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Government of India
Ministry of Jal Shakti
CENTRAL GROUND WATER BOARD

BULLETIN
ON
BEHAVIOUR OF WATER LEVEL IN NCT, DELHI DURING AUGUST 2024

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STATE UNIT OFFICE, NEW DELHI

BULLETIN
ON
BEHAVIOUR OF WATER LEVEL IN NCT, DELHI DURING AUGUST 2024

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Govt. of India

August 2024

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1. 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 but the measurements in August are quite crucial as they provide the overall impact of rainfall infiltration into ground water system during monsoon season and ground water withdrawal for drinking and domestic purpose which counts nearly 75% of its drinking and domestic demands during this period only.

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 Toposheet 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 across the river. NCT of Delhi is divided in 11 Revenue District and one non-revenue unit along river Yamuna, named as Nazul Land. Each district is headed by District Magistrate and assisted by 1 Additional District Magistrate & 3 Sub Divisional Magistrates. 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.

Three geological rock groups are prevalent in the state viz. Pre-Cambrian, Tertiary and Quaternary. The Quaternary Group comprises of alluvium which occupies 97 % of the area of the State. The Tertiary Group is represented by the outermost zone of the Siwalik System composed mainly of sandstones, clay and boulders. The rocks of Pre-Cambrian Group which form part of the Aravalli Hill Ranges are exposed in Gurgaon, Mewat and Faridabad districts and as small outcrops in other Southern districts. The thickness of alluvium deposits decreases from North to South. The State of Delhi lies in the great Indo-Gangetic Plain. The Quaternary alluvium has been deposited at places on semi-consolidated Tertiary rocks (Siwalik Group) or on a basement of metamorphic and igneous rocks of Precambrian Era. The present and ancient rivers laid down the alluvial sediments since Pleistocene Epoch in the fore deep or a down wrap formed in front of the rising Himalayan ranges and these pediments represent the younger geological formation.

2. BEHAVIOUR OF WATER LEVEL

To meticulously evaluate the quantitative shifts in groundwater resources, a comprehensive analysis was conducted by comparing water level data from August 2024 with that of May 2024, August 2023, and the decadal mean for August (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 August 2024, providing a critical examination of changes relative to the referenced temporal benchmarks.

2.1 DEPTH TO WATER LEVEL: AUGUST 2024

The analysis of the water level behavior in August 2024, as illustrated in ***Figure 1***, 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 August 2024, the depth to the water table in Delhi exhibits a significant range, from a mere 0.21 meters below ground level (bgl) in Rani Khera DW within the Rohini district to a substantial 68.18 meters bgl in Gadaipur Pz in the Mehrauli district. Notably, the districts which are characterized by extremely shallow water levels ranging from 0 to 2 meters bgl, observed in 14% of monitoring wells, signify localized waterlogging within 4% of the state's area. Similarly, shallow water levels between 2 to 5 meters bgl are recorded in 14% of wells encompassing 16% area across Preet Vihar, Chanakyapuri, Najafgarh, Narela, Civil Lines, Model Town, Rohini, Defence Colony, Punjabi Bagh, Nazul Land and Kanjhawala districts. Depth to water level ranges of 5 to 10 meters bgl is exhibited by 31% of the monitoring wells. These wells span 33% of the total area and are dispersed across North, New Delhi, Central, East, Northeast, Southeast, Southwest, and West Delhi, manifesting in patchy distributions in some of these areas. Moderate water levels, ranging from 10 to 20 meters bgl, are observed in approximately 23% of wells, spanning 27% of the area in Chanakyapuri, Alipur, Narela, Vivek Vihar, Mayur Vihar, Najafgarh, Dwarka, Patel Nagar, Saket, Vasant Vihar, and Civil Lines districts, predominantly in the Northeast, Shahdara, East, Northwest, West, North, South, Southeast, and Southwest regions. Deep water levels, ranging from 20 to 40 meters bgl, are found in 14% of wells, covering 16% of the area in Patel Nagar, Delhi Cantonment, Preet Vihar, Yamuna Vihar, Mehrauli, Mayur Vihar, Chanakyapuri, Rajouri Garden, Patel Nagar, Hauz Khas, and Alipur districts. Very deep water levels exceeding 40 meters bgl occur in 4% of the wells and 4% of the area, including Delhi Cantonment, Vasant Vihar, Mehrauli, and Kalkaji (***Figure 2, Figure 3 &Figure 4 & Table 1***).

Table 1: Number of Wells monitored and Area Covered falling in different Depth to Water Level Ranges (August 2024)

Depth to water level range	Wells Monitored		Area Covered	
	No.	%Age	Km^2	%Age
0 to 2m	17	14	50.61	4
2 to 5m	18	14	240.88	16
5 to 10m	39	31	490.88	33
10 to 20m	28	23	405.66	27
20 to 40m	17	14	241.13	16
>40m	5	4	53.84	4
Total	124	100	1483.00	100

