges suggests variability in groundwater conditions throughout the city.

Overall, this depth distribution points to a groundwater regime that is under moderate stress. The significant proportion of wells at moderate depths indicates that while groundwater is available, it was not uniformly accessible or abundant. The deeper groundwater levels suggest that the system might be experiencing pressure from high demand or insufficient recharge, contributing to an overall stressed groundwater condition in the region.

The comparative analysis of water level data from November 2024 with the previous measurements recorded in May 2024 elucidates the seasonal fluctuations in groundwater levels. This comparative evaluation, which captures the variability in groundwater levels across different times of the year, is critical for understanding the cyclical behavior of aquifer recharge and depletion (***Figure 6***). The analysis of seasonal fluctuations reveals a predominant decline in groundwater levels across 11.94 % of the monitored wells, encompassing 2.43 % of the state's area. Specifically, a decline is seen around 0 to 2 meter in range, predominantly in isolated patches across the North, East, New Delhi, Shahdara, South, South East, South West, and West regions, including Vivek Vihar, Mayur Vihar, Dwarka, Mehrauli, Preet Vihar, Saket, Delhi Cantonment, Rajouri Garden, Kalkaji, Seelampuri, Alipur, VasantVihar and Nazul Land. (***Figure 7, Figure 8 & Table 9***).

Conversely, water level increases are recorded in 88 % of the wells and 97.57 % of the area, with a rise of 0 - 2 meters noted in 70.90 % of wells and 81.25 % of the area, primarily in Alipur, Chanakyapuri, Civil Lines, Defence Colony, Delhi Cantonment, Dwarka, Hauz Khas, Kanjhawala, Kapashera, Kotwali, Mayur Vihar, Mehrauli, Najafgarh, Narela, Nazul land, Preet Vihar, Punjab Bagh, Rohini, Saraswati Vihar, Vasant Vihar and Yamuna Vihar. Instances of water level rise exceeding 2 meters are observed, with 2 - 4 meters encompassing an area of 11.94% and occurring in 10.79 % of the total monitoring wells. These cover Chanakyapuri, Kalkaji, Kanjhawala, Narela and Punjab Bagh. Greater than 4 meter ranges showing 5.22% occurrences in wells and 5.53% state area is seen in Chanakyapuri, Mehrauli, Vasant Vihar, Rohini, Saket and

Kalkaji of the state.

Table 4: Number of Wells monitored and Area Covered falling in different Water Level Fluctuation Ranges (May 2024 & November 2024)

Water Level Fluctuation Range in meter		Wells Monitored		Area Covered	
		No.	% Age	Km^2	% Age
Decline	0-2	16	11.94	36	2.43
Rise	0 -2	95	70.90	1205	81.25
	2- 4	16	11.94	160	10.79
	> 4	7	5.22	82	5.53
Total		**134**	**100.00**	**1483**	**100.00**

