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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 MAY 2024

(AAP: 2024-25)

STATE UNIT OFFICE, NEW DELHI

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

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Ministry of Jal Shakti
Govt. of India
May 2024

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IN NCT DELHI STATE DURING
MAY 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 June 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 May 2024 with that of January 2024, May 2023, and the decadal mean for May (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 May 2024, providing a critical examination of changes relative to the referenced temporal benchmarks.

2.1 DEPTH TO WATER LEVEL: MAY 2024

The analysis of the water level behavior in May 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 May 2024, the depth to the water table in Delhi exhibits a significant range, from a mere 1.62 meters below ground level (bgl) in Rani Khera DW within the Rohini district to a substantial 67.77 meters bgl in Gadaipur Pz in the Mehrauli district. Notably, the Rohini district is characterized by extremely shallow water levels ranging from 0 to 2 meters bgl, observed in only 1% of monitoring wells, signifying localized waterlogging within 0.1 % of the state's area. Conversely, shallow water levels between 2 and 5 meters bgl are recorded in 25 % of wells encompassing 8.2% area across Narela, Preet Vihar, Punjabi Bagh, Civil Lines, Model Town, Najafgarh, Alipur, Kotwali, Kanjhawala, Defence Colony, Saraswati Vihar, Kapashera, and Nazul Land districts. These levels are dispersed across Central, East, Northeast, Southeast, Southwest, and West Delhi, manifesting in patchy distributions. Moderate water levels, ranging from 5 to 10 meters bgl, are observed in approximately 32 % of wells, spanning 39.5 % of the area in Alipur, Narela, Kotwali, Kapashera, Mayur Vihar, Kalkaji, Preet Vihar, Chanakyapuri, Sarita Vihar, Patel Nagar, Najafgarh, Kanjhawala, Punjabi Bagh, Seelampur, and Rohini districts, Moderate water levels, ranging from 10 to 20 m are observed in approximately 25 % of wells, spanning 32.3 % of the area in Kapashera, Najafgarh, Dwarka, Dwarka, Patel Nagar, Saket, Vasant Vihar,Civil Lines.

Deep water levels, ranging from 20 to 40 meters bgl, are found in 12 % of wells, covering 13.6 % of the area in Delhi Cantonment, Preet Vihar, Yamuna Vihar, Mehrauli, Chanakyapuri, Rajouri Garden, Hauz Khas, and Alipur districts. Very deep water levels exceeding 40 meters bgl occur in 5 % of the wells and 6.3 % of the area, including Vasant

Vihar, Delhi Cantonment, Mehrauli, Saket, and Kalkaji districts (***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 (May 2024)

Depth to water level range	**Wells Monitored**		**Area Covered**	
	No.	**%Age**	**Km^2**	**%Age**
0 to 2m	1	1	0.91	0.1
2 to 5m	35	25	121.60	8.2
5 to 10m	44	32	586.19	39.5
10 to 20m	35	25	478.50	32.3
20 to 40m	16	12	202.26	13.6
>40m	7	5	93.55	6.3
Total	138	100	1483.01	100

