

GROUND WATER LEVEL BULLETIN

November 2024

ABSTRACT

Groundwater level scenario during November 2024 highlighting the findings, status of ground water level in different aquifers and its seasonal, annual and decadal comparison.

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1.0 INTRODUCTION

Groundwater bulletin is prepared by CGWB depicting changes in groundwater regime of the country through different seasons. It is an effort to obtain information on groundwater levels through representative monitoring wells. The important attributes of groundwater regime monitoring are groundwater level.

The natural conditions affecting the groundwater regime involve climatic parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include pumpage from the aquifer, recharge due to irrigation systems and other practices like waste disposal etc.

Groundwater levels are being measured by Central Ground Water Board four times a year during January, March/April/May, August and November. The regime monitoring started in the year 1969 by Central Groundwater Board. Currently, a network of 27163 observation wells called National Hydrograph Network Stations (NHNS) located all over the country is being monitored.

2.0 HYDROGEOLOGICAL SETUP OF COUNTRY

India's hydrogeological setup is characterized by diverse aquifer systems across its varied geography. The Indo-Gangetic Plain features extensive, productive alluvial aquifers, while Peninsular India has less permeable hard rock aquifers in the Deccan Plateau and sedimentary basins. Arid regions like Rajasthan and Gujarat experience scanty rainfall and feature less productive, shallow aquifers. The hydrogeological map of India is depicted in Figure -1 and the geographical distribution of hydrogeological units along with their Groundwater potential is given in Table 1.

Table1. Aquifer System in the Country

System	Coverage	Groundwater potential
Unconsolidated formations - alluvial	Indo-Gangetic, Brahmaputra plains	Highly productive system down to 600 m depth.
	Coastal Areas	Reasonably extensive aquifers but risk of saline water intrusion
	Arid areas	Scanty rainfall. Salinity hazards. Groundwater availability at great depths.
Consolidated/semi-consolidated formations - sedimentary, basalts & crystalline rocks	Peninsular Areas	Groundwater available in fractures and in weathered zones with varying yield at shallower depths (20-40 m) in some areas and deeper depths (100-200 m) in other areas.
Hilly	Hilly states	Low storage capacity due to quick runoff

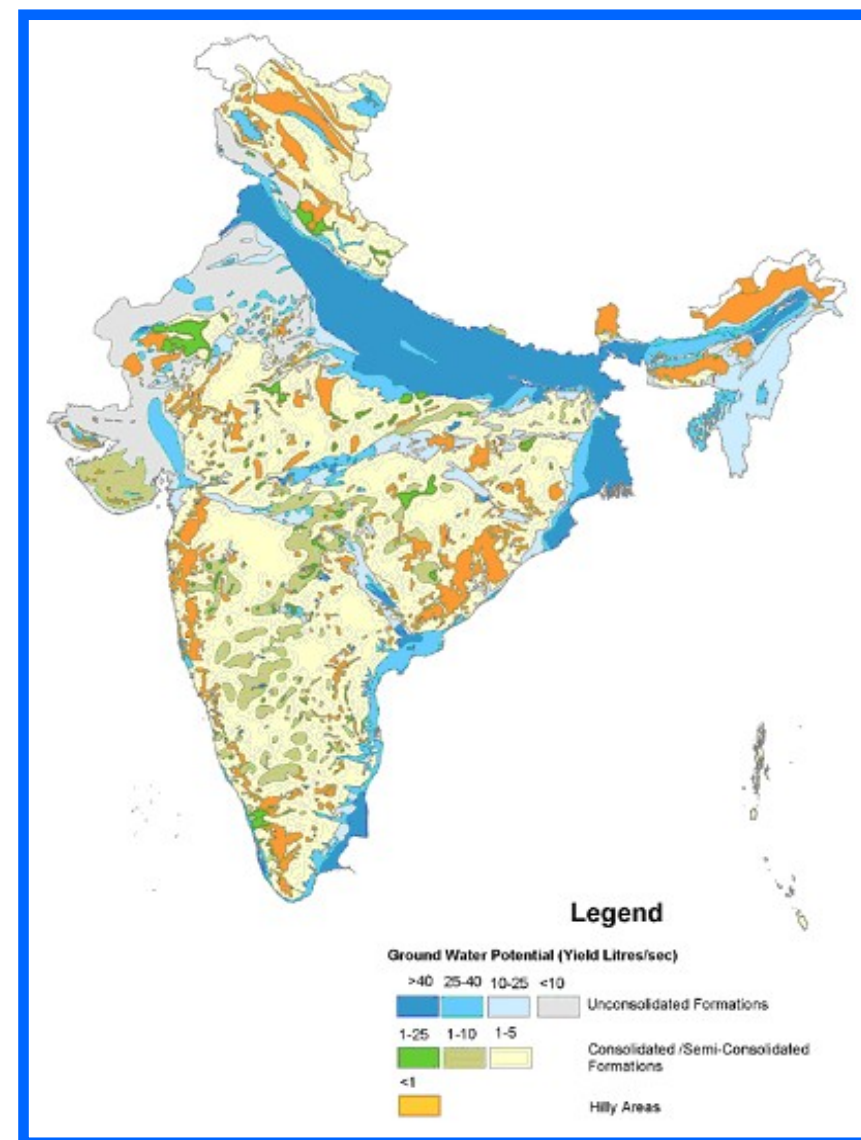


Figure 1: Map showing major aquifers and geomorphic divisions

3.0 GROUND WATER LEVEL MONITORING

Central Ground Water Board is monitoring changes in groundwater regime in the country on quarterly basis continuously. This is facilitated by a network of monitoring stations in the country located in diverse hydrogeological and geomorphic units. The number of operational wells till March 2024 was 27163 which include 16516 dug wells, 9552 piezometers, 913 Handpumps and 182 Springs.

The state-wise breakup of the water level monitoring stations is given in Table 2.

Table 2. state-wise water level monitoring stations

State/UT	Dug Well	Piezometer	Hand pump	Spring	Total
Andhra Pradesh	676	797	0	0	1473
Arunachal Pradesh	26	6	0	0	32
Assam	355	80	8	0	443
Bihar	796	120	0	0	916
Chhattisgarh	1044	269	5	0	1318
Goa	83	52	0	0	135
Gujarat	789	504	0	0	1293
Haryana	478	819	0	0	1297
Himachal Pradesh	138	55	0	24	217
Jharkhand	460	122	0	0	582
Karnataka	1360	931	0	0	2291
Kerala	1330	296	0	24	1650
Madhya Pradesh	1386	485	0	0	1871
Maharashtra	1779	296	0	0	2075
Manipur	4	0	0	2	6
Meghalaya	67	13	0	19	99
Mizoram	3	0	0	0	3
Nagaland	99	1	0	28	128
Odisha	1507	277	0	0	1784
Punjab	175	995	0	0	1170
Rajasthan	642	660	0	0	1302
Sikkim	0	4	0	0	4
Tamil Nadu	743	694	0	0	1437
Telangana	273	1008	0	0	1281
Tripura	97	18	0	0	115
Uttar Pradesh	978	486	0	0	1464
Uttarakhand	39	12	149	79	279
West Bengal	695	286	751	0	1732
Andaman & Nicobar	111	2	0	0	113