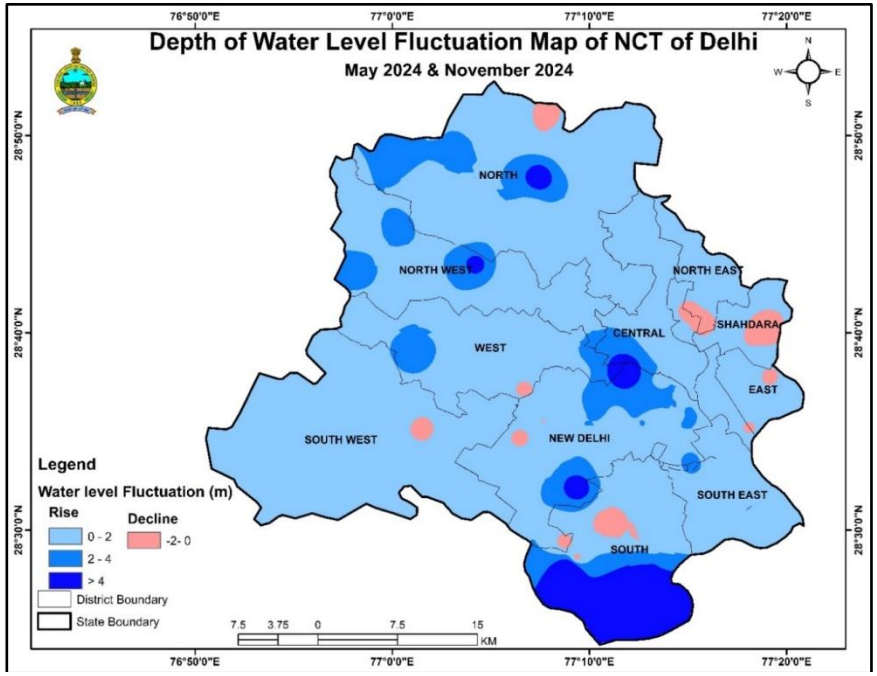


Figure 6: Water Level Fluctuation Map of NCT of Delhi (May 2024 & November 2024)

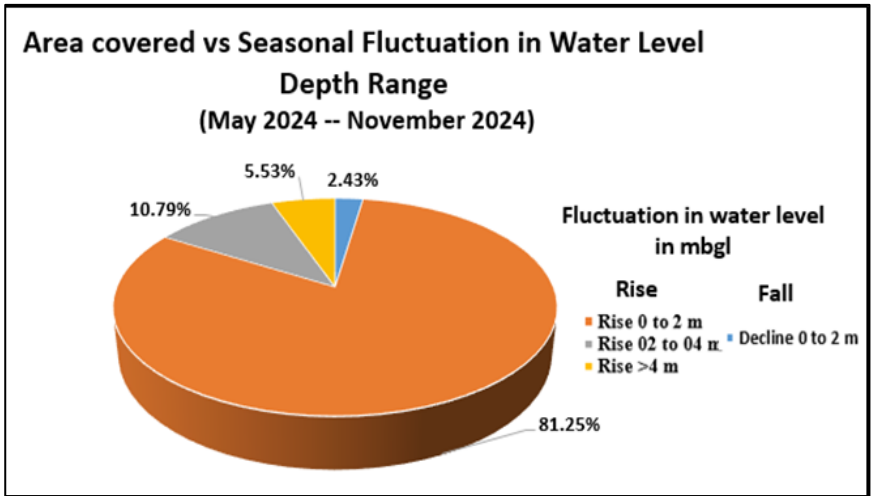


Figure 7: Fluctuations in Water Level by Area (May 2024 Vs November 2024)

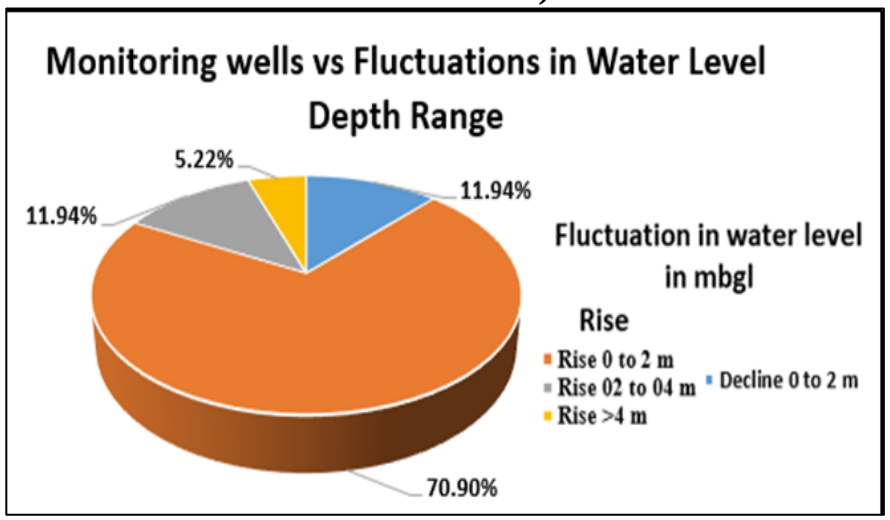


Figure 8: Fluctuation in Water Level May 2024 Vs November 2024

The seasonal water level fluctuation, i.e. the change in the depth to water level of November 2024 with respect to May 2024 reveals the effective rise of groundwater levels owing to the monsoonal season. Number of

wells showing the change in groundwater level in the region over a period from May to November is present below (***Figure 8***).