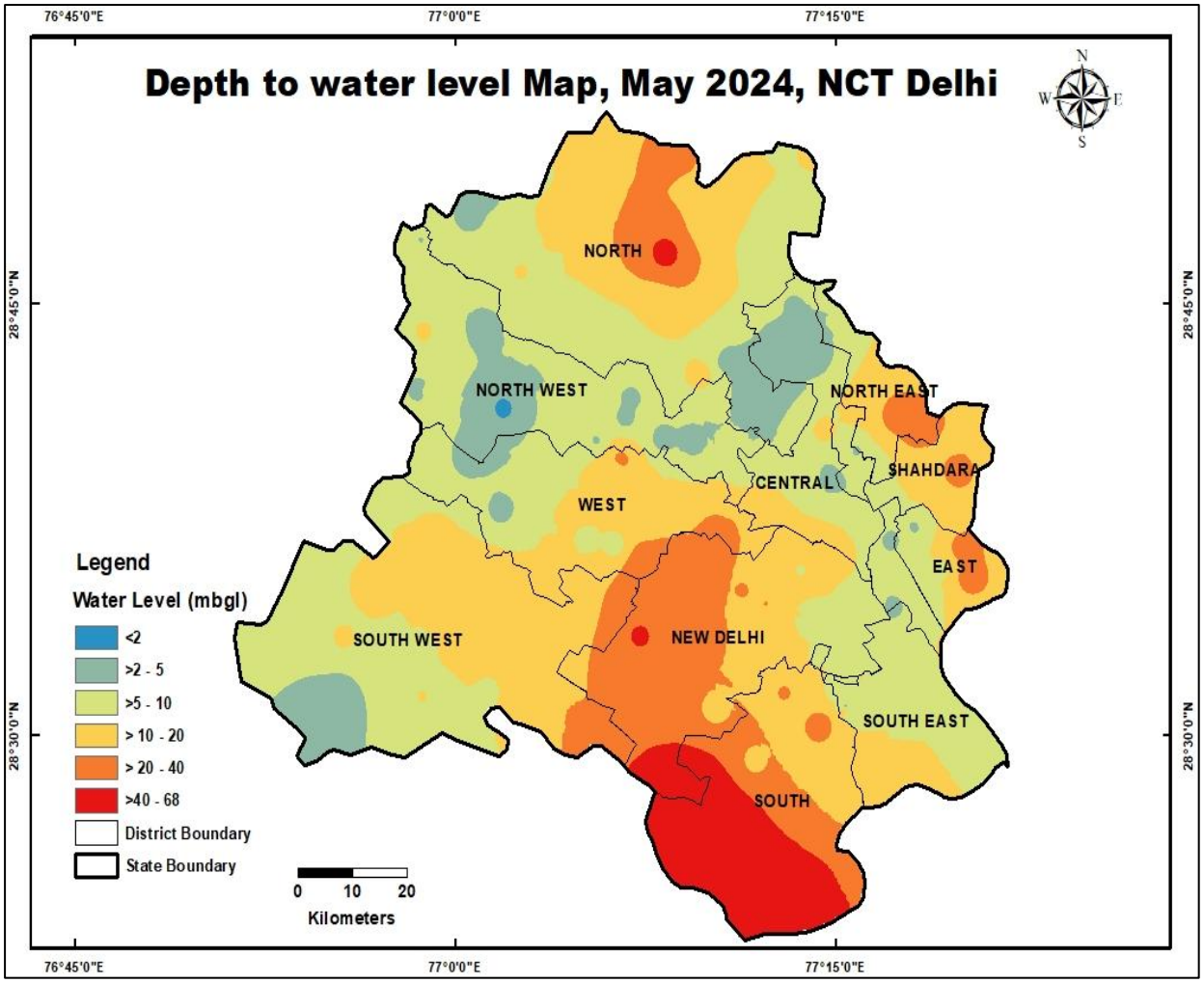

Figure 1: Depth to Water Level Map, May 2024, NCT Delhi

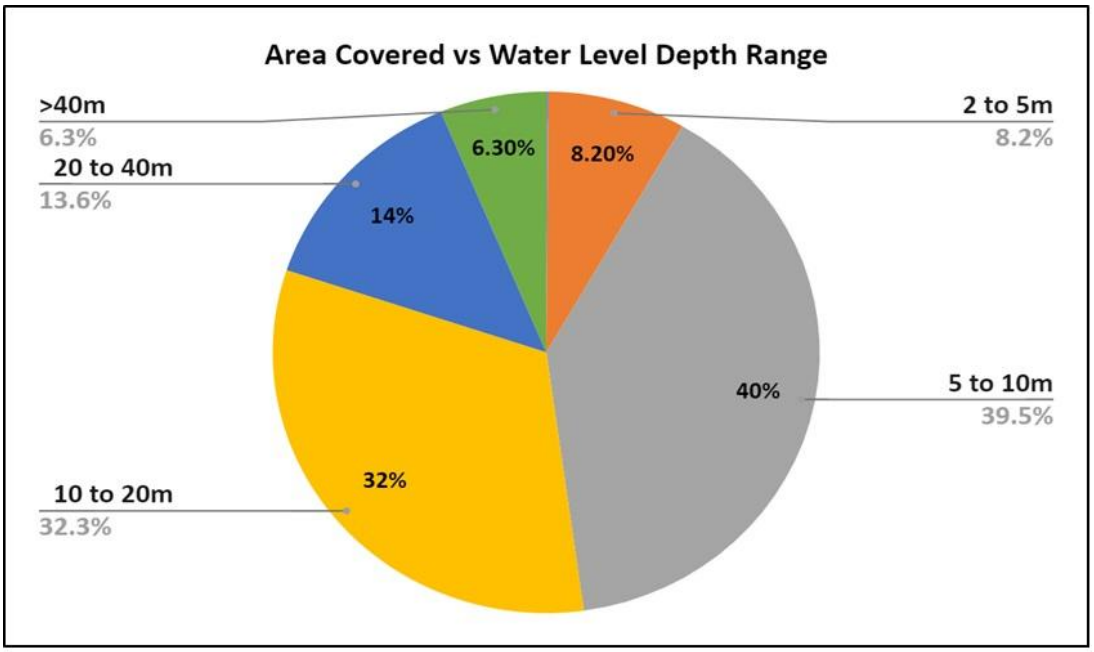

Figure 2: Area Covered Versus Water Level Depth Range (May 2024)

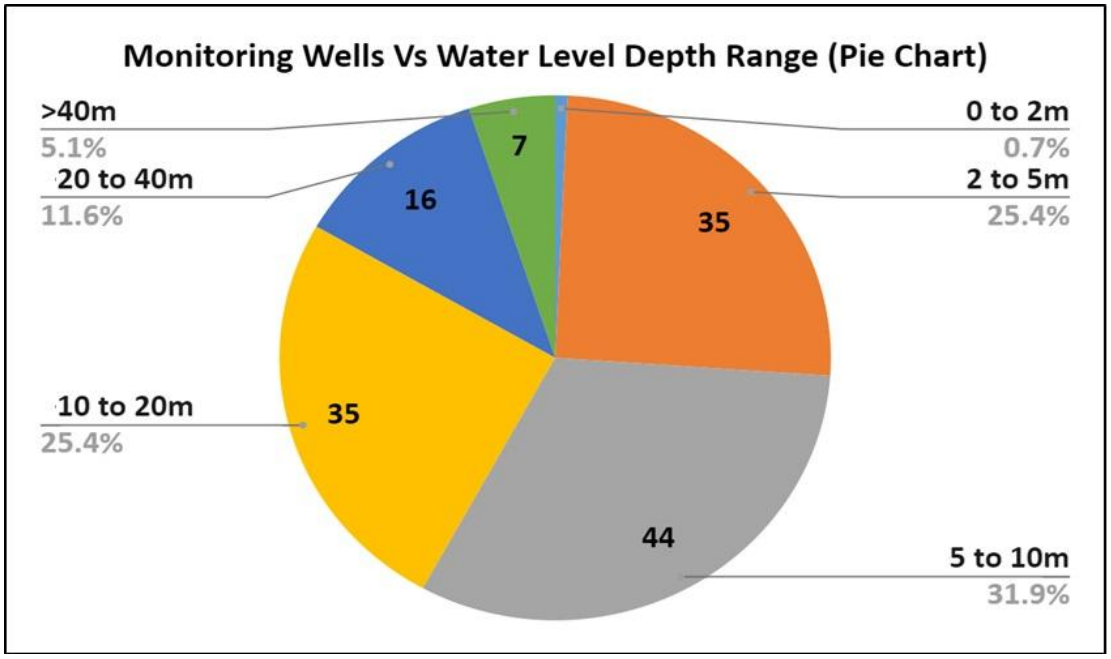

Figure 3: Monitoring Wells Vs Water Level Depth Range (May 2024)

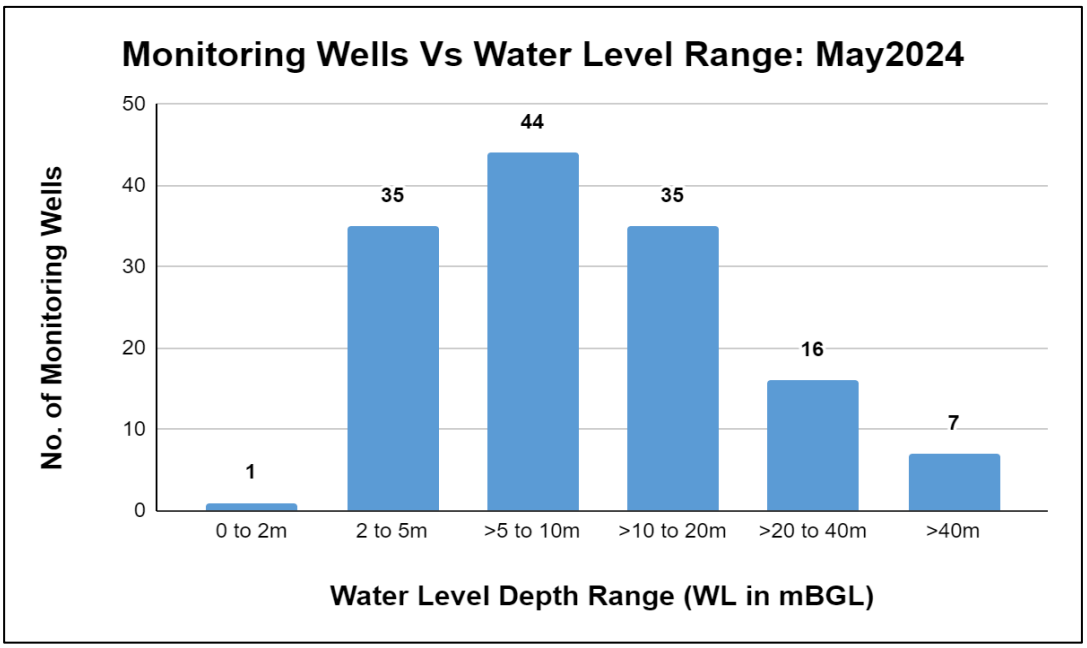

Figure 4: Monitoring Well Vs Water Level Depth Range (May 2024)

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

The predominance of groundwater levels in the 5 to 10 meters bgl range 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 may not be 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 - MAY 2024)

The comparative analysis of water level data from May 2024 with the previous measurements recorded in January 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 75 % of the monitored wells, encompassing 88 % of the state's area. Specifically, a decline in the 0 - 2 meter range is evident in 64 % of the wells and 81 % of the area, underscoring significant groundwater stress conditions. A more moderate decline, within the 2 - 4 meter range, is observed in 8 % of wells and 5 % of the area, predominantly in isolated patches across the North, West, and North West regions, including Kalkaji, Narela, Civil Lines, Saraswati Vihar, and Punjabi Bagh districts. Notably, 3 % of wells and 2 % of the areas report a decline exceeding 4 meters, indicating no severe groundwater depletion (***Figure 6 & Figure 7 & Table 2***).