Chandigarh	1	22	0	0	23
DD and DNH	38	5	0	0	43
Delhi	22	113	0	0	135
Jammu and Kashmir	313	106	0	6	425
Puducherry	9	18	0	0	27
Total	16516	9552	913	182	27163

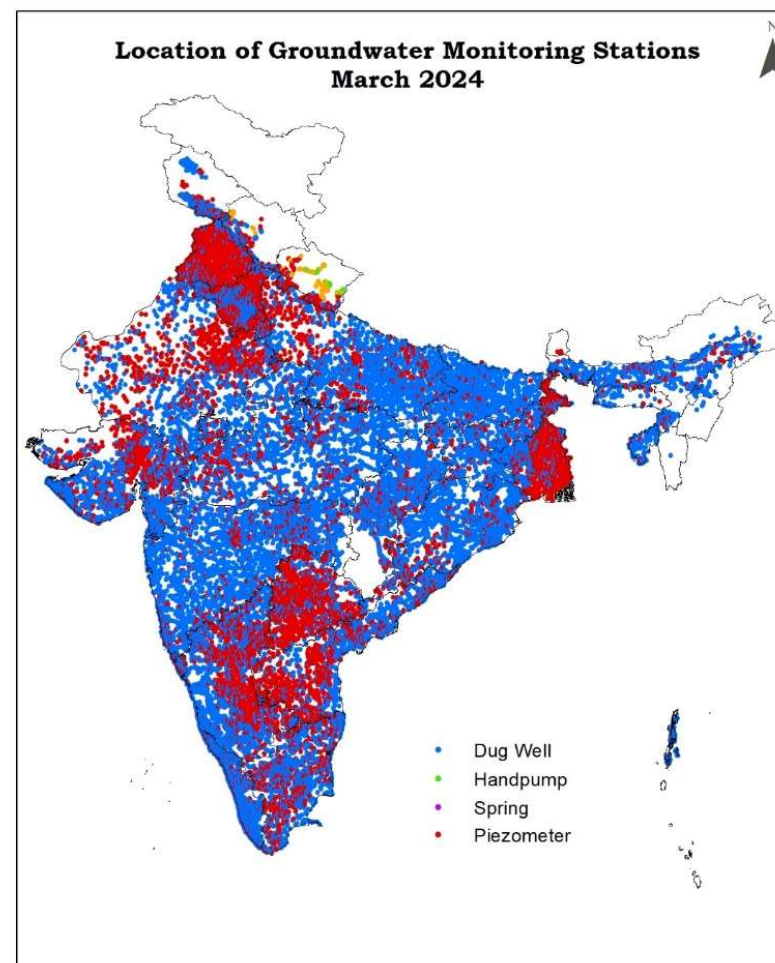


Figure 2: Location of groundwater monitoring stations

4.0 RAINFALL

The state-wise rainfall data was collected from the India Meteorological Department (IMD) to analyze the rainfall patterns during the monsoon period. Table 3 presents the normal rainfall and actual rainfall for each state during the Southwest Monsoon of 2023 and 2024, along with the departures from normal rainfall. It also indicates the percentage increase in monsoon rainfall in 2024 compared to 2023.

Observations show that in 2024, the SW Monsoon rainfall had a 7.6% departure from the normal rainfall. Additionally, during the SW Monsoon of 2024, a 14.0% increase in rainfall was recorded compared to the Southwest Monsoon of 2023.

Table3. State-wise rainfall (mm) during SW Monsoon 2023 and 2024.

State/UTs	Normal Rainfall	Actual Rainfall 2023	% Deviation	Actual Rainfall 2024	% Deviation	% Deviation 2024 to 2023
Andhra Pradesh	521.6	485.9	-6.8	662.9	27.1	36.4
Arunachal Pradesh	1675.1	1466.3	-12.5	1200	-28.4	-18.2
Assam	1479.1	1176.9	-20.4	1202.3	-18.7	2.2
Bihar	992.2	760.6	-23.3	798.7	-19.5	5.0
Chhattisgarh	1132.2	1061.3	-6.3	1231.7	8.8	16.1
Delhi	544.3	542.2	-0.4	658.3	20.9	21.4
DNH & DD	2206.5	2476.5	12.2	2885.2	30.8	16.5
Goa	3007.7	3367.8	12.0	4400.5	46.3	30.7
Gujarat	711.9	841.7	18.2	1055.4	48.3	25.4
Haryana	426	419.7	-1.5	408.7	-4.1	-2.6
Himachal Pradesh	734.4	876.4	19.3	594.7	-19.0	-32.1
Jammu & Kashmir	549.1	574.2	4.6	408.5	-25.6	-28.9
Jharkhand	1022.9	755.7	-26.1	1011.6	-1.1	33.9
Karnataka	831.8	681.1	-18.1	927.3	11.5	36.1
Kerala	2018.6	1327.4	-34.2	1748.2	-13.4	31.7
Ladakh	22.3	45.2	102.7	26	16.6	-42.5

Madhya Pradesh	949.5	947.3	-0.2	1121.2	18.1	18.4
Maharashtra	994.5	965.7	-2.9	1252.1	25.9	29.7
Manipur	1038.8	565.1	-45.6	714.3	-31.2	26.4
Meghalaya	2695.3	2272.3	-15.7	2430.2	-9.8	6.9
Mizoram	1626.1	1470	-9.6	1349.2	-17.0	-8.2
Nagaland	1038.8	934.9	-10.0	701.3	-32.5	-25.0
Odisha	1150.2	1115.4	-3.0	1091.9	-5.1	-2.1
Puducherry	418	462.4	10.6	497	18.9	7.5
Punjab	439.8	417.5	-5.1	314.8	-28.4	-24.6
Rajasthan	435.6	499.7	14.7	678.4	55.7	35.8
Sikkim	1672.9	1753.6	4.8	2040.8	22.0	16.4
Tamil Nadu	328.4	353.9	7.8	389	18.5	9.9
Telangana	734.8	846.8	15.2	948.3	29.1	12.0
Tripura	1391.1	1221.9	-12.2	1578.4	13.5	29.2
Uttar Pradesh	746.2	620.9	-16.8	744.9	-0.2	20.0
Uttarakhand	1162.7	1210.8	4.1	1273.4	9.5	5.2
West Bengal	1344.2	1202.4	-10.5	1391	3.5	15.7
Total	868.6	820	-5.6	934.8	7.6	14.0