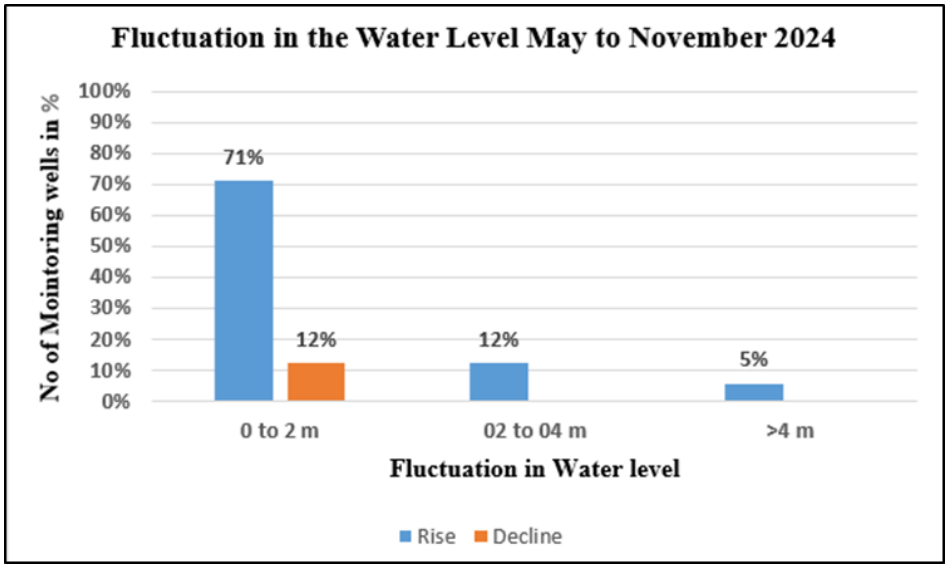


Figure 9 : Fluctuation in Water Level: May 2024 - November 2024

The data indicates a predominantly water logged groundwater system with a general rise in water levels across both shallow and moderate depths. The minimal decline observed in a small percentage of wells suggests overall improvement.

3.4 ANNUAL FLUCTUATIONS: (NOVEMBER 2023 - NOVEMBER 2024)

To assess the effects of rainfall and groundwater extraction over the past year, we computed annual water level fluctuations between November 2023 and November 2024. The resulting behavior is detailed below and illustrated in ***Figure 10***.

The interpretation of the data reveals that water levels declined in approximately 39% of monitored wells, encompassing 25 % of the state's total area. Specifically, a decline of 0-2 meters was noted in 35.2 % of wells, affecting 24.3 % of the area, while a 2-4 meter drop was observed in 1.6 % of wells and 0.7% of the area. More significant declines, exceeding 4 meters, were recorded in 1.6% of wells and 0.2 % area manifesting itself in patches of the state; this indicates excessive stress on the aquifer system.

Conversely, water levels rose in 61% of the wells, covering 75 % of the area. A rise of 0-2 meters was most prevalent, detected in 51.2 % of wells and 65.9 % of the state area, encompassing the tehsil of Kalkaji, Alipur, Chanakyapuri, Civil Lines, Delhi Cantonment, Dwarka, Hauz Khas, Kanjhawala, Kapashera, Kotwali, Mehrauli, Model Town, Najafgarh, Narela, Nazulland, Patel Nagar, Punjabi Bagh, Rohini, Saraswati Vihar, Vasant Viharand Yamuna Vihar. Notably, a 2-4 meter rise occurred in 5.6 % of both wells and 6.1 % area occurring in patches in Chanakyapuri, Yamuna Vihar, Mayur Vihar and Saket. Water levels over 4 meters of rise are observed in 4.8 % of wells and 2.8 % of the surveyed region (***Figure 11 & Figure 12 & Table 5***).