Conversely, water level increases are recorded in 25 % of the wells and 12 % of the area, with a rise of 0 - 2 meters noted in 23 % of wells and 10% of the area, primarily in Civil Lines, Kapashera, Patel Nagar, Dwarka, Mehrauli, Hauz Khas, Najafgarh, Model Town, Chanakyapuri, Alipur, and Kalkaji districts. Instances of water level rise 2 – 4 meters are observed, showing 1 % occurrences in wells and 1 % state area and also greater than 4 meter ranges showing 1 % occurrences in wells and 1 % state area. This pattern highlights that while some regions exhibit slight improvements, the overall groundwater levels in the most accessible aquifer zones are generally declining.

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

Water Level Fluctuation Range in meter		Wells Monitored		Area Covered	
		No.	%Age	Km^2	%Age
Decline	0-2	81	64	1199.21	81
	2-4	10	8	80.59	5
	>4.0	4	3	28.27	2
Rise	0-2	29	23	145.90	10
	2-4	1	1	12.50	1
	>4.0	1	1	16.35	1
Total		126	100	1483	100

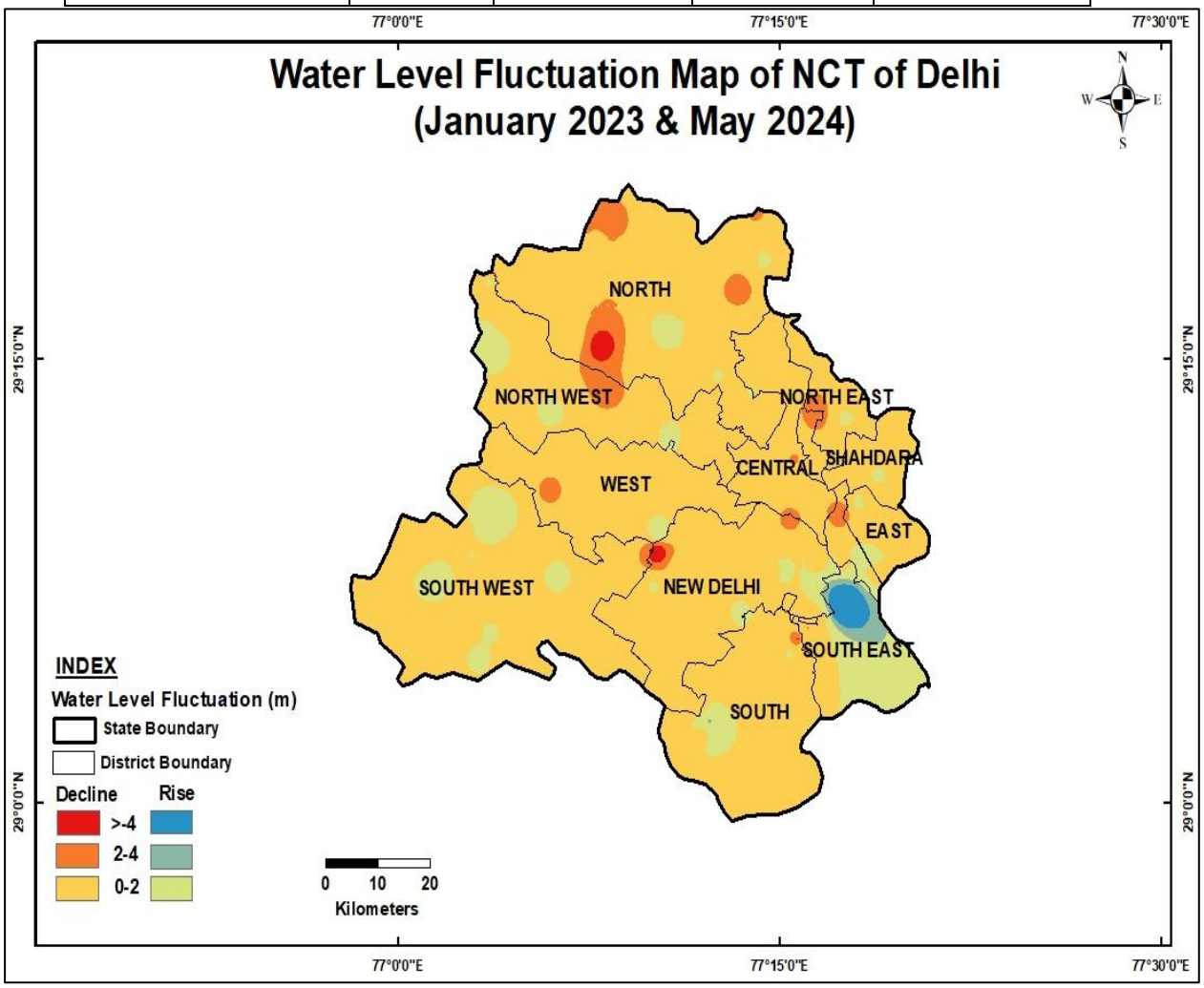

Figure 5: Water Level Fluctuation Map of NCT of Delhi (January 2023 & May 2024)