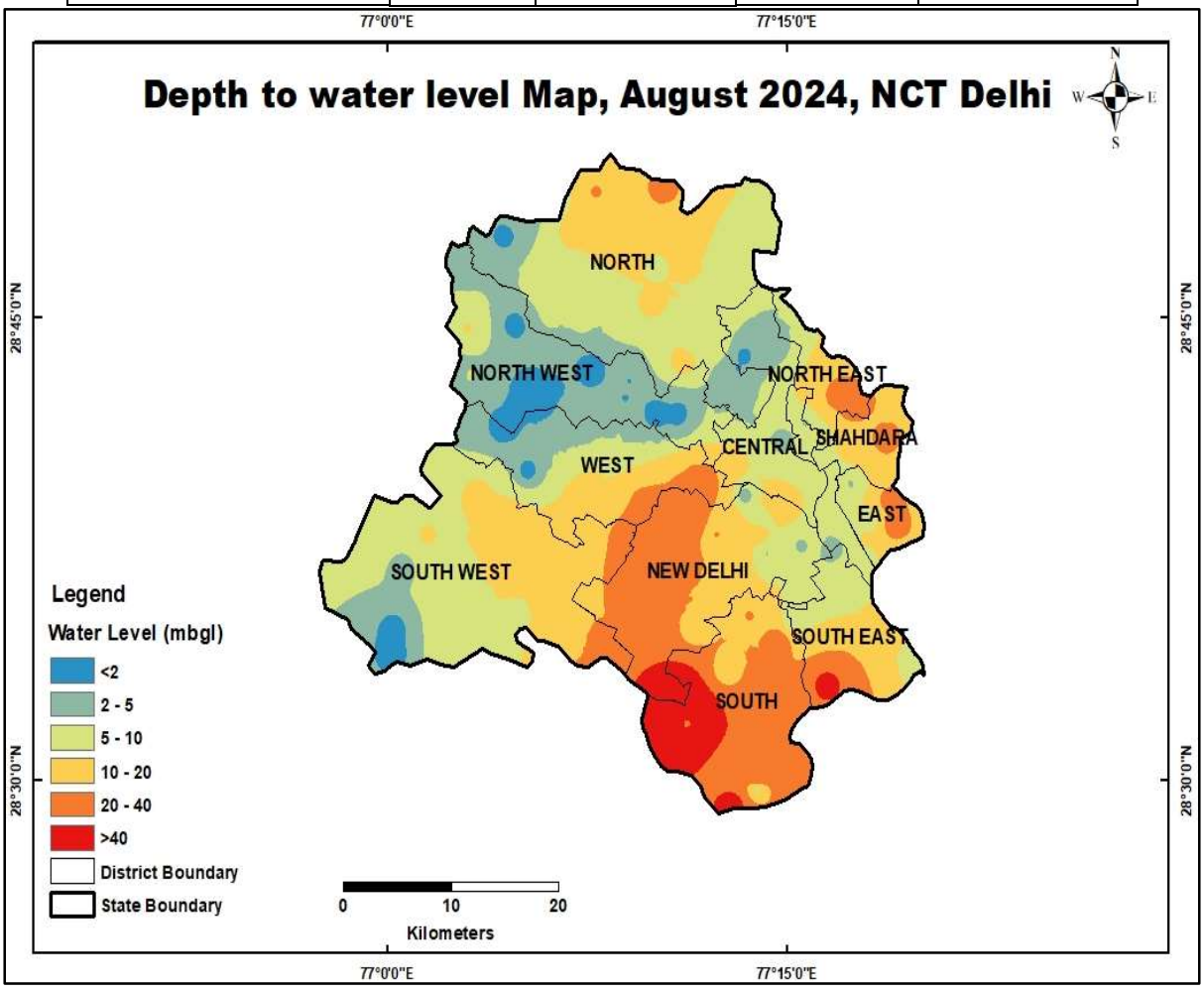

Figure 1: Depth to Water Level Map, August 2024, NCT Delhi

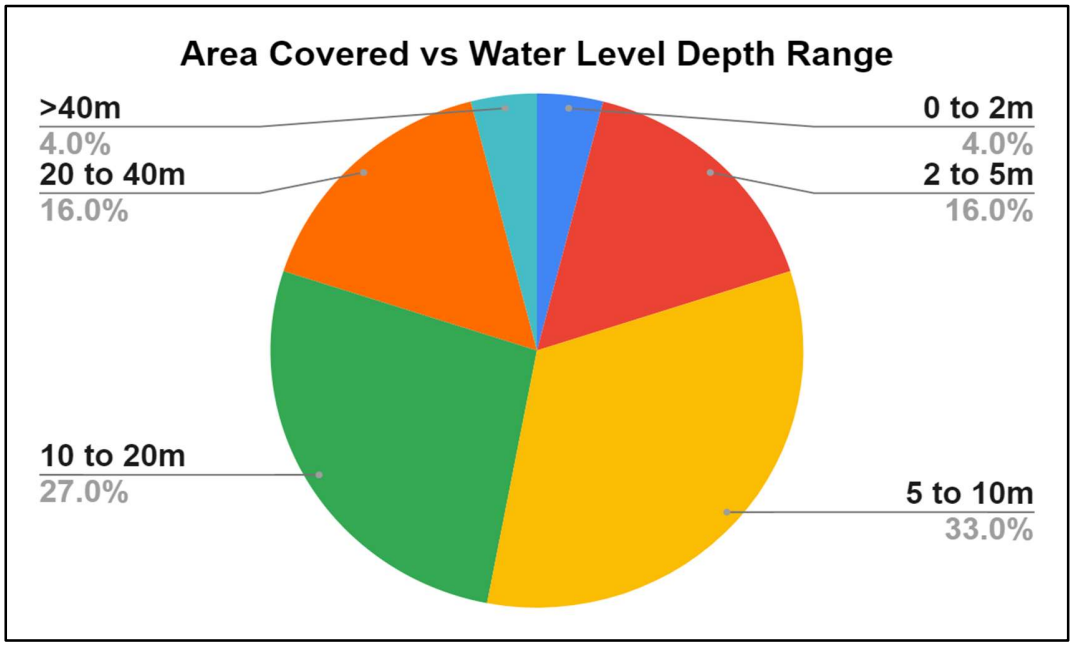

Figure 2: Area Covered Versus Water Level Depth Range (August 2024)

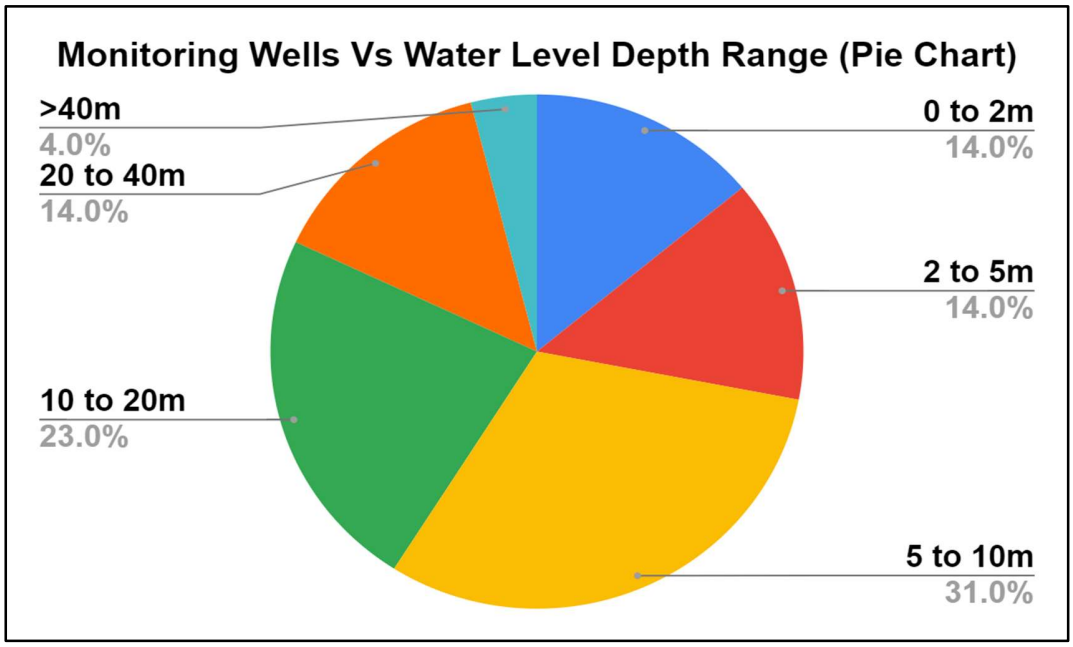

Figure 3: Monitoring Wells Vs Water Level Depth Range (August 2024)