Table 5: Number of Wells monitored and Area Covered falling in different Water Level Fluctuation Ranges (November 2023 & November

Water Level Fluctuation Range in meter		Wells Monitored		Area Covered	
		No.	%	Km^2	%
Decline	0 to 2	44	35.2	360	24.3
	2 to 4	2	1.6	10	0.7
	>4	2	1.6	3	0.2
Rise	0 to 2	64	51.2	978	65.9
	2 to 4	7	5.6	90	6.1
	> 4	6	4.8	42	2.8
Total		**125**	**100**	**1483**	**100**

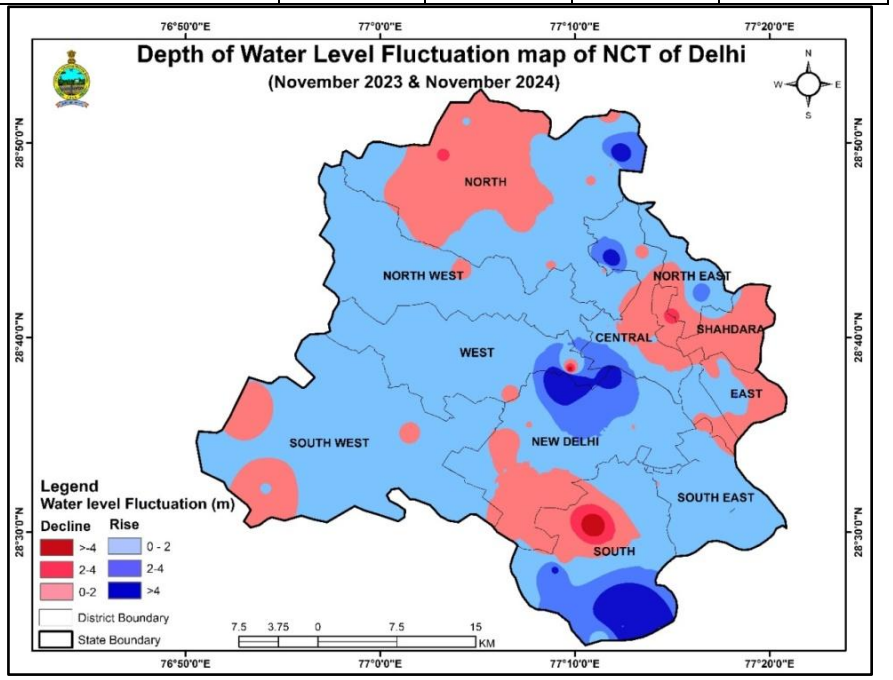


Figure 10 : Depth to Water Level Fluctuation Map of NCT of Delhi (November 2023 & November 2024)