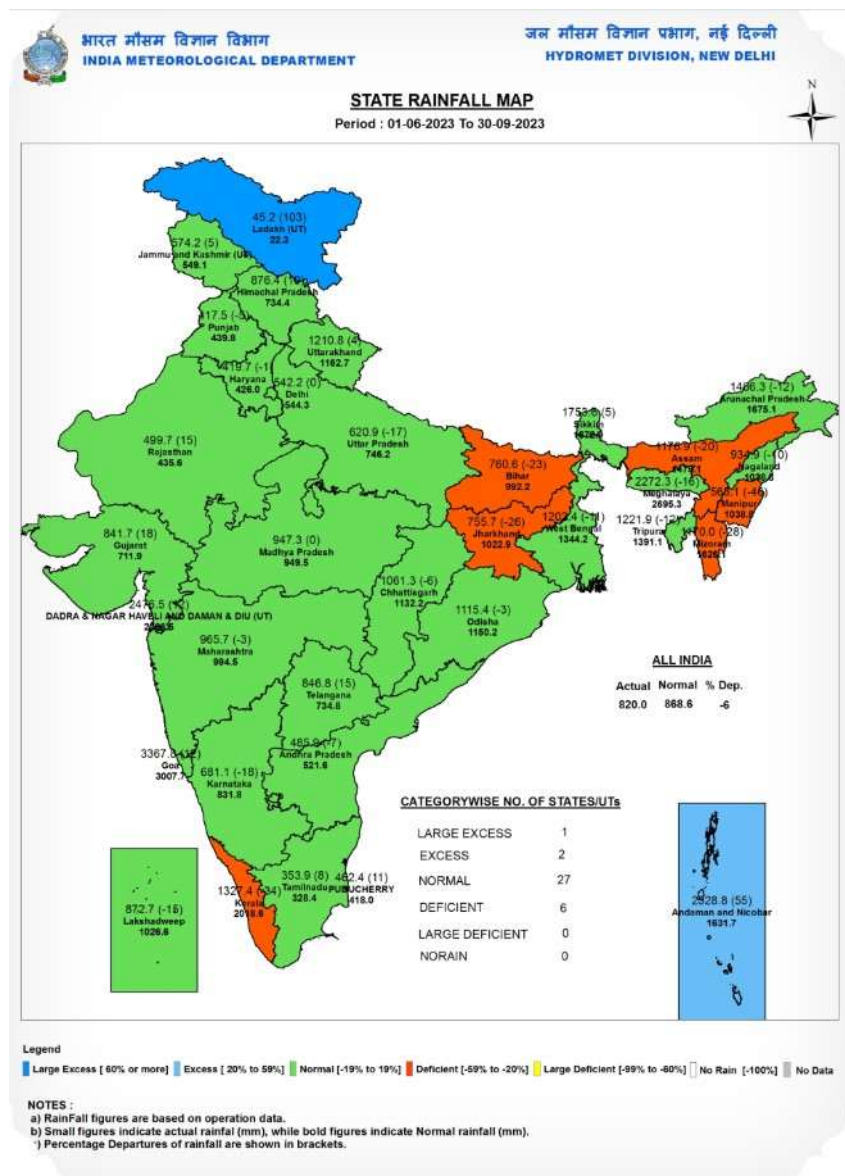


Figure 3: State-wise rainfall pattern during monsoon period 2023



Figure 4: State-wise rainfall pattern during monsoon period 2024

5.0 GROUND WATER LEVEL SCENARIO (NOVEMBER 2024)

5.1 SHALLOW AQUIFER (UNCONFINED)

5.1.1 DEPTH TO WATER LEVEL

Depth To Water Level in Unconfined Aquifer (November 2024)

The groundwater level data for November 2024 indicates that out of the total 16981 wells analysed, 24.2% wells are showing water level less than 2 m bgl (meter below ground level), 44.0% wells are showing water level in the depth range of 2 to 5 m bgl, 21% wells are showing water level in the depth range of 5 to 10 m bgl, 6.2% wells are showing water level in the depth range of 10 to 20 m bgl, 2.7% wells are showing water level in the depth range of 20 to 40 m bgl and the remaining 1.9% wells are showing water level more than 40 m bgl. (Fig. 5).

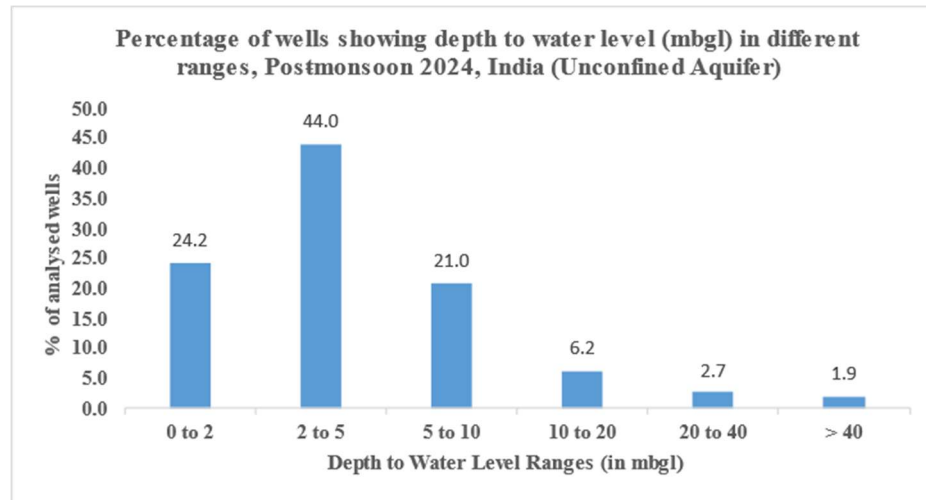


Figure 5: Number of wells showing depth to water level (mbgl) in different ranges, November 2024 in unconfined aquifers, India

Groundwater level data of November 2024 for the country reveals that the general depth to water level of the country ranges from 0-10 m bgl. A very shallow water level of less than 10 m bgl is observed in almost all states in patches except Haryana, Himachal, Punjab, Rajasthan, Chandigarh and Delhi. In major parts of north-western

and western states, especially in the states of Delhi, Haryana, Punjab and Rajasthan, depth to water level is generally deeper and ranges from about 20 to more than 40 m bgl. (Fig. 6).

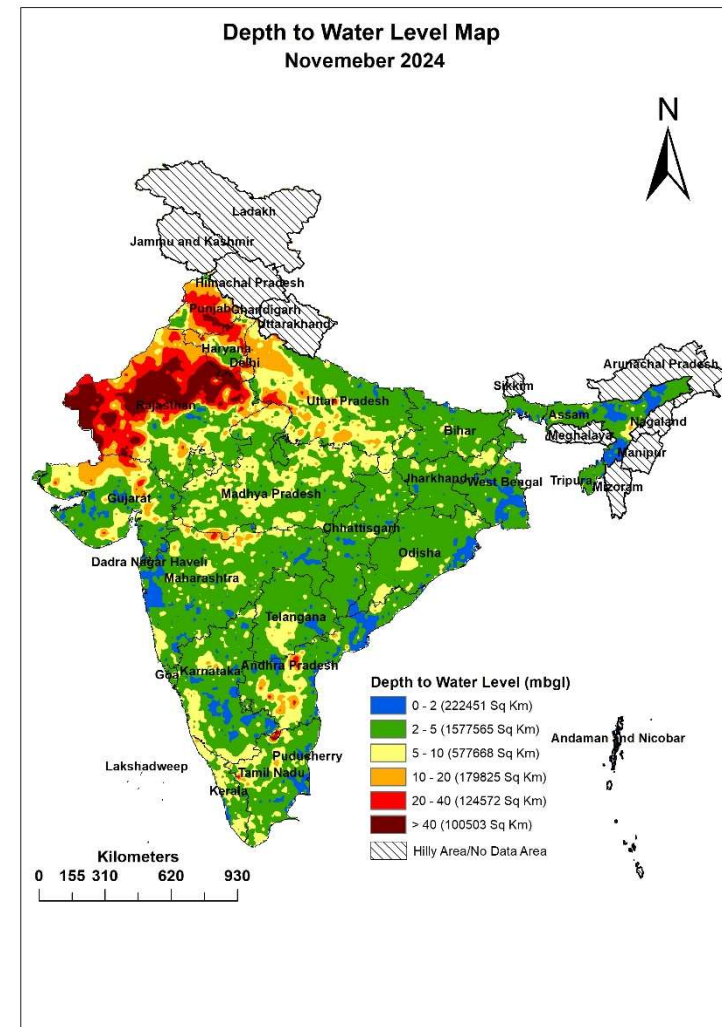


Figure 6: Depth to water level of unconfined aquifer during November 2024

5.1.2 ANNUAL FLUCTUATION IN WATER LEVEL

Annual Fluctuation of Water Level in Unconfined Aquifer (November 2023 to November 2024)

The groundwater level fluctuation analysis done in 15096 wells. The water level fluctuation of November 2023 compared to November 2024 shows that, 9076 (60.1%) are showing rise and 5938 (39.3%) are showing fall in water level. The remaining 82 (0.6%) stations analysed do not show any change in water level. (Fig. 7).