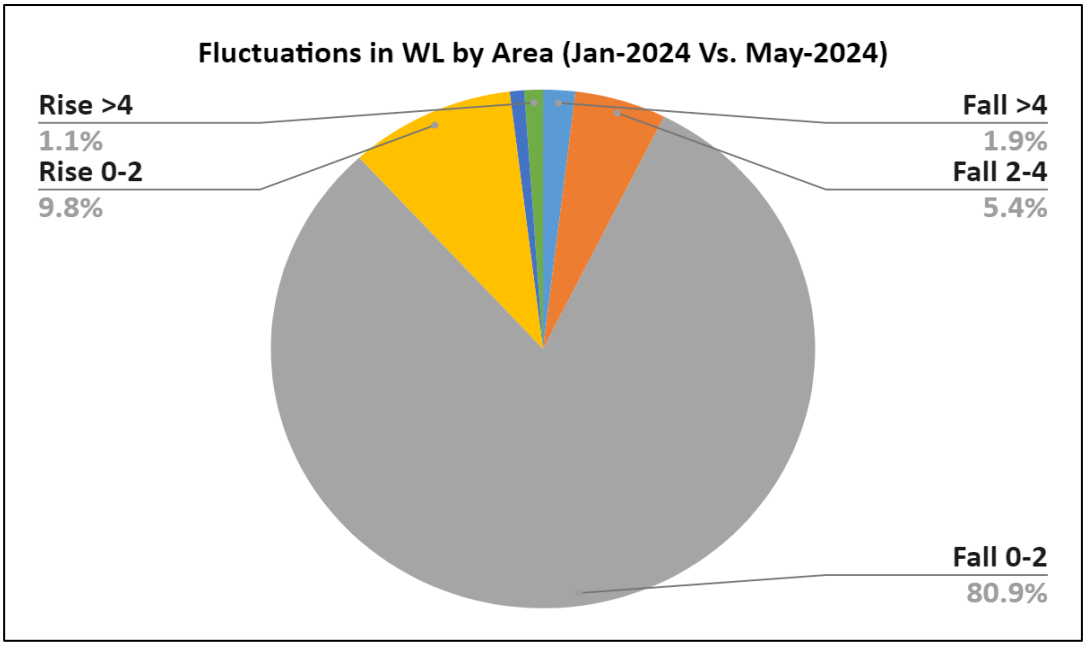

Figure 6: Fluctuations in Water Level by Area (January 2024 Vs May 2024)

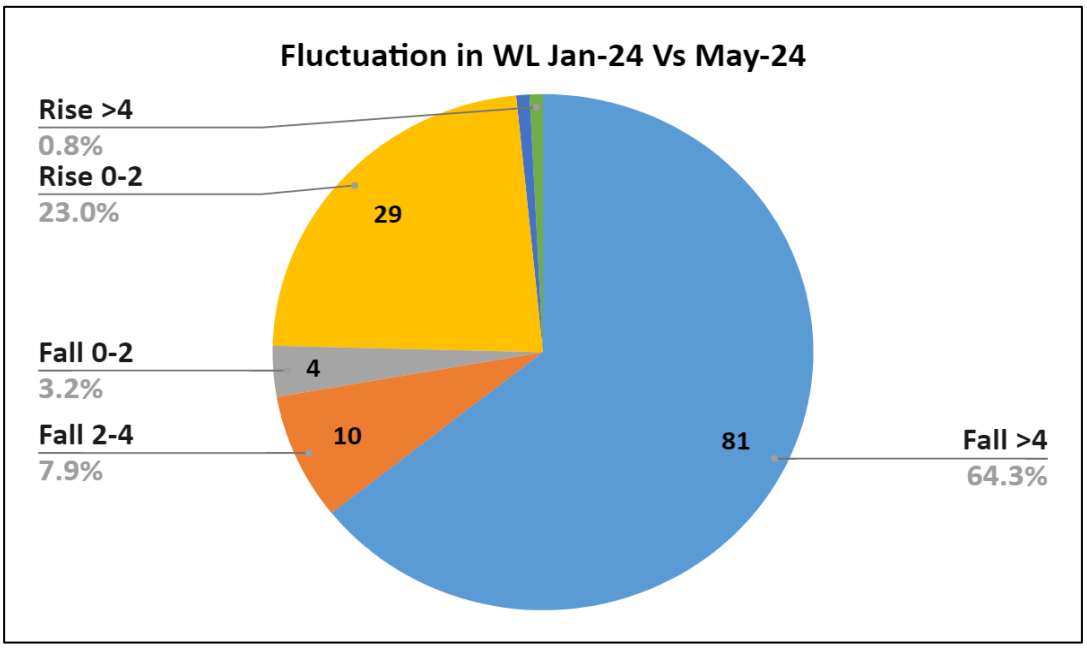

Figure 7: Fluctuation in Water Level January 2024 Vs May 2024

The seasonal water level fluctuation, i.e. the change in the depth to water level of May 2024 with respect to January 2024 reveals the effective utilization of groundwater for various needs like Domestic, Irrigation, Industrial etc., on the overall groundwater regime of the area. A number of wells showing the change in groundwater level in the region over a period from January to May is preset below (***Figure 8***).

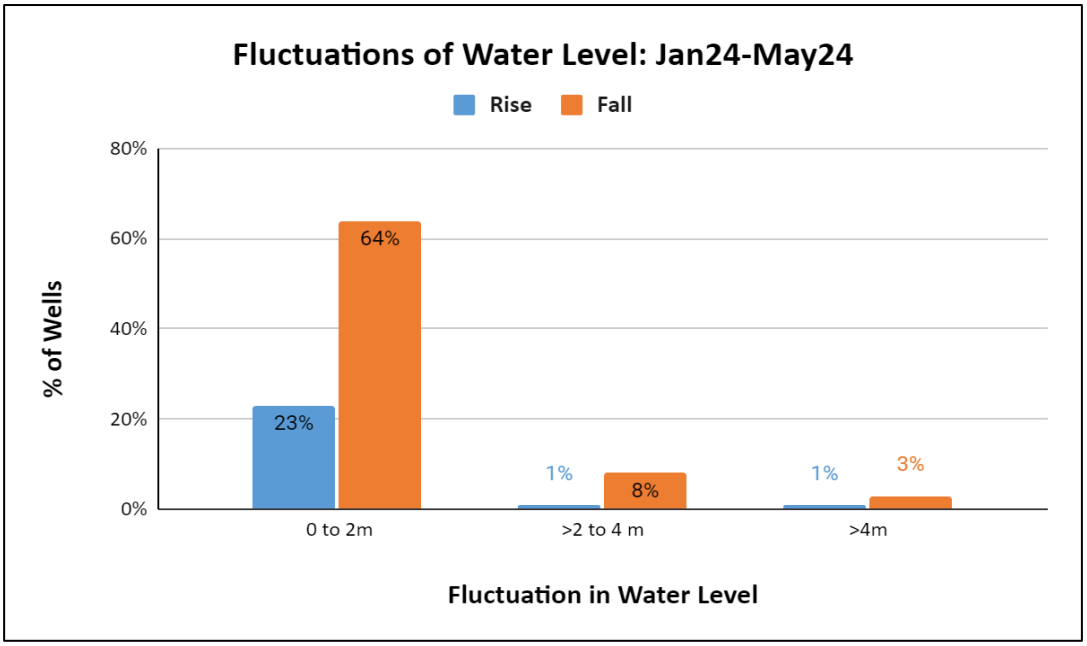

Figure 8: Fluctuation in Water Level: January 2024 - May 2024

The data indicates a predominantly stressed groundwater system with a general decline in water levels across both shallow and moderate depths. The minimal rise observed in a small percentage of wells suggests that, overall, the groundwater situation is critical, with only limited areas showing any improvement.

2.3 ANNUAL FLUCTUATIONS: (MAY 2023 - MAY 2024)

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

The interpretation of the data reveals that water levels declined in approximately 56 % of monitored wells, encompassing 53 % of the state's total area. Specifically, a decline of 0-2 meters was noted in 16% of wells, affecting 15 % of the area, while a 2 - 4 meter drop was observed in 13 % of wells and 14 % of the area. More significant declines, exceeding 4 meters, were recorded in 27 % of wells and 24 % area manifesting itself in the New Delhi, and North regions of the state, while also appearing as patches in the areas of North West, East, South, North and South East regions. This indicates excessive stress on the aquifer system.