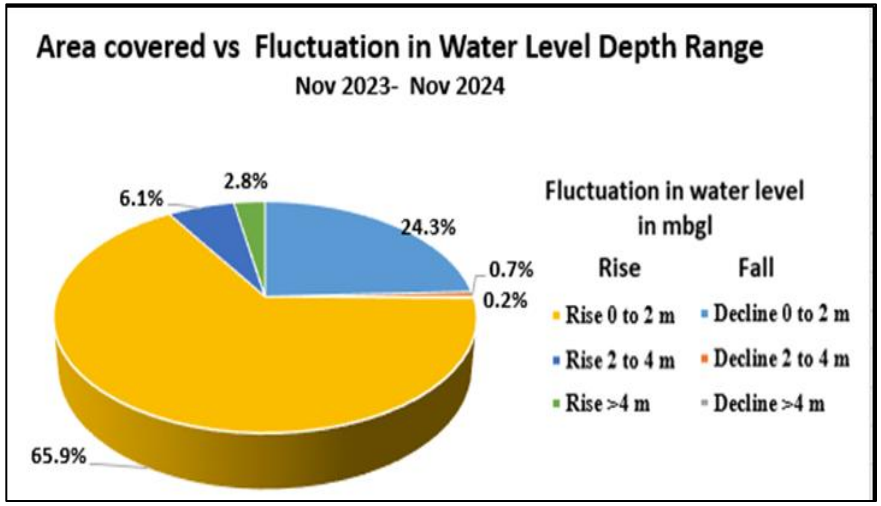


Figure 11 : Fluctuation in Water Level by Area (November 2023 Vs November 2024)

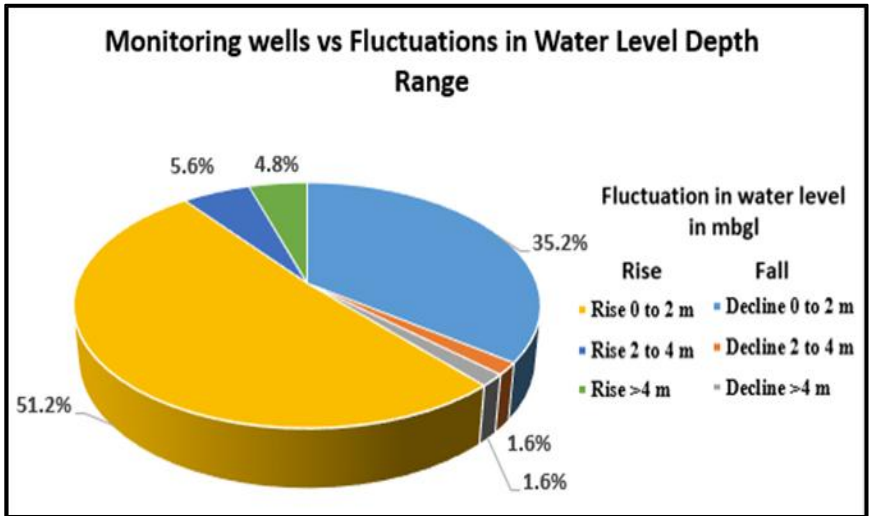


Figure 12 : Fluctuation in Water Level: November 2023 Vs November 2024

The monsoon groundwater regime monitoring highlights significant annual fluctuations across the monitored wells. Notably, a rise in groundwater levels in 0-2 meters range was recorded in 51% of wells, suggesting zones of positive recharge trends. Moderate increases, with 10% of wells experiencing water level rises in the 2-4 meters and > 4 meter indicating areas of effective recharge during the observation period.

Conversely, groundwater level declines present a concerning scenario where, in spite of a substantial rise in the water level during the recharge period, the decline percentage remains 39%. Each of these observations can be spotted in the following graph (***Figure 13***).