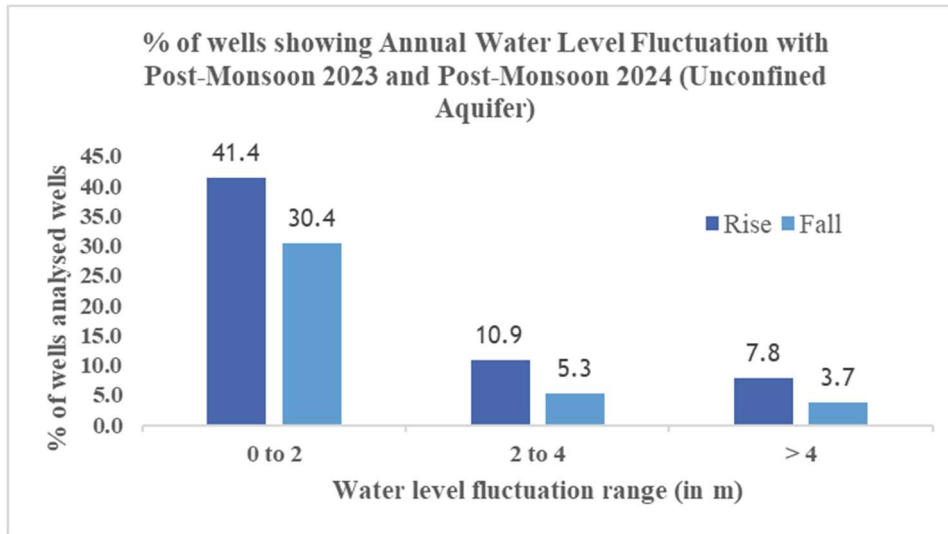


Figure 7: Annual Water Level Fluctuation & Frequency Distribution of Different Ranges from November 2023 to November 2024 in unconfined aquifer, India

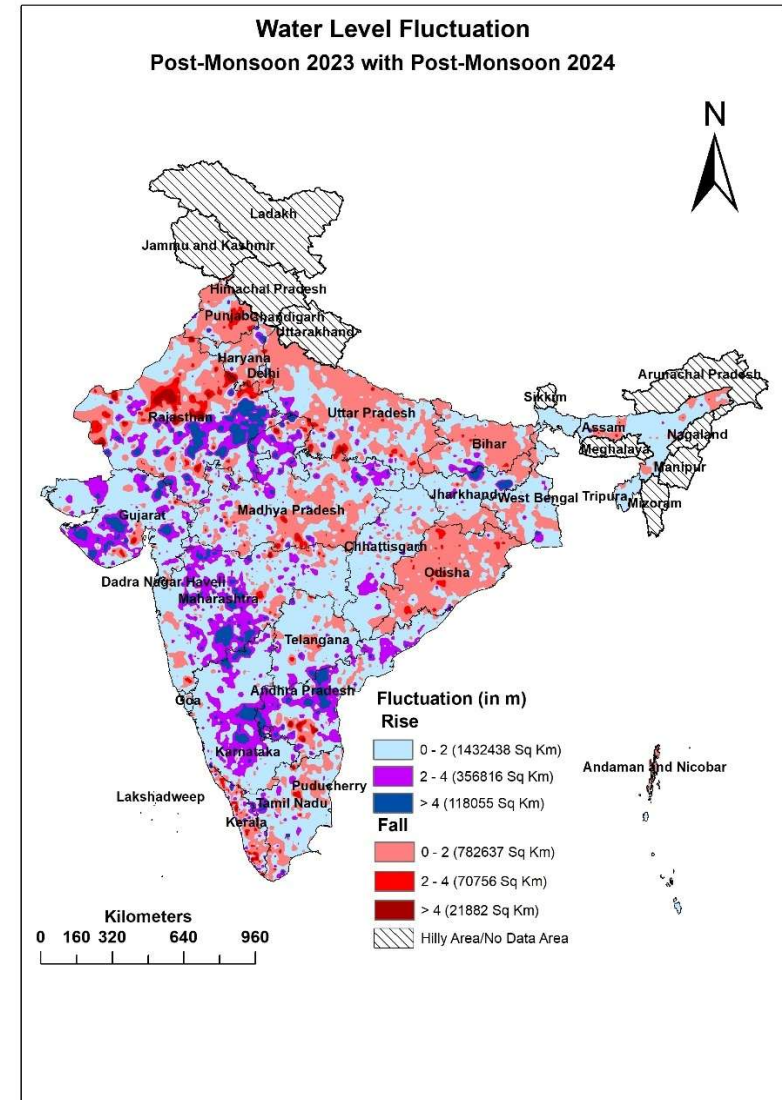


Figure 8: Annual water level fluctuation in unconfined aquifer (November 2023 to November 2024)

Rise in Water Levels:

About 41.4% wells are showing rise in the water level in the range of less than 2 m. About 10.9% wells are showing rise in water level in 2 to 4 m range and 7.8% wells showing rise in water level more than 4 m range. Rise in water level is prominently observed in patches in the states of Chhattisgarh, Goa, Gujarat, Jharkhand, Karnataka, Maharashtra, Eastern Rajasthan and Tripura.

Fall in Water Levels:

About, 30.4% wells are showing decline in water level in less than 2 m range. About 5.3% wells are showing decline in water level in 2 to 4 m range and 3.7% wells are showing decline in water level more than 4 m range. Fluctuation is mainly in the range of 0 to 2 m. A comparison of depth to water level of November 2023 to November 2024 also reveals that fall in the water level is prominently observed in part of the states such as Bihar, Haryana, Madhya Pradesh, Odisha, Punjab, Telangana, Tamil Nadu, Puducherry, Uttar Pradesh and Chandigarh. (Fig. 8).

Annual Fluctuation of Water Level in Unconfined Aquifer (November 2022 to November 2024)

The groundwater level fluctuation analysis done in 13854 wells. The water level fluctuation of November 2022 compared to November 2024 shows that, 6966 (50.3%) are showing rise and 6779 (48.9%) are showing fall in water level. The remaining 109 (0.8%) stations analysed do not show any change in water level. (Fig. 9).

Rise in Water Levels:

About 40.4% wells are showing rise in the water level in the range of less than 2 m. About 6.4% wells are showing rise in water level in 2 to 4 m range and 3.5% wells showing rise in water level more than 4 m range. Fluctuation is mainly in the range of 0 to 2 m. A rise in water level is observed in the scattered pattern in parts of the states of Assam, Bihar, Delhi, Goa, Jharkhand, Rajasthan, Tamil Nadu and West Bengal.