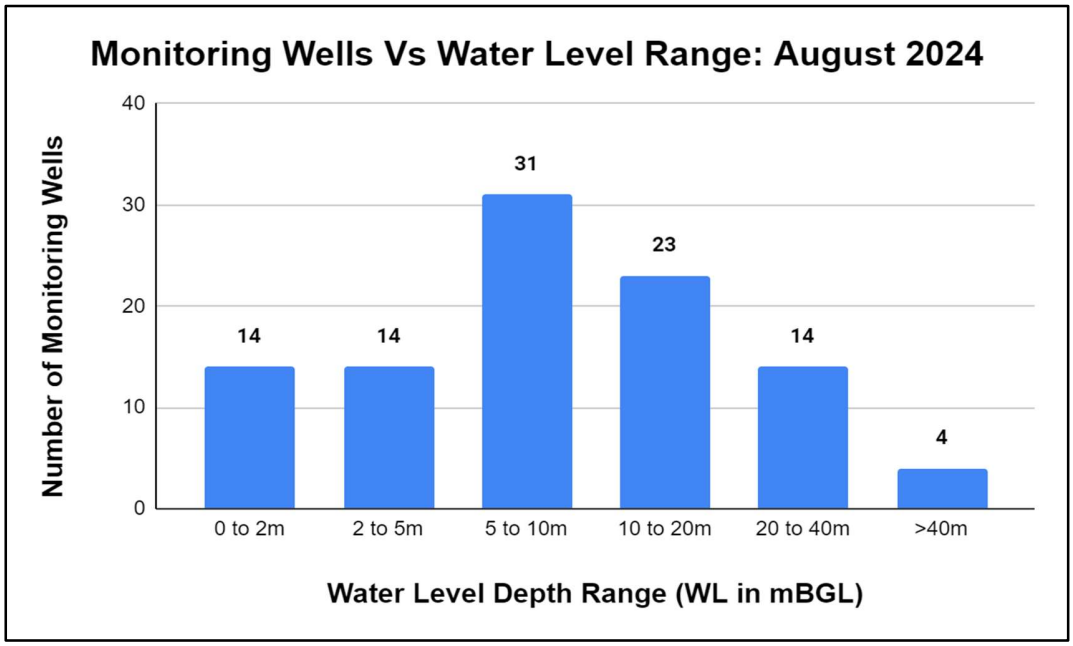

Figure 4: Monitoring Well Vs Water Level Depth Range (August 2024)

In August 2024, the groundwater depth conditions across Delhi reveal a notable pattern, with the maximum concentration of wells falling within the 5 to 10 meters and 10 to 20 meters, below ground level (bgl) range, totalling 54% 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, 2 to 5 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 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.

2.2 SEASONAL WATER LEVEL FLUCTUATIONS: (JANUARY 2024 - AUGUST 2024)

The comparative analysis of water level data from August 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 5***).

The analysis of seasonal fluctuations reveals a predominant decline in groundwater levels across 26% of the monitored wells, encompassing 14% of the state's area. Specifically, a decline in the 0-2 meter range is evident in 22% of the wells and 12% of the area, underscoring significant groundwater stress conditions. Moderate decline, within the 2-4 meter range, is observed in 2% of wells and 1% of the area, predominantly in isolated patches across the North, and West Delhi regions, including Mayur Vihar, and Patel Nagar districts. Notably, 2% of wells or 1% area reports a decline exceeding 4 meters, indicating no severe groundwater depletion (***Figure 6 &Figure 7& Table 2***).

Table 2: Number of Wells monitored and Area Covered falling in different Water Level Fluctuation Ranges (May 2024 & August 2024)

Water Level Fluctuation Range in meter		**Wells Monitored**		**Area Covered**	
		No.	**% Age**	**Km²**	**% Age**
Decline	0-2	24	22	186.20	12
	2-4	2	2	6.28	1
	>4.0	2	2	2.83	1
Rise	0-2	62	51	864.40	58
	2-4	20	16	299.74	20
	>4.0	9	7	123.55	8
Total		122	100	1483.00	100