Conversely, water levels rose in 44% of the wells, covering 47 % of the area. A rise of 0-2 meters was most prevalent, detected in 10% of wells and 14 % of the central state area. Notably, a 2 - 4 meter rise occurred in 10% of both wells and 16% area, with over 4 meters of rise observed in 24% of wells and 17 % of the surveyed region (***Figure 10 & Figure 11 & Table 3***).

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

Water Level Fluctuation Range in meter		**Wells Monitored**		**Area Covered**	
		No.	**% Age**	**Km^2**	**% Age**
Decline	0-2	14	16	217.20	15
	2-4	12	13	201.80	14
	>4.0	24	27	359.90	24
Rise	0-2	8	10	206.6	14
	2-4	8	10	242.89	16
	>4.0	23	24	254.62	17
Total		89	100	1483.01	100

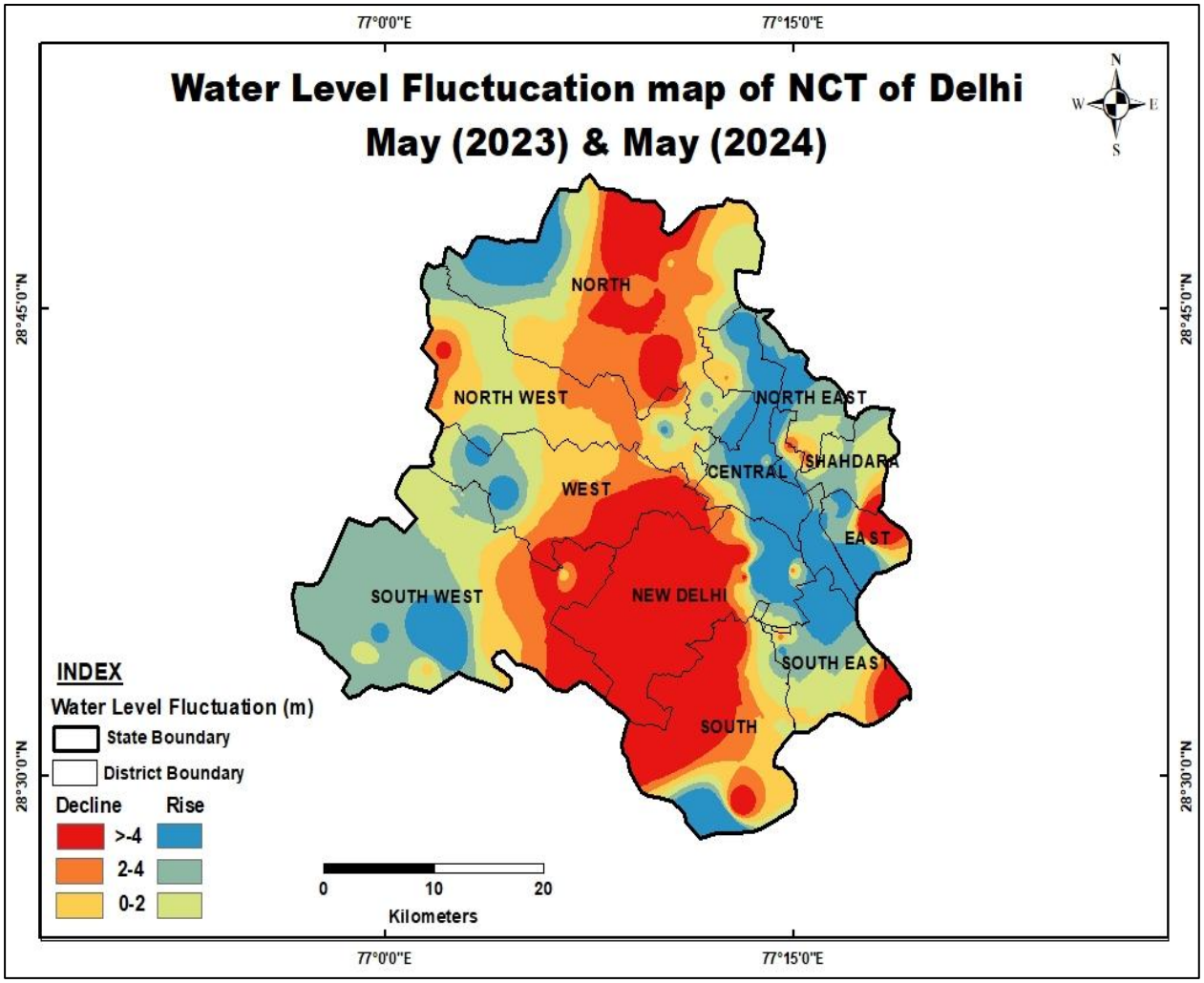

Figure 9: Depth to Water Level Fluctuation Map of NCT of Delhi (May 2023 & May 2024)

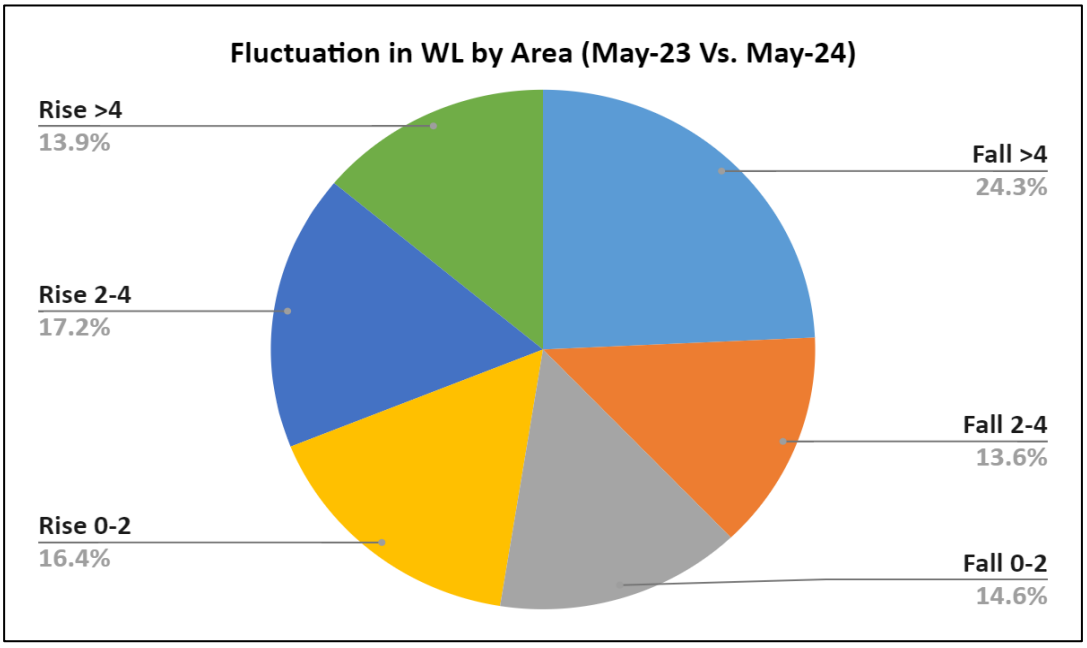

Figure 10: Fluctuation in Water Level by Area (May 2023 Vs May 2024)