Fall in Water Levels:

About, 48.9% of the total analysed wells are showing a declining water level, out of which, 38.7% wells are showing decline in water level in less than 2 m range. About 7.0% wells are showing decline in water level in 2 to 4 m range and 3.3% wells are showing decline in water level more than 4 m range. Fluctuation is mainly in the range of 0 to 2 m. A comparison of depth to water level of November 2022 to

November 2024 also reveals that fall in water level is observed in all over the county especially in the parts of states of Andhra Pradesh, Haryana, Karnataka, Madhya Pradesh, Odisha, Punjab Telangana, and Uttar Pradesh.

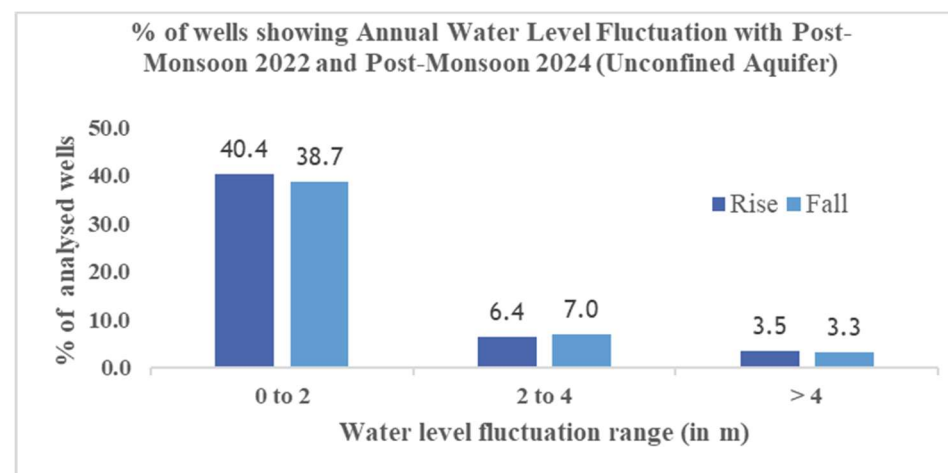


Figure 9: Annual Water Level Fluctuation & Frequency Distribution of Different Ranges from November 2022 to November 2024 in unconfined aquifer, India

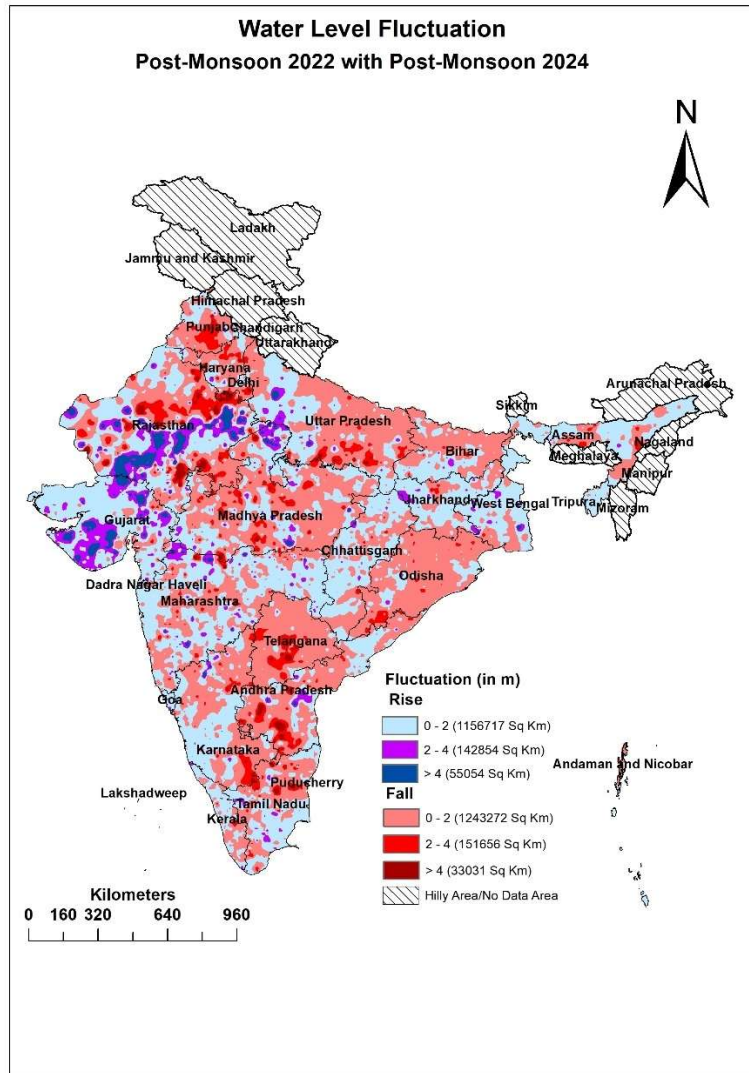


Figure 10: Annual water level fluctuation in unconfined aquifer (November 2022 to November 2024)

5.1.3 SEASONAL FLUCTUATION IN WATER LEVEL

Seasonal Fluctuation of Water Level in Unconfined Aquifer (Pre-monsoon 2024 to Post-monsoon 2024)

The groundwater level fluctuation analysis done in 14876 wells. A comparison of depth to water level of November 2024 with Pre-monsoon 2024 indicate that, 13315 (89.5%) are showing rise and 1522 (10.2%) are showing fall in water level. Remaining 39 (0.3%) stations analysed do not show any change in water level. (Fig. 11).

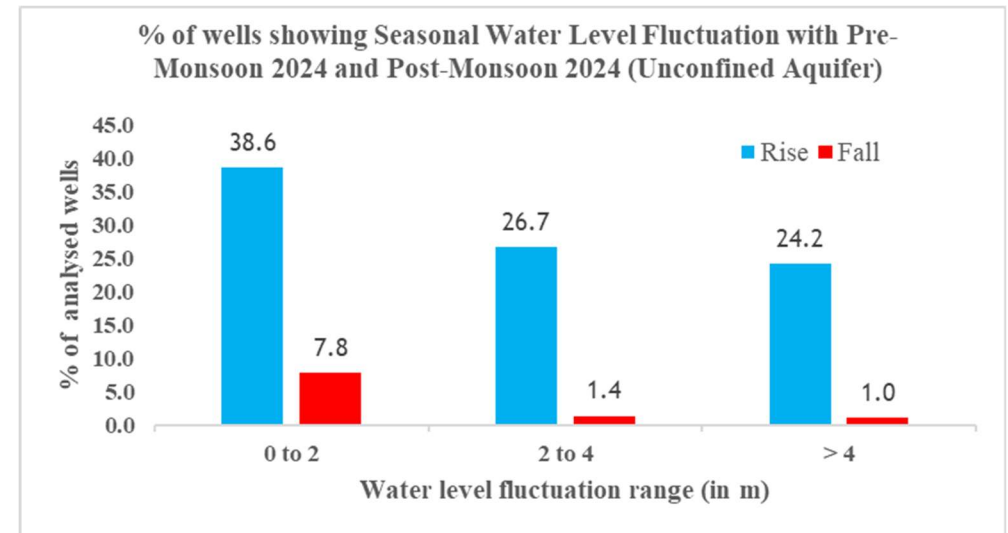


Figure 11: Seasonal Water Level Fluctuation with Pre-monsoon 2024 and Post-monsoon 2024 in an unconfined aquifer, India