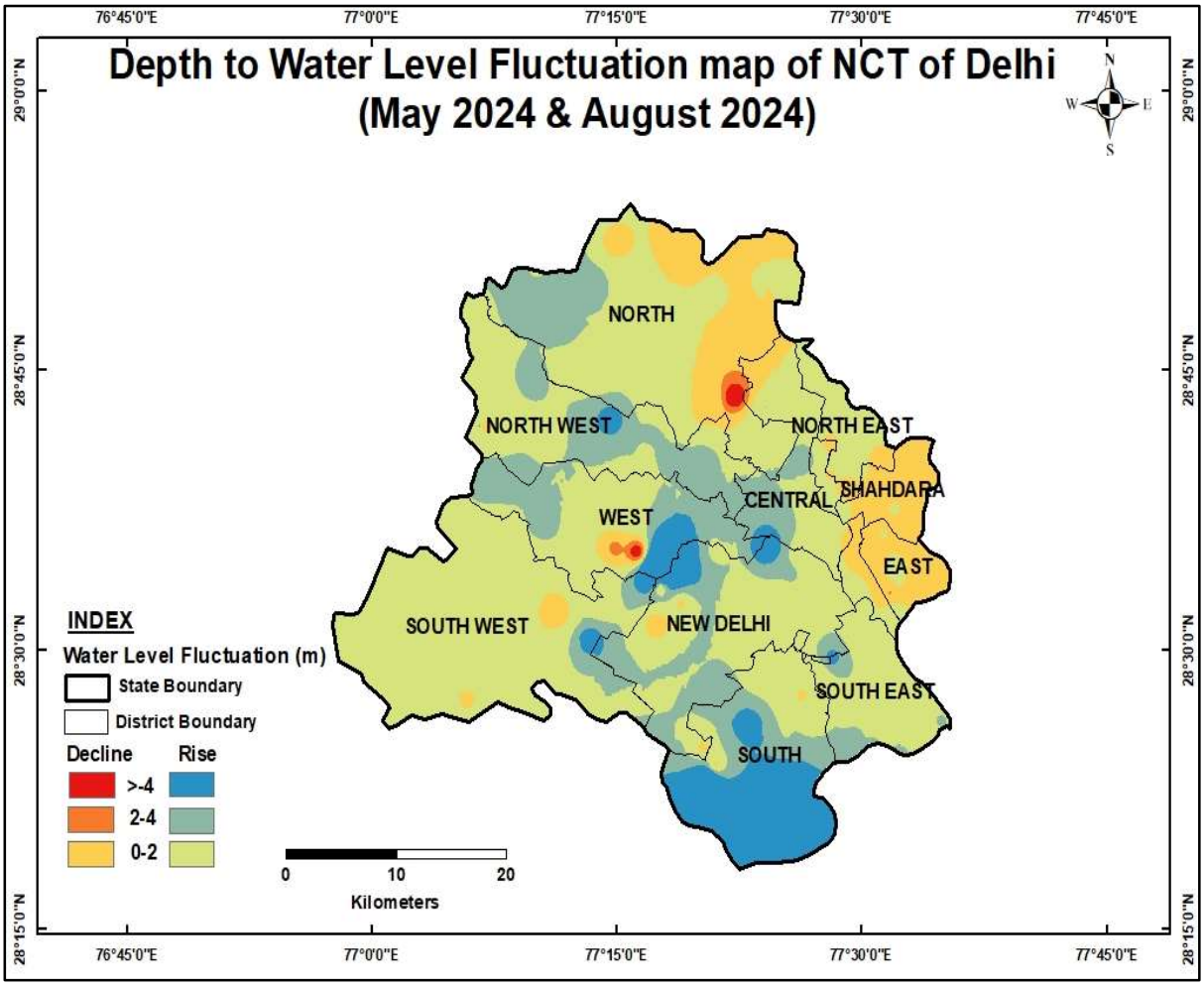

Figure 5: Water Level Fluctuation Map of NCT of Delhi (May 2023 & August 2024)

Conversely, water level increases are recorded in 74% of the wells and 86% of the area, with a rise of 0-2 meters noted in 51% of wells and 58% of the area, primarily in Civil Lines, Chandini Chowk, Chanakyapuri, Narela, Kanjhawala, Rohini, Kalkaji, Kapashera, Najafgarh, Delhi Cantonment, Mayur Vihar, Alipur, Model Town, Narela, Rohini, Shahdara, Hauz Khas, Defence Colony, Dwarka, Patel Nagar and Rajouri Garden districts. Instances of water level rise exceeding 2 meters are observed, with 2-4 meters encompassing an area of 20% and occurring in 16% of the total monitoring wells. These cover districts of North, Northwest, South, Southeast, New Delhi, Central and West Delhi and manifest in patches. Greater than 4 meter ranges showing 7% occurrences in wells and 8% state area is seen in Chanakyapuri, Mehrauli, Rohini, Saket, Kalkaji, Dwarka, and Punjabi Bagh districts of the state.

The seasonal water level fluctuation, i.e. the change in the depth to water level of August 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 August is preset below (***Figure 8***).

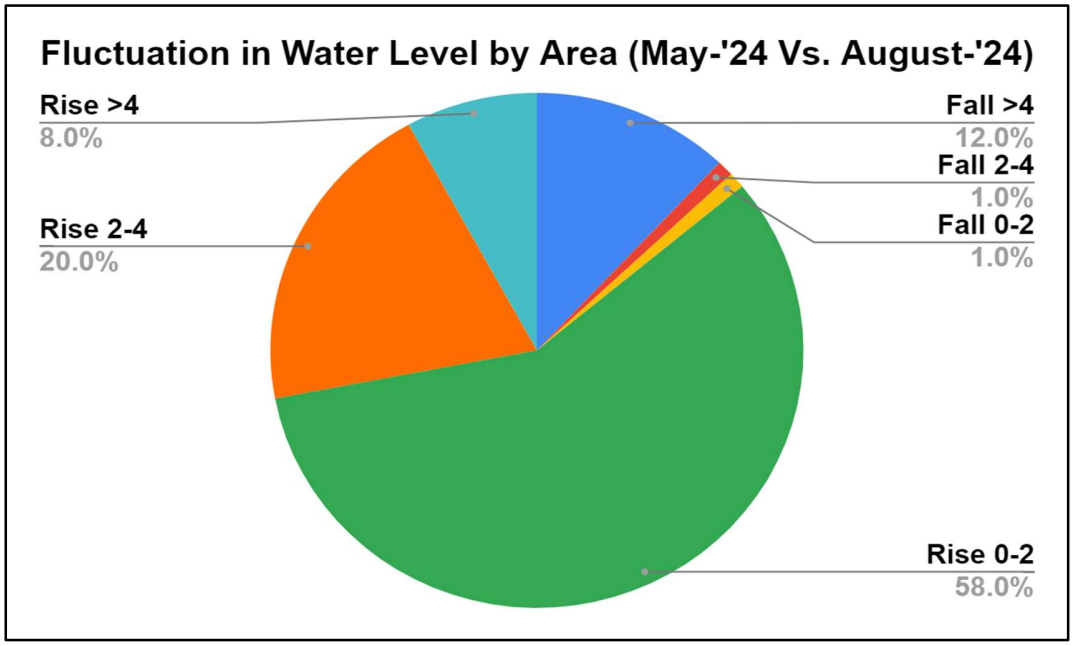

Figure 6: Fluctuations in Water Level by Area (May 2024 Vs August 2024)