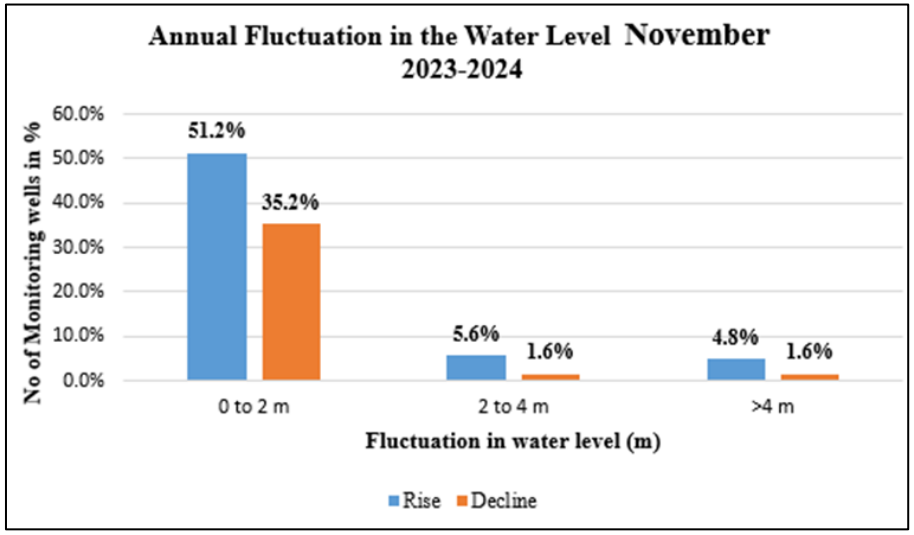


Figure 13 : Fluctuation in Water Level: November 2023- November 2024

3.5 DECADAL MEAN FLUCTUATIONS NOVEMBER (2014-2023) & NOVEMBER 2024

The changes in groundwater level behavior over the last decade have been assessed using decadal mean data. For each groundwater observation well, the mean water level for the period 2014-2023 was computed and compared with the corresponding water level data from November 2024. The observed trends over this period are detailed below, with accompanying ***Figure 14***.

The interpretation of decadal mean fluctuations reveals that 25 % of the wells exhibit a water level decline, impacting approximately 11 % of the state's total area. A decline in the 0 - 2 meter range is noted in 14.43 % of the wells, affecting 8.70% of the state. Additionally, a decline between 2-4 meters has been reported from 6.19% of wells, encompassing 1.82% of the state's area, while more severe declines of over 4 meters were observed in 4.12% of wells and 0.13% of the area, seen in Bank Enclave, Bawana, Bhalaswa Lake, Cbd Shahdara, Chandini Chowk, Chilla Regulator, CVD Depot Cant, Gadaipur, Ghazipur Crossing, Gokulpuri, Haiderpur, Humayun Tomb, ISBT (Kashmiri Gate), Jagatpur, Majnu Ka Tila, Mangolpuri, PUSA, Qatlupur, Qatlupur, Shastri Park, Singhola, Sultanpur, Ushmanpur, Vivek Vihar (***Figure 15 &Figure 16 & Table 6***).

Conversely, a water level rise has been recorded in 75% of wells, covering 89% of the state's area. A small yet significant rise in the 0-2 meter range was observed in 37.11% of wells, spanning 44.64% of the state's area, seen in the form of patches in the Alipur, Civil lines, Defence

Colony, Delhi Cantonment, Dwaraka, Kanjhawala, Kapashera, Najafgarh, Narela, Preet Vihar , Punjabi Bagh, Rajouri Garden, Rohini, Saket, Saraswativ Vihar and Vasant Vihar. Rises of 2-4 meters were noted in 18.56% of wells, covering 31.09% of the state, while more substantial rises of over 4 meters were recorded in 19.59% of wells, affecting 13.62% of the area. These fluctuations provide a detailed view

of the state's groundwater regime, reflecting both areas of depletion and zones of recharge. The above information has been depicted in statistical format in the graphs following (***Figure 17).***

Table 6: Number of Wells monitored and Area Covered falling in different Water Level Fluctuation Ranges (November (2014-'23) & November 2024)

Water Level Fluctuation Range in meter		Wells Monitored		Area Covered	
		No.	% ge	Km2	% Age
Decline	0 to 2	14	14.43%	129	8.70%
	2 to 4	6	6.18%	27	1.82%
	>4	4	4.12%	2	0.13%
Rise	0 to 2	36	37.11%	662	44.64%
	2 to 4	18	18.56%	461	31.09%
	> 4	19	19.59%	202	13.62%
Total		**97**	**100**	**1483**	**100**