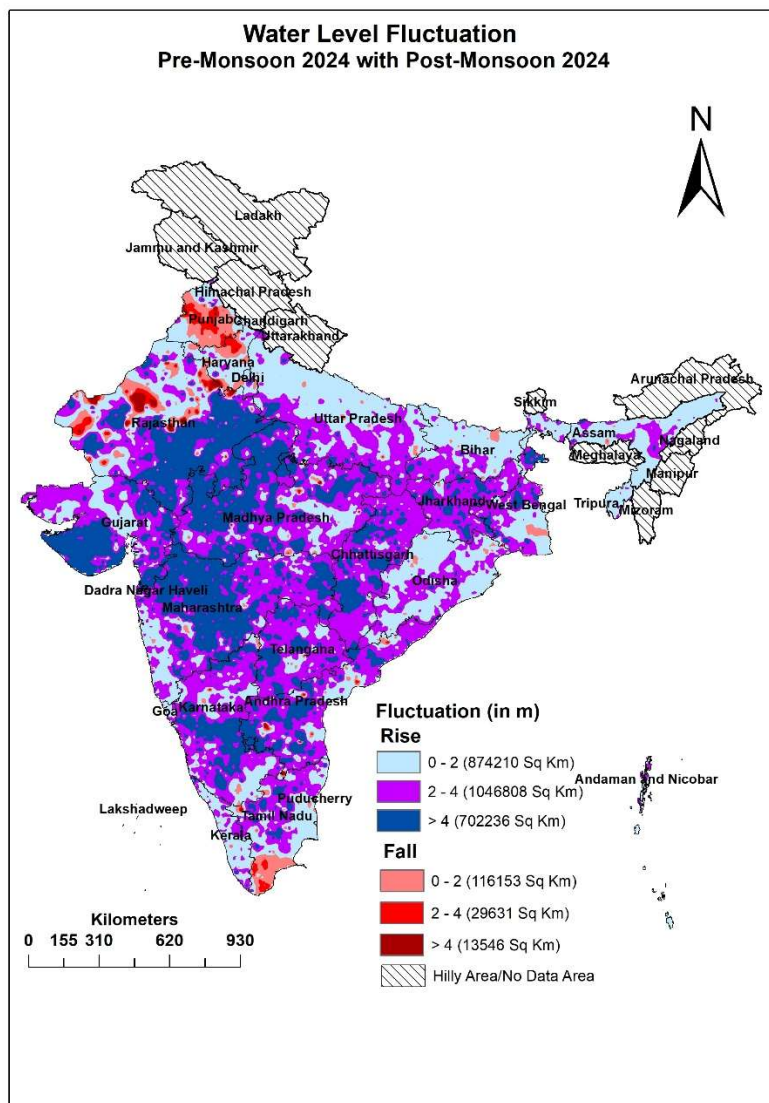


Figure 12: Seasonal Water Level Fluctuation with Pre-monsoon 2024 and November 2024 in an unconfined aquifer, India

Rise in Water Levels:

About 38.6% wells are showing rise of water level less than 2 m. About 26.7% wells are showing rise in water level in the range of 2 to 4 m and about 24.2% wells are showing rise in water level in the range of more than 4 m. Rise in water level is prominently observed in all the states except Punjab.

Fall in Water Levels:

About 7.8% wells are showing decline in water in the range of 0 to 2 m. 1.4% wells are showing decline in water level in 2 to 4 m range and the remaining 1.0% are in the range of more than 4 m. Fall is mostly in the range of 0 to 2 m observed in patches in few states like Punjab, Haryana, Rajasthan and Tamil Nadu (Fig. 12).

Seasonal Fluctuation of Water Level in Unconfined Aquifer (August 2024 to Post-monsoon 2024)

The groundwater level fluctuation analysis done in 15351 wells. A comparison of depth to water level of November 2024 with August 2024 indicates that, 5337 (34.8%) are showing rise and 9935 (64.7%) are showing fall in water level. Remaining 79 (0.5%) stations analysed do not show any change in water level. (Fig. 11).

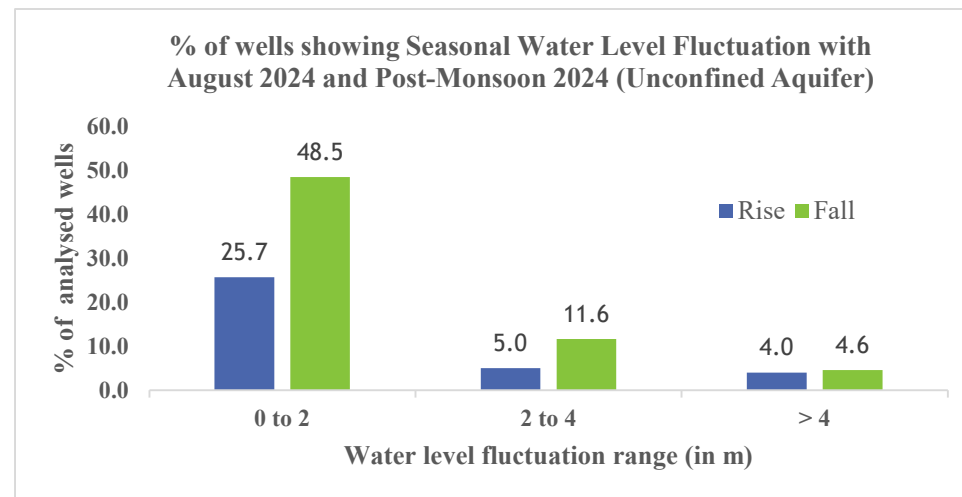


Figure 11: Seasonal Water Level Fluctuation with August 2024 and Post-monsoon 2024 in an unconfined aquifer, India