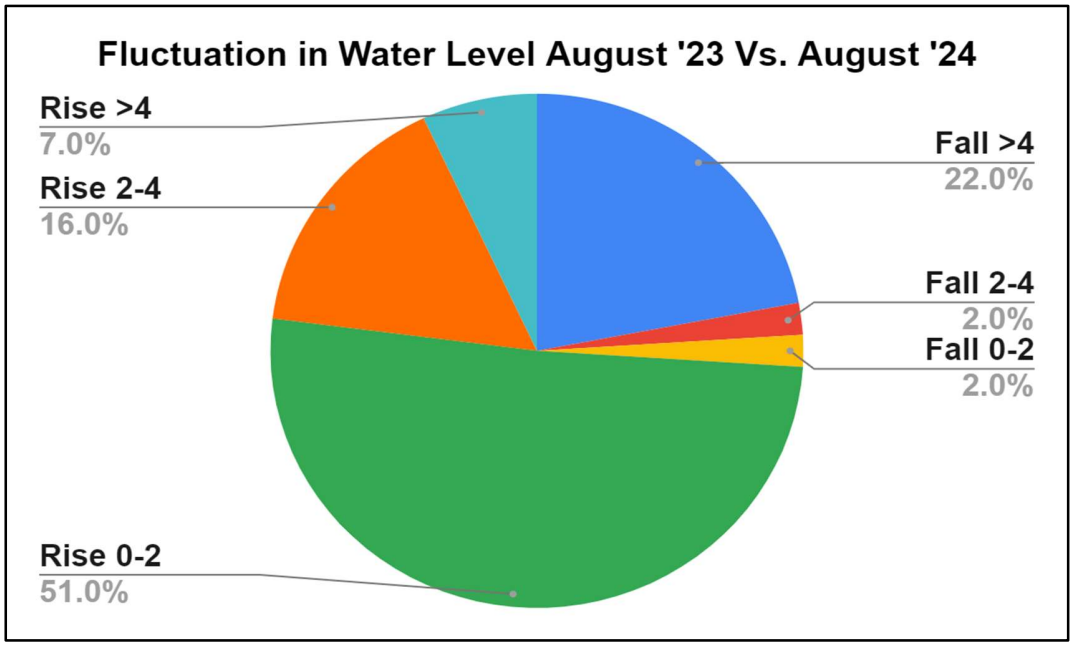

Figure 7: Fluctuation in Water Level May 2024 Vs August 2024

The data indicates a predominantly waterlogged 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.

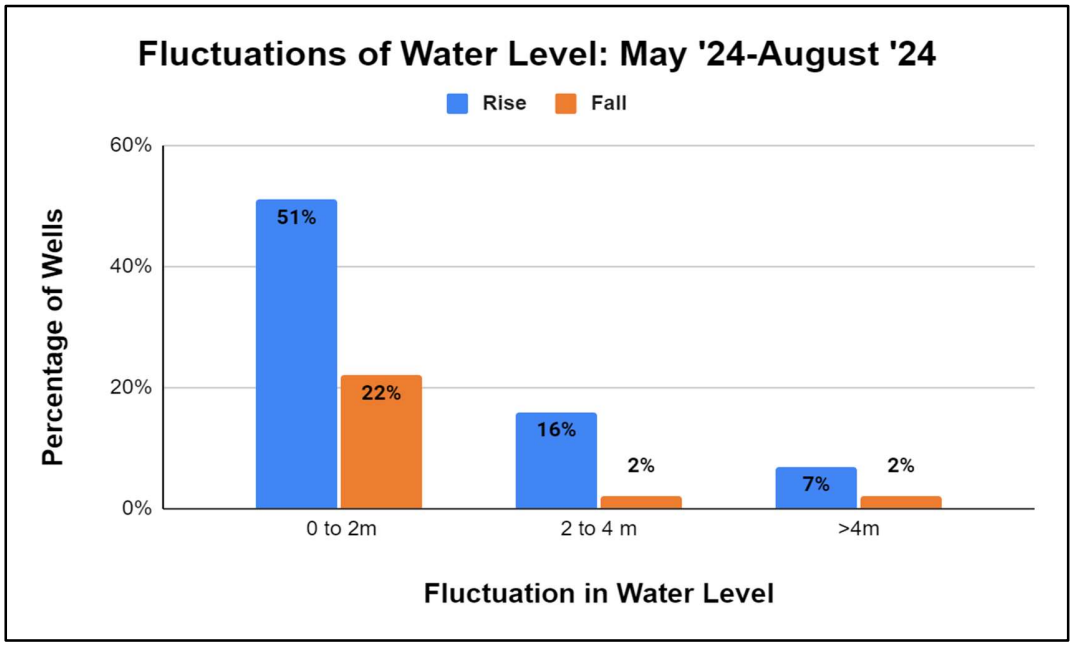

Figure 8: Fluctuation in Water Level: May 2024 - August 2024

2.3 ANNUAL FLUCTUATIONS: (AUGUST 2023 - AUGUST 2024)

To assess the effects of rainfall and groundwater extraction over the past year, we computed annual water level fluctuations between August 2023 and August 2024. The resulting behavior is detailed below and illustrated in ***Figure 9***.

The interpretation of the data reveals that water levels declined in approximately 47% of monitored wells, encompassing 46% of the state's total area. Specifically, a decline of 0-2 meters was noted in 35% of wells, affecting 40% of the area, while a 2-4 meter drop was observed in 10% of wells and 4% of the area. More significant declines, exceeding 4 meters, were recorded in 2% of wells and 2% area manifesting itself in patches the New Delhi, South and West regions of the state, this indicates excessive stress on the aquifer system.

Conversely, water levels rose in 53% of the wells, covering 54% of the area. A rise of 0-2 meters was most prevalent, detected in 45% of wells and 50% of the state area, encompassing the districts of Kalkaji, Alipur, Narela, Punjabi Bagh, Civil Lines, Chandini Chowk, Delhi Cantonment, Kapashera, Najafgarh, Dwarka, Vasant Vihar, Mehrauli, Kanjhawala, Model Town, Patel Nagar, Chanakyapuri, Rohini, Mayur Vihar, Narela, and Saraswati Vihar. Notably, a 2-4 meter rise occurred in 4% of both wells and 3% area occurring in patches in Northwest, South, Central, New Delhi and Southwest Delhi. Water levels over 4 meters of rise are observed in 4% of wells and 1% of the surveyed region (**Figure 10 & Figure 11 & Table 3**).