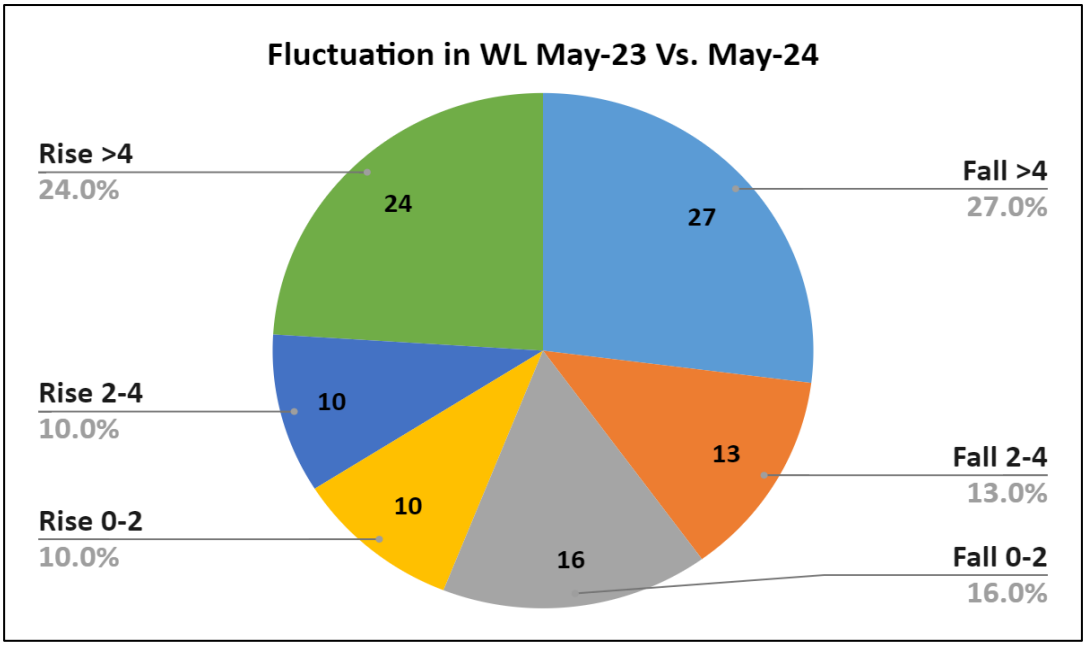

Figure 11: Fluctuation in Water Level: May 2023 Vs May 2024

The pre-monsoon groundwater regime monitoring highlights significant annual fluctuations across the monitored wells. Notably, a substantial rise in groundwater levels exceeding 4 meters was recorded in 24 % of wells, indicating areas of effective recharge during the observation period. This is followed by moderate increases, with 10 % of wells experiencing water level rises in the 0 - 2 meter and 2 - 4 meter ranges, suggesting localized zones of positive recharge trends.

Conversely, groundwater level declines present a concerning scenario. A decline of more than 4 meters was observed in 27 % of the wells, pointing to areas where groundwater extraction or inadequate recharge has led to substantial depletion. Additionally, 14 % and 15 % of wells recorded declines in the 2 - 4 meter and 0 - 2 meter categories respectively, reflecting moderate declines across various regions. Each of these observations can be spotted in the following graph (***Figure 12***).

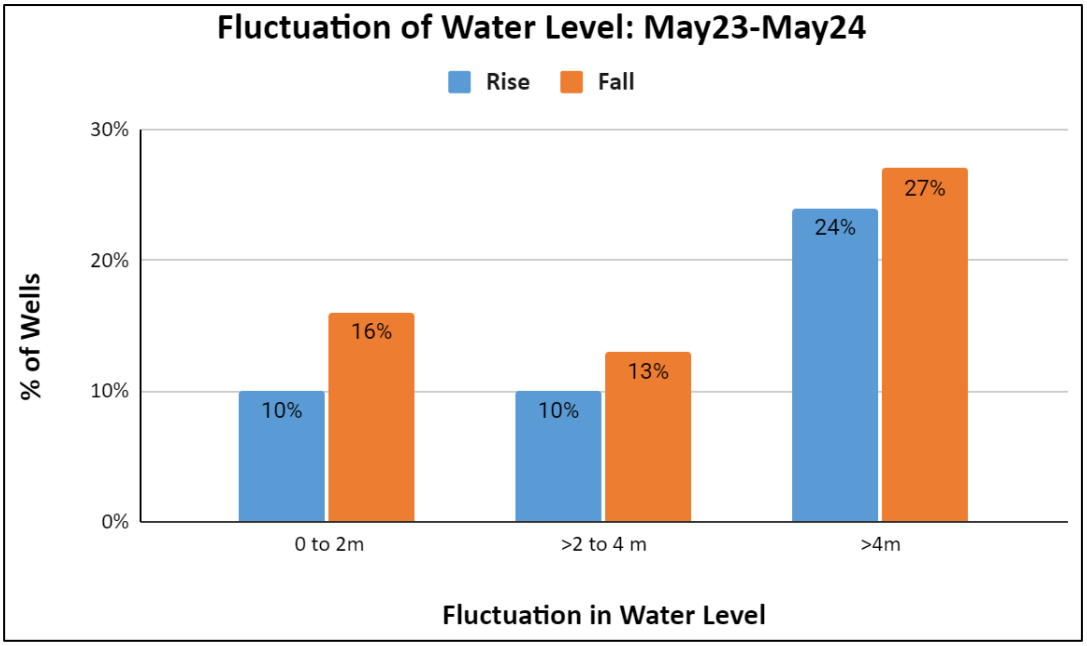

Figure 12: Fluctuation in Water Level: May 2023- May 2024

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

The interpretation of decadal mean fluctuations reveals that 48% of the wells exhibit a water level decline, impacting approximately 45 % of the state's total area. A decline in the 0 - 2 meter range is noted in 13% of the wells, affecting 19% of the state. Additionally, a decline between 2 - 4 meters has been reported from 8% of wells, encompassing 8 % of the state's area, while more severe declines of over 4 meters were observed in 27 % of wells and 18% of the area. (***Figure 14 & Figure 15 & Table 4***)

Conversely, a water level rise has been recorded in 52 % of wells, covering 55 % of the state's area. A small yet significant rise in the 0 - 2 meter range was observed in 34 % of wells, spanning 24 % of the state's area, seen in the form of patches in the districts of Mehrauli, Vasant Vihar, Sarita Vihar, Hauz Khas, Chanakyapuri, Delhi Cantonment, Preet Vihar, Alipur, Kanjhawala and Rajouri Garden. Rises of 2 - 4 meters were noted in 6 % of wells, covering 13 % of the state, while more substantial rises of over 4 meters were recorded in 12 % 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).***