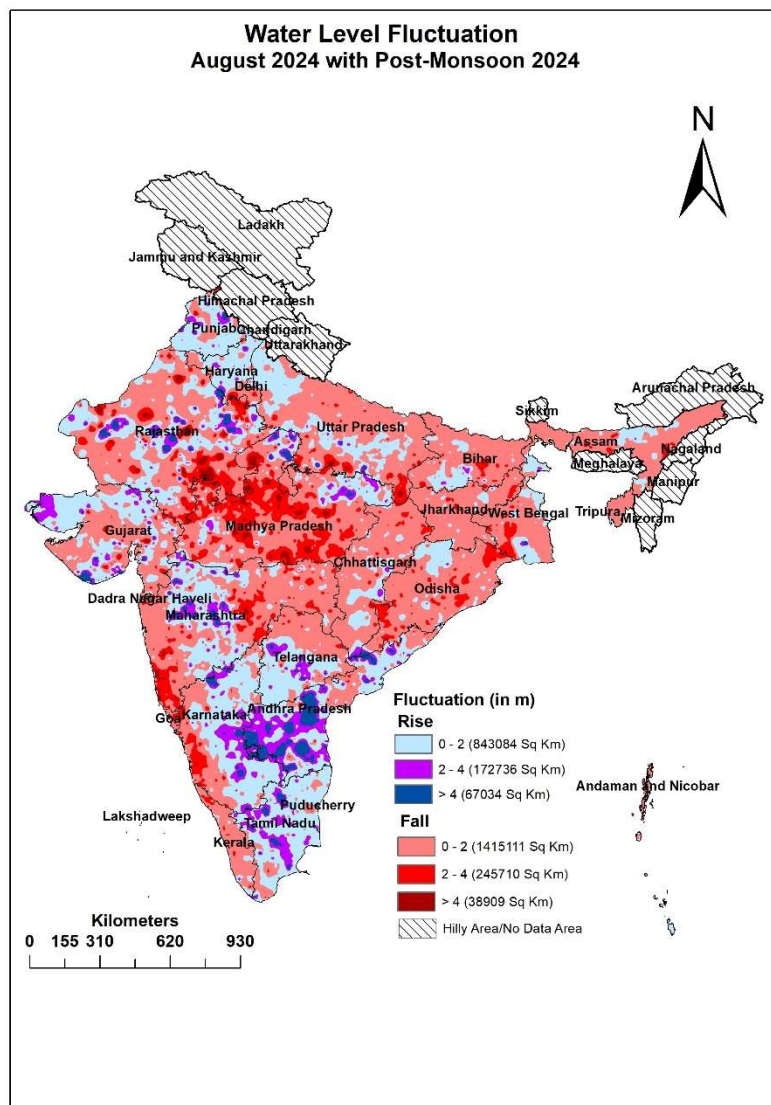


Figure 12: Seasonal Water Level Fluctuation with August 2024 and November 2024 in an unconfined aquifer, India

Rise in Water Levels:

About 25.7% wells are showing rise of water level less than 2 m. About 5.0% wells are showing rise in water level in the range of 2 to 4 m and about 4.0% wells are showing rise in water level in the range of more than 4 m. Rise in water level is prominently observed in all the parts of states Andhra Pradesh, Tamil Nadu, Puducherry, Punjab and Haryana.

Fall in Water Levels:

About 48.5% wells are showing decline in water in the range of 0 to 2 m. 11.6% wells are showing decline in water level in 2 to 4 m range and the remaining 4.6% are in the range of more than 4 m. Fall is mostly in the range of 0 to 2 m is significantly observed in all states except Andhra Pradesh, Tamil Nadu, Puducherry, Punjab and Haryana (Fig. 12).

5.1.4 DECADAL FLUCTUATION IN WATER LEVEL

Decadal Fluctuation of Water Level in Unconfined Aquifer (Decadal Mean Post-monsoon (2014-2023) to Post-monsoon 2024)

The groundwater level fluctuation analysis done in 13358 wells. A comparison of depth to water level of Post-monsoon 2024 with decadal mean of Post-monsoon (2014-2023) indicate that, 8420 (63.0%) are showing rise and 4883 (36.6%) are showing fall in water level. Remaining 55 (0.4%) stations analysed do not show any change in water level. (Fig. 13).

Rise in Water Levels:

About 46.8% wells are showing rise of water level less than 2 m. About 10.4% wells are showing rise in water level in the range of 2 to 4 m and about 5.9% wells are showing rise in water level in the range of more than 4 m. Rise in water level is prominently observed in the states of Andaman & Nicobar, Andhra Pradesh, Arunachal, Assam, Bihar, Chhattisgarh, Chandigarh, Delhi, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Telangana, Tripura, West Bengal, and south eastern part of Rajasthan.

Fall in Water Levels:

About 30.2% wells are showing decline in water in the range of 0 to 2 m. 4.2% wells are showing decline in water level in 2 to 4 m range and the remaining 2.1% are in the range of more than 4 m. Fall is mostly in the range of 0 to 2 m observed in patches

in northern states like Haryana, Himchal Pradesh, Jammu & Kashmir, Meghalaya, Nagaland, Odisha, Punjab, Eastern Uttar Pradesh and Uttarakhand.

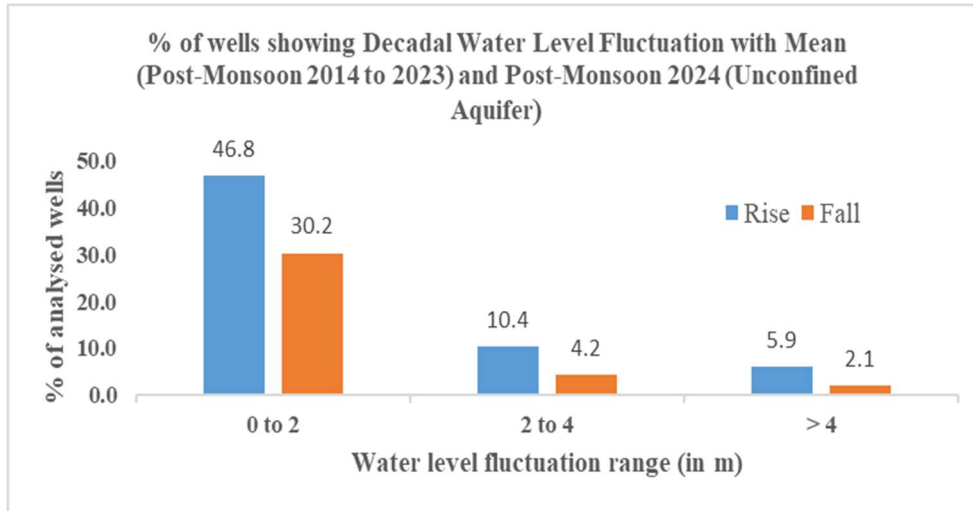


Figure 13: Decadal Water Level Fluctuation with mean (Post-monsoon 2014 to 2023) and Post-monsoon 2024 in unconfined aquifer, India

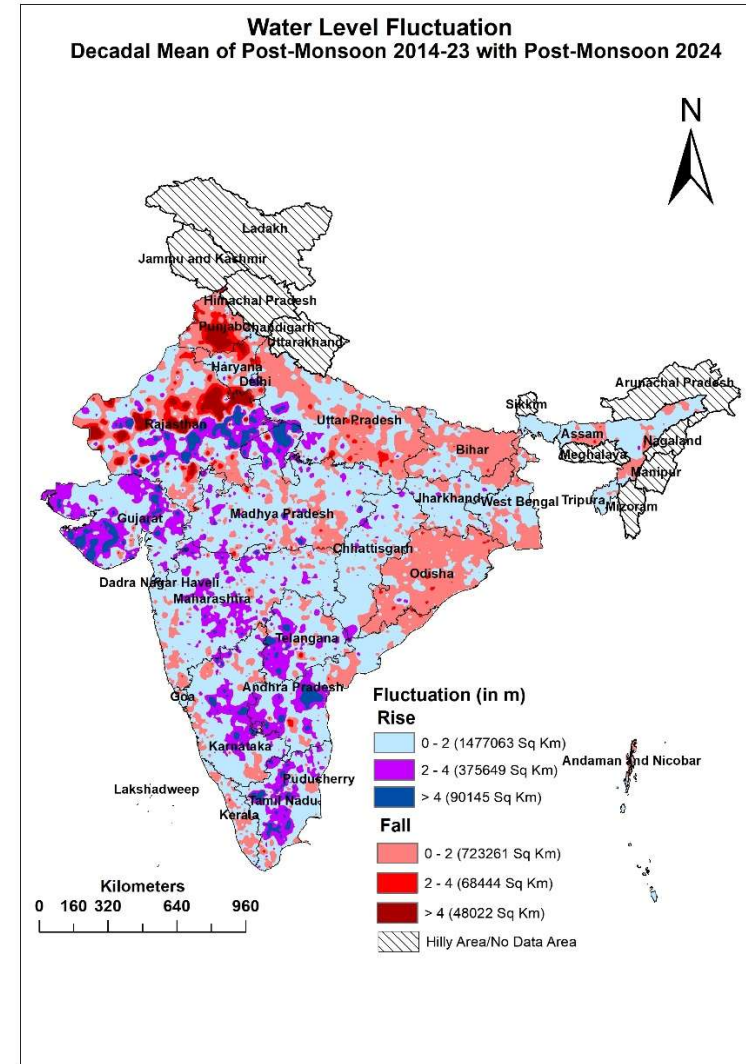


Figure 14: Decadal Water Level Fluctuation with mean (Post-monsoon 2014 to 2023) and Post-monsoon 2024 in unconfined aquifer, India