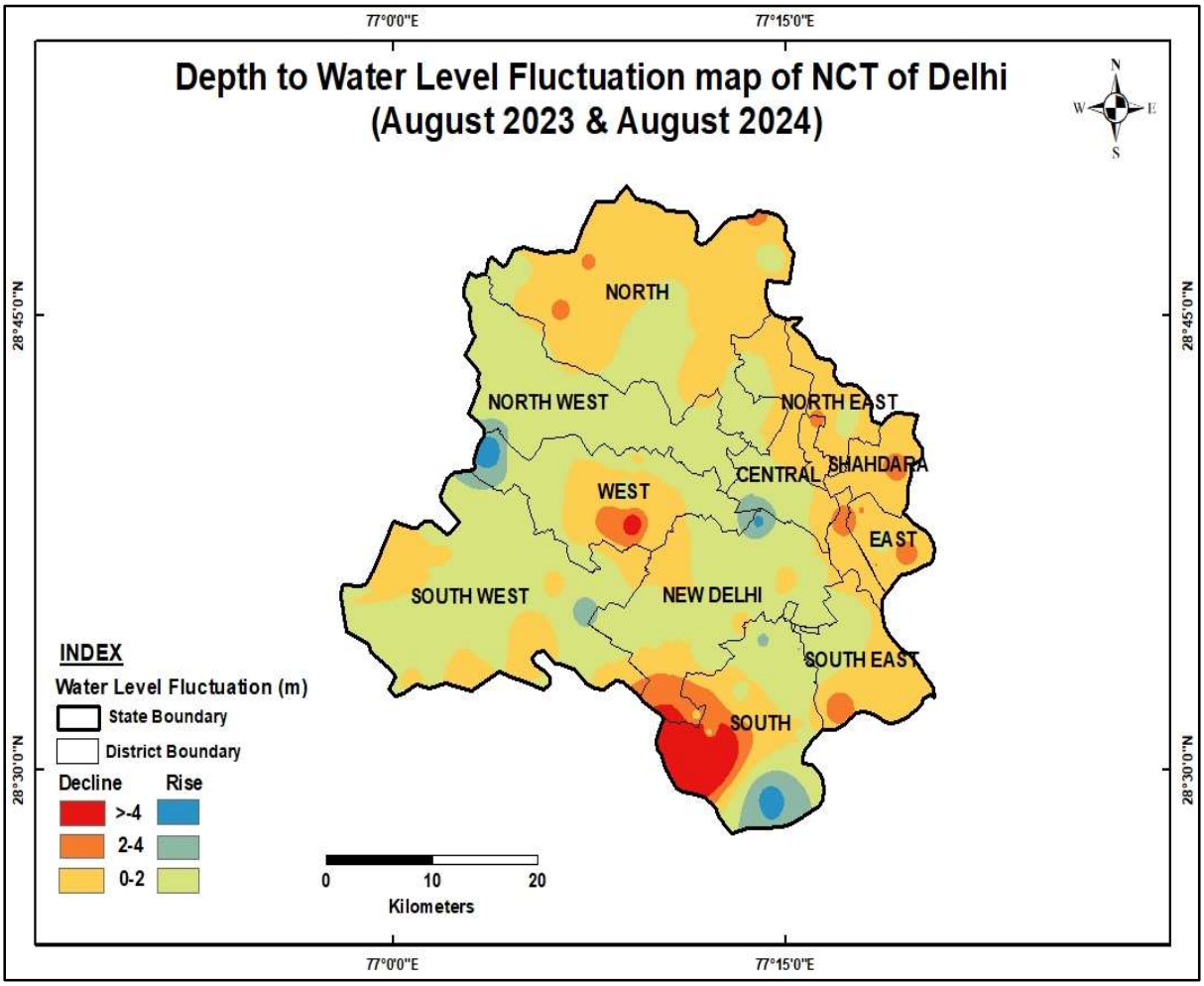

Figure 9: Depth to Water Level Fluctuation Map of NCT of Delhi (August 2023 & August 2024)

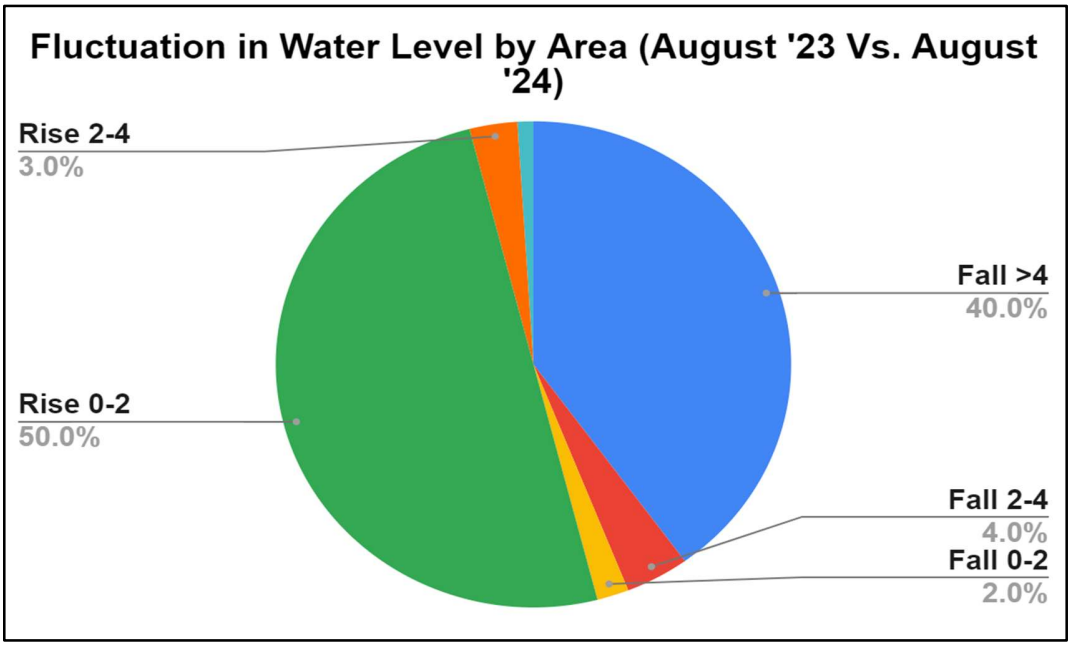

Figure 10: Fluctuation in Water Level by Area (August 2023 Vs August 2024)

Table 3: Number of Wells monitored and Area Covered falling in different Water Level Fluctuation Ranges (August 2023 & August 2024)