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

Water Level Fluctuation Range in meter		Wells Monitored		Area Covered	
		No.	% Age	Km^2	% Age
Decline	0-2	8	13	277.78	19
	2-4	5	8	127.01	8
	>4.0	18	27	262.74	18
Rise	0-2	22	34	350.28	24
	2-4	4	6	195.86	13
	>4.0	8	12	269.33	18
Total		65	100	1483.00	100

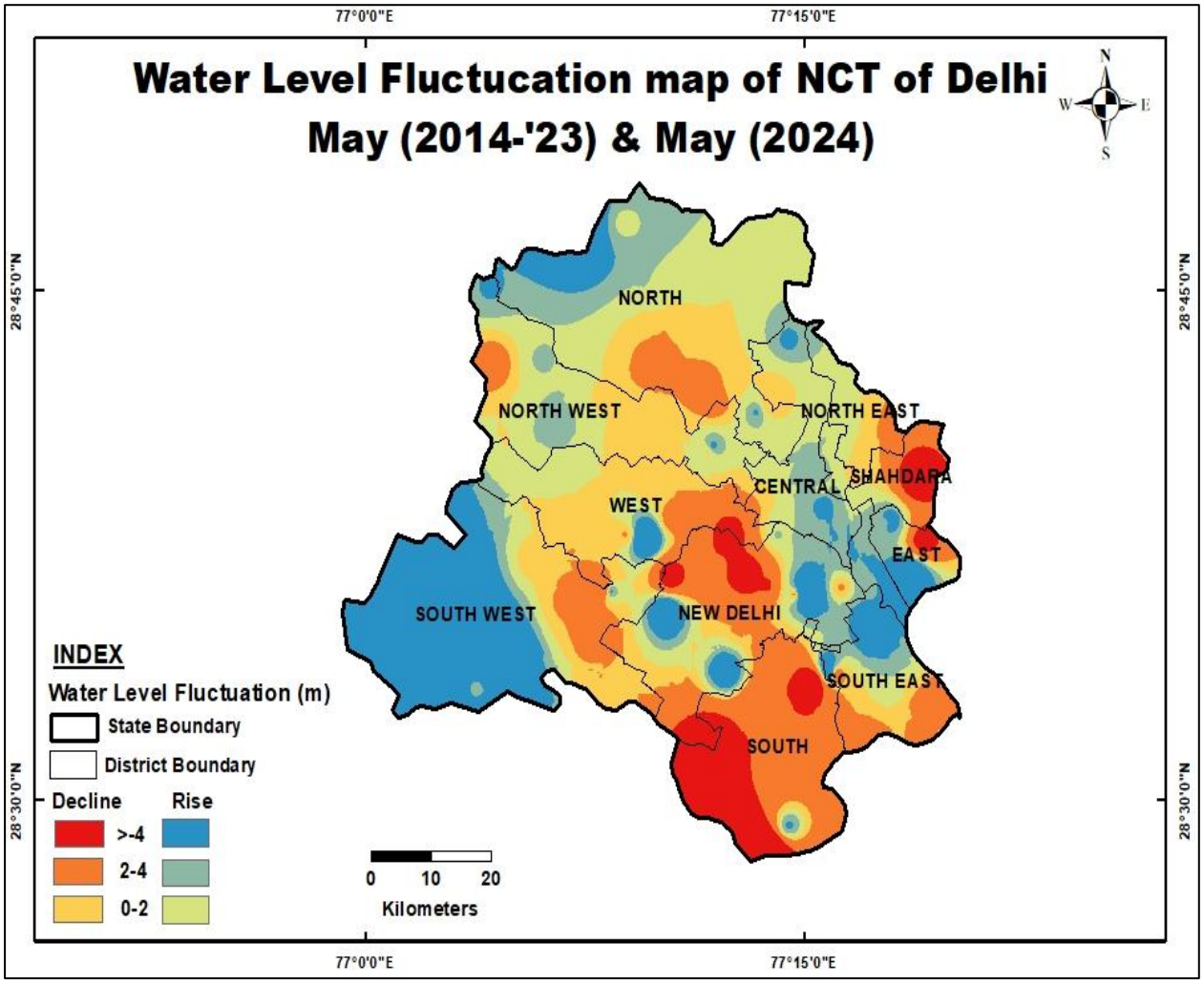

Figure 13: Water Level Fluctuation Map of NCT of Delhi Decadal Mean May (2014-2023) & May 2024