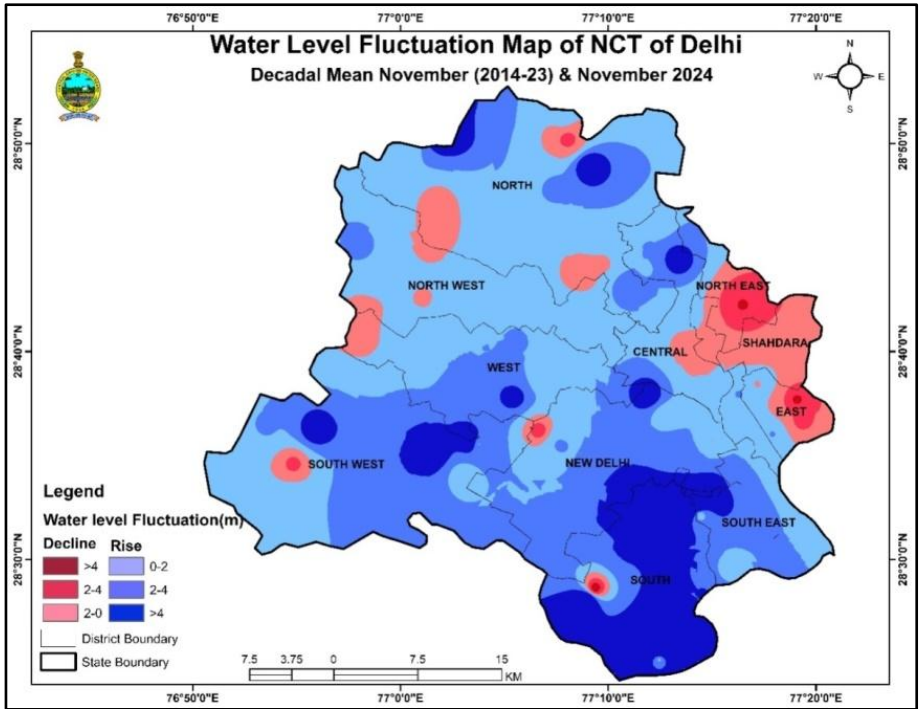


Figure 14 : Water Level Fluctuation Map of NCT of Delhi Decadal Mean November (2014-2023) & November 2024

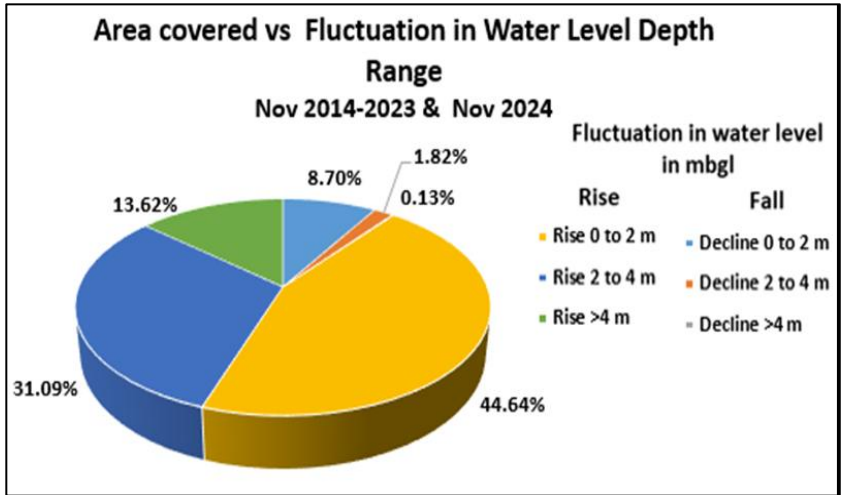


Figure 15 Fluctuation in Water Level by Area (November 2014-2023) Vs November 2024