Water Level Fluctuation Range in meter		Wells Monitored		Area Covered	
		No.	% Age	Km²	% Age
Decline	0-2	40	35	602.53	40
	2-4	11	10	56.56	4
	>4.0	2	2	35.47	2
Rise	0-2	51	45	739.34	50
	2-4	5	4	40.00	3
	>4.0	4	4	9.1	1
Total		113	100	1483.00	100

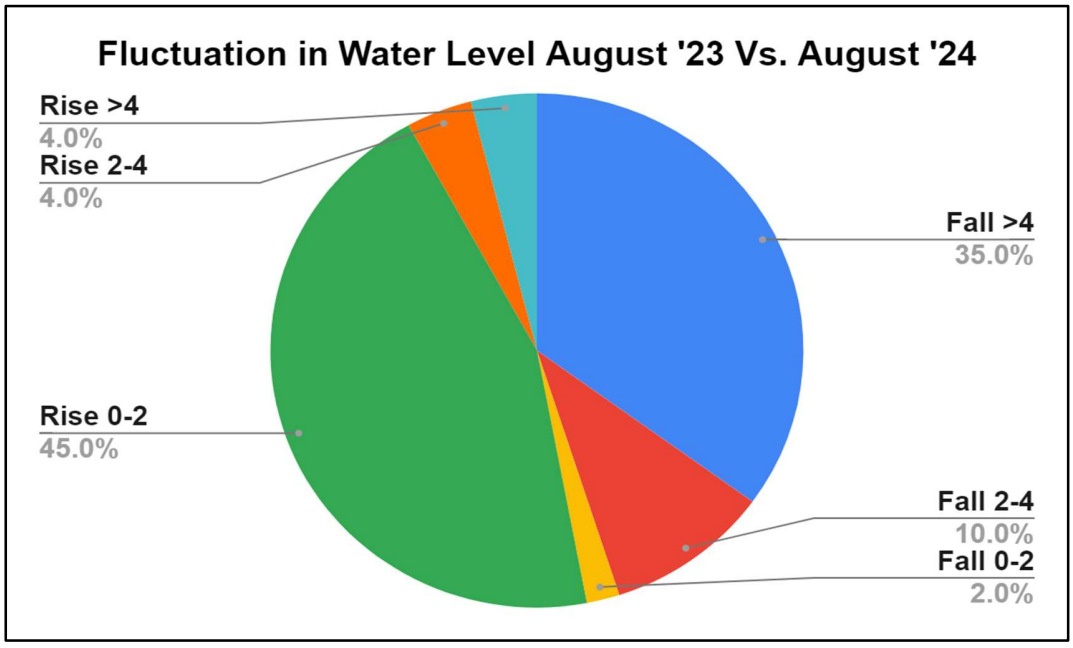

Figure 11: Fluctuation in Water Level: August 2023 Vs August 2024

The monsoon groundwater regime monitoring highlights significant annual fluctuations across the monitored wells. Notably, a rise in groundwater levels in 2-4 meters range and exceeding 4 meters was recorded in 4% of wells for each range, suggesting localized zones of positive recharge trends. Moderate increases, with 45% of wells experiencing water level rises in the 0-2 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 47%. Each of these observations can be spotted in the following graph (***Figure 12***).

2.4 DECADAL MEAN FLUCTUATIONS AUGUST (2014-2023) & AUGUST 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 August 2024. The observed trends over this period are detailed below, with accompanying ***Figure 13***.

The interpretation of decadal mean fluctuations reveals that 37% of the wells exhibit a water level decline, impacting approximately 36% of the state's total area. A decline in the 0-2 meter range is noted in 21% of the wells, affecting 28% of the state. Additionally, a decline between 2-4 meters has been reported from 8% of wells, encompassing 5% of the state's area, while more severe declines of over 4 meters were observed in 8% of wells and 3% of the area (***Figure 14&Figure 15& Table 4***).

Table 4: Number of Wells monitored and Area Covered falling in different Water Level Fluctuation Ranges (August (2014-'23) & August 2024)

Water Level Fluctuation Range in meter		**Wells Monitored**		**Area Covered**	
		No.	**%Age**	**Km^2**	**%Age**
Decline	0-2	10	21	413.58	28
	2-4	4	8	72.8	5
	>4.0	4	8	46.19	3
Rise	0-2	16	33	403.66	27
	2-4	4	8	283.77	19
	>4.0	11	22	263.00	18
Total		65	100	1483.00	100