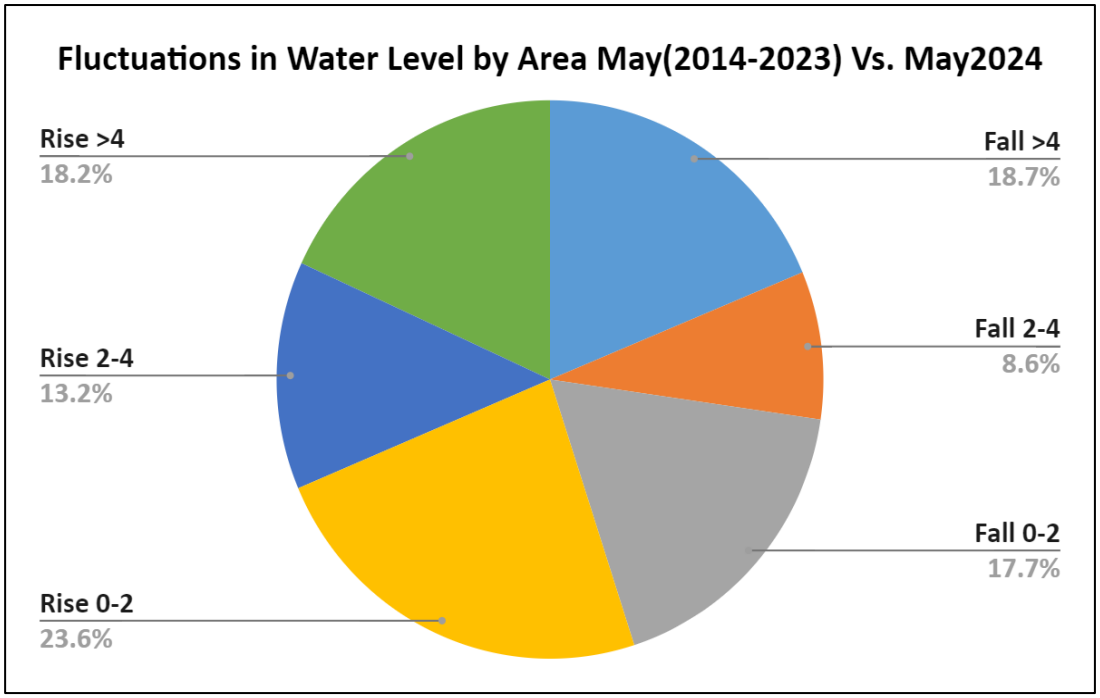

Figure 14: Fluctuation in Water Level by Area (May 2014-2023) Vs May 2024

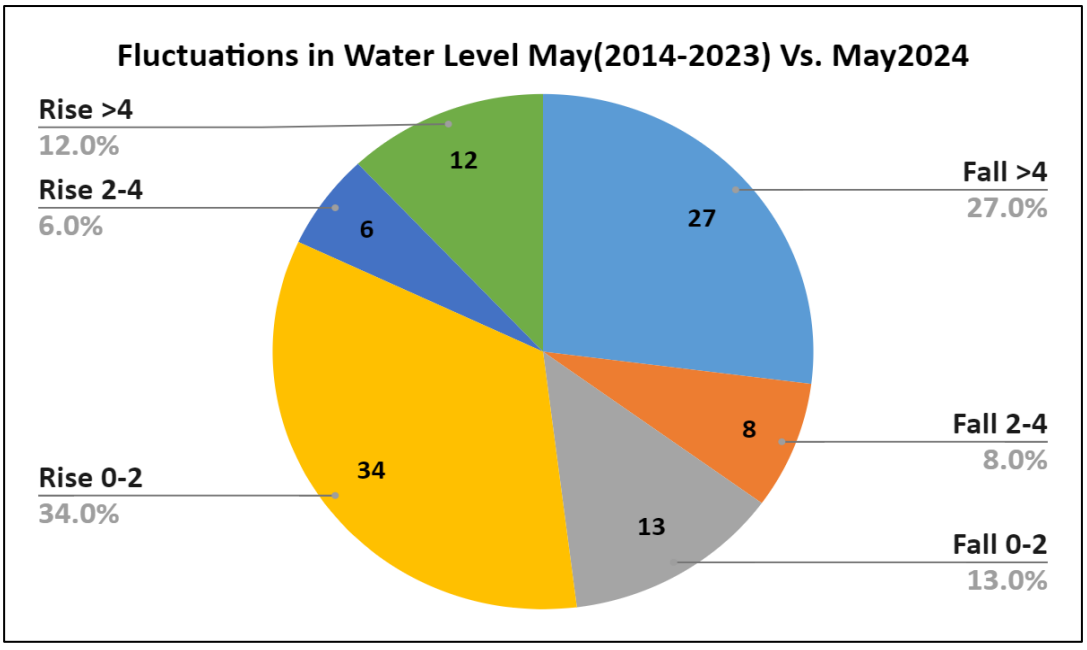

Figure 15: Fluctuation in Water Level: May 2014-2023 Vs May 2024

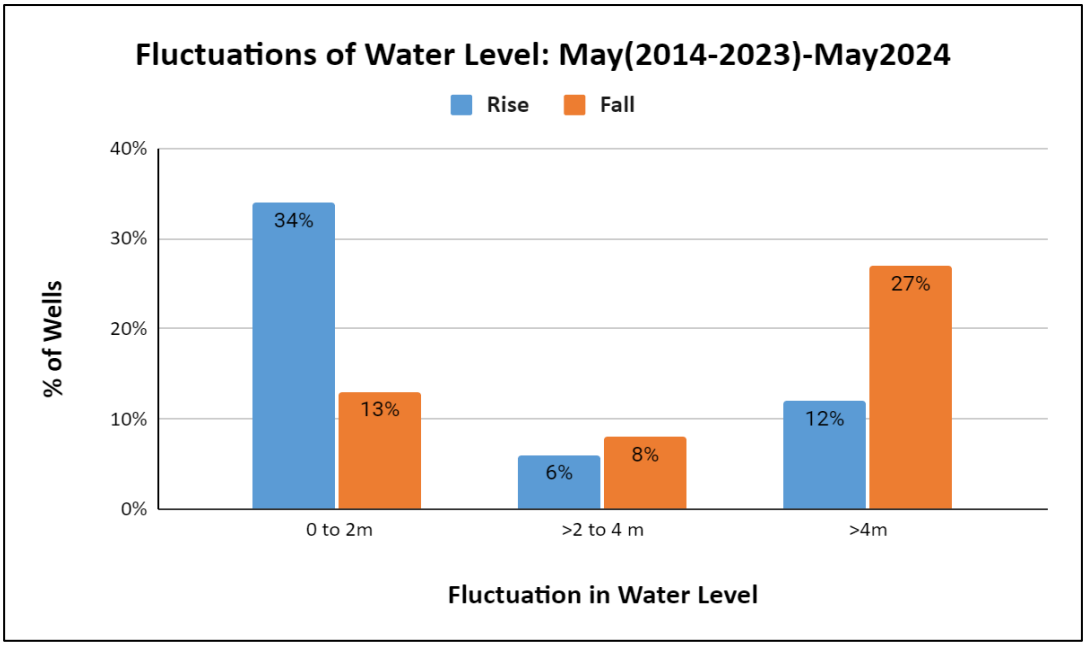

Figure 16: Fluctuations in Water Level: May (2014-2023)-May 2024

3. CONCLUSIONS

The interpretation results show a New Delhi and South Delhi districts showing deeper water level in pre monsoon season and also getting much recharge form rainfall. Water level fluctuation map of January 2024 vs May 2024 shows that Water level is declining with the fluctuation of 2 – 4 meter in these districts. Water level fluctuation map of January 2024 vs May 2024 clearly depict that 80 % of the area is showing 0-2 range of decline 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.

4. RECOMMENDATIONS

(i) Parts of New Delhi, South, North, North East, East and Shahdara district are showing decline water level along with deeper water level (>10 m). So, in these districts Artificial Recharge, Roof Top Rain Water Harvesting (RTRWH) should be promoted so that water will get recharged. Other than that surface water supply may be provided for reducing ground water extraction. Dual water supply system can also be promoted with the use of treated waste water.

(ii) In the parts of districts like East, South East, South West and Central where water level is in the rising trend of above 0.4 m/annum along with 5 – 10 m water level range, tube wells may be constructed with sustainable development coupled with Artificial Recharge measures.

(iii) In the parts of district like North East, North West, South West, New Delhi, Central, North water logging problem occurs, (Water level in the range of 2 – 5 mbgl), dewatering is required by over pumping of Ground Water.

(iv) The Urban Development (UD) department sent a DO letter to the CEO (DJB) regarding identifying the leakage points and preparing a complete mapping of pipelines. Delhi Jal Board (Water Supply) should stop the leakage of supply water so that groundwater extraction will be reduced by providing a proper supply of surface water.

(v) In Over Exploited Tehsils (OE), and Deeper water level areas the construction of RTRWHS compulsory in all Government and private buildings to increase Groundwater recharge. Also, an implementable notification must be issued for buildings having more than 100 Sq. m area.

(vi) For Horticulture purposes use STP water only and not Groundwater. NDMC and DJB have to take responsibility for providing STP water through tankers or pipelines. It is recommended to stop dependency on groundwater within one year for horticulture purposes.

(vii) Directorate of Environment to expedite issuance of guidelines for the regulation of the groundwater in line with the guidelines notified by the MoJS for control and regulation of groundwater extraction with pan-India applicability on 24.09.2020 and amendments dated 29.03.2023.

(viii) In areas, where extraction is more, NOC for groundwater extraction is only issued when they have to maintain the balance of the quantity of extraction water and the same or more than extraction, water has to recharge. Otherwise, no NOC will be issued.