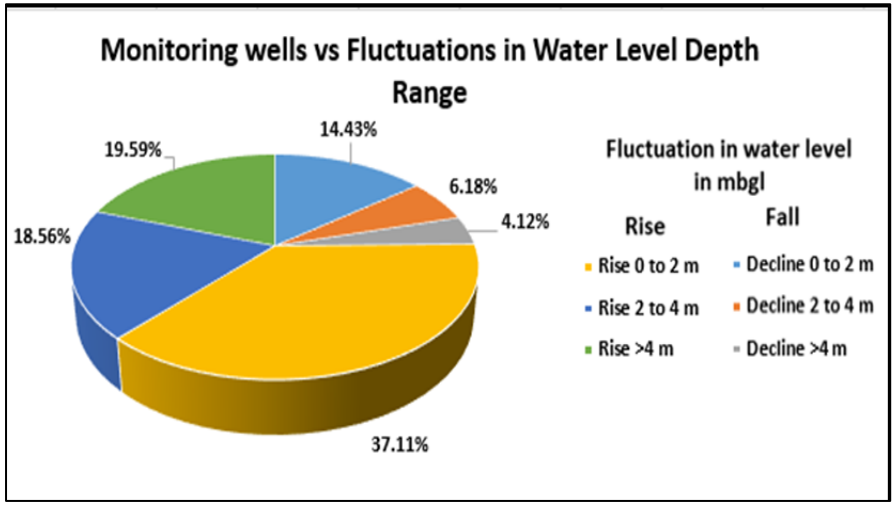


Figure 16 : Fluctuation in Water Level: November 2014- 2023 Vs November 2024

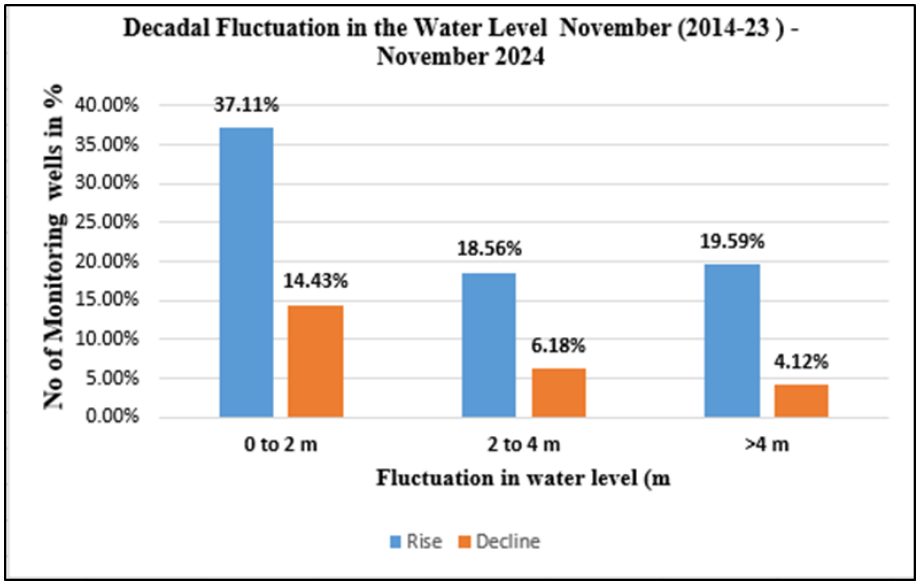


Figure 17: Fluctuations in Water Level: November (2014-2023)- November 2024

4. CONCLUSIONS

The interpretation results shows a New Delhi and South Delhi districts showing deeper water level in post monsoon season also and also getting much recharge form rainfall. Water level fluctuation map of May 2024 vs November 2024 shows that Water level is declining with the fluctuation of 0-2 meter in South East, South West, New Delhi and South Delhi districts. Water level fluctuation map of May 2024 vs November 2024 clearly depict that 2.43 % of the area is showing 0 -2 range of decline in water level. However, in Southern part of North district, Central district and South district water level is shallow and showing rising situation, so in these districts recharge from rainfall and other sources is taking place.

The interpretation of decadal mean fluctuations reveals that New Delhi, South East, South West and South districts shows rise in water level greater than 4 meter. Rather than East, North East, Shahdara, and parts of North West district shows decline in water level in the range of 2 - 4 meter. The 89.4 % area of NCT Delhi is showing rising trend due to strict regulation of CGWA guideline by State Government, Rainfall and intervention for recharging of Ground Water by State Government.