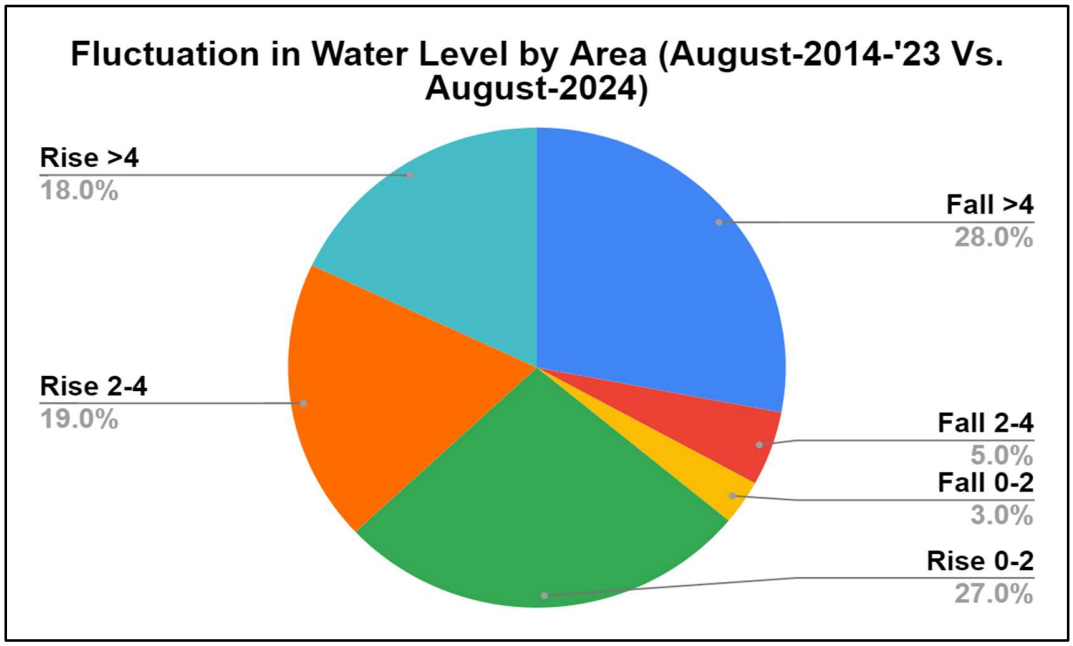

Figure 14: Fluctuation in Water Level by Area (August 2014-2023) Vs August 2024

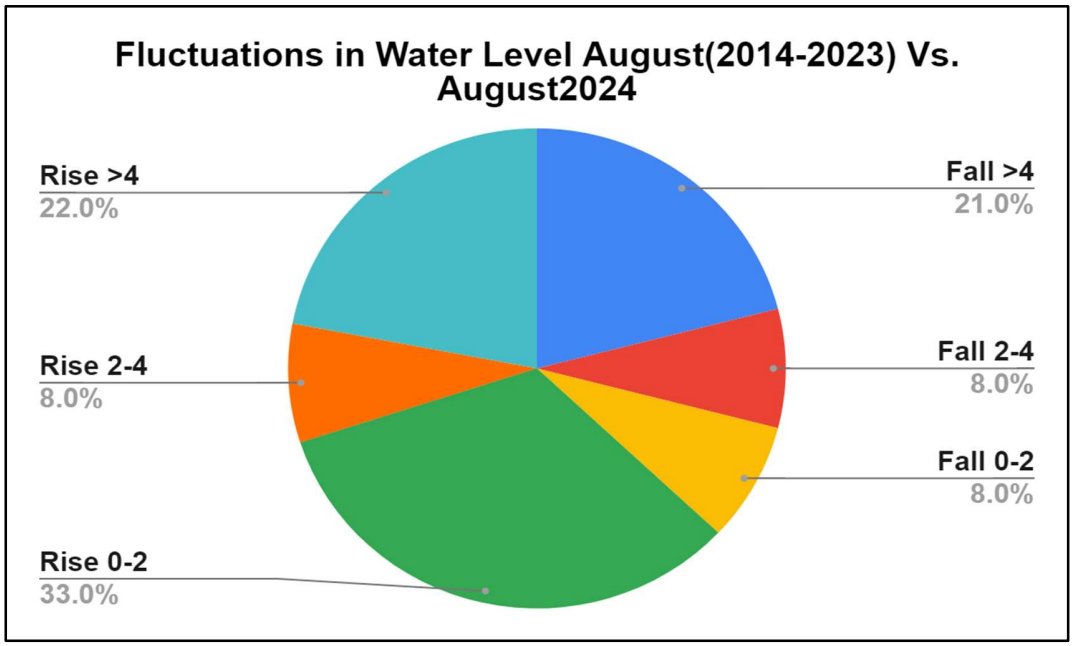

Figure 15: Fluctuation in Water Level: August 2014-2023 Vs August 2024

Conversely, a water level rise has been recorded in 63% of wells, covering 64% of the state's area. A small yet significant rise in the 0-2 meter range was observed in 33% of wells, spanning 27% of the state's area, seen in the form of patches in the districts of Alipur, Narela, Punjabi Bagh, Chandini Chowk, Mayur Vihar, Preet Vihar, Kalkaji, Kanjhawala, Najafgarh, and

Model Town. Rises of 2-4 meters were noted in 8% of wells, covering 19% of the state, while more substantial rises of over 4 meters were recorded in 22% of wells, affecting 18% of the area.

These fluctuations provide a nuanced 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 16).***

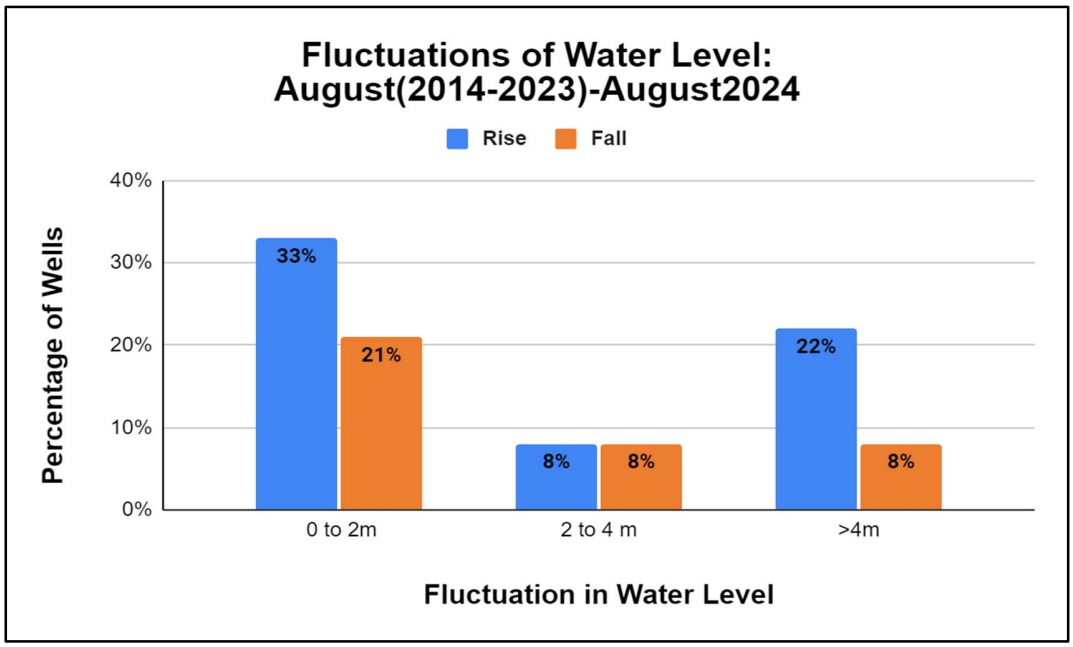

Figure 16: Fluctuations in Water Level: August (2014-2023)-August 2024

3. CONCLUSIONS

The interpretation results shows a New Delhi, South Delhi and South East Delhi districts showing deeper water level in monsoon season and also not getting much recharge form rainfall. Water level fluctuation map of May 2024 vs August 2024 shows that Water level is decline with the fluctuation of 2 – 4 meter in North Delhi district only. Water level fluctuation map of May 2024 vs August 2024 clearly depict that 80 % of the area is showing 0 - 2 range of rise in water level. However, in Southern part of North district and Central district water level is shallow and showing rising situation, so in these districts recharge from rainfall and other sources is taking place. In South District water level is showing rising Water level situation with the range of greater than 4 m.