5.2 DEEPER AQUIFER (CONFINED/ SEMI-CONFINED)

5.2.1 DEPTH TO PIEZOMETRIC LEVEL/ HEAD

Depth To Piezometric Level in Confined/Semi-Confined Aquifer (Post-monsoon 2024)

The piezometric water level of confined aquifers for Post-monsoon 2024 indicates that out of the total 5468 wells analysed. It is observed from the analysis that the piezometric water level of 10.8% wells are less than 2 m bgl, 27.1% wells are in the depth range of 2 to 5 m bgl, 26.9% wells are in the depth range of 5 to 10 m bgl, 20.7% wells in the depth range of 10 to 20 m bgl, 9.1% wells are in the depth range of 20 to 40 m bgl and the remaining 5.4% wells have more than 40 m bgl. (Fig. 15). Thus, the country's typical range of piezometric water levels is less than 20 meters. From the analysis of the data, it's also revealed that deeper piezometric level of more than 20 m is prominently observed in Chandigarh, Gujarat, Haryana, Punjab and Puducherry

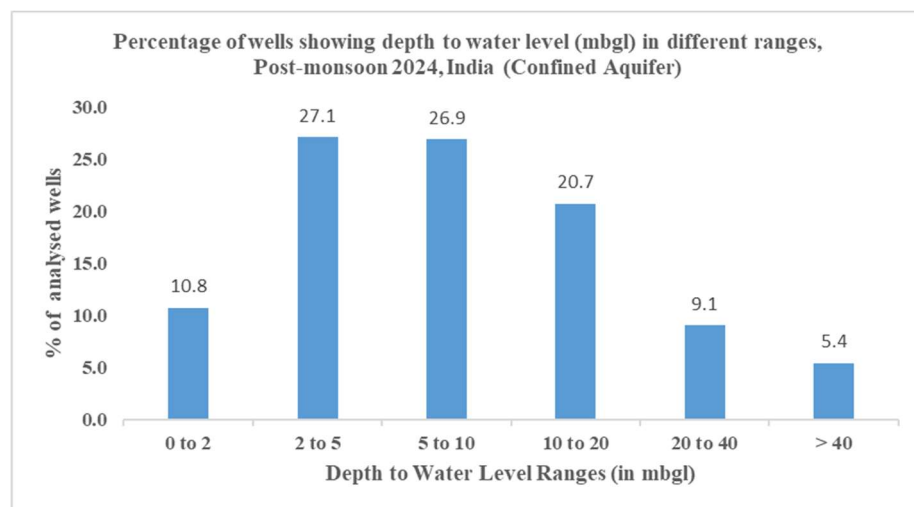


Figure 15: Number of wells showing depth to piezometric water level (mbgl) in different ranges Post-monsoon 2024 in confined aquifers, India

5.2.2 ANNUAL FLUCTUATION IN PIEZOMETRIC HEAD

Annual Fluctuation of Piezometric Water Level in confined Aquifer (Post-monsoon 2023 to Post-monsoon 2024)

A comparison of depth to piezometric water level of Post-monsoon 2024 with Post-monsoon 2023 reveals that out of a total of 4366 wells analysed, 2747 (62.9%) of wells are showing rise in piezometric water level, among which 33.8% wells are showing rise of less than 2 m. About 13.2% wells are showing rise in water level in the range of 2 to 4 m and 16.0% wells are showing rise in the range of more than 4 m. Among the 1612 (36.92%) wells showing decline in water level, 22.5% wells are showing decline in piezometric level in the range of 0 to 2 m. 6.0% wells are showing decline in piezometric water level in 2 to 4 m range and remaining 8.3% are in the range of more than 4 m. 7 wells are showing no change in their piezometric head. (Fig. 16).

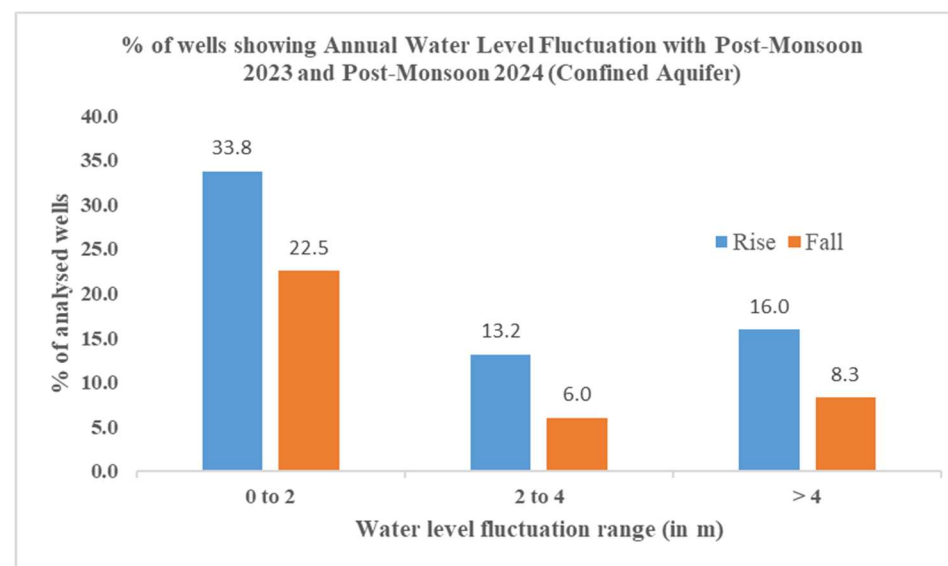


Figure 16: Annual Piezometric Water Level Fluctuation & Frequency Distribution of Different Ranges from Post-monsoon 2023 to Post-monsoon 2024 in confined aquifer, India

Rise in piezometric water level in the majority of wells observed in Andhra Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nādu, Telangana, Tripura, West Bengal and Chandigarh. Similarly fall in the significant number of wells is observed in Haryana, Jharkhand, Kerala, Odisha, Punjab and Uttar Pradesh.

Annual Fluctuation of Piezometric Water Level in confined Aquifer (Post-monsoon 2022 to Post-monsoon 2024)

A comparison of depth to piezometric water level of Post-monsoon 2024 with Post-monsoon 2022 reveals that out of a total of 3346 wells analysed, 1368 (40.9%) of wells are showing rise in piezometric water level, among which 26.5% wells are showing rise of less than 2 m. About 7.6% wells are showing rise in water level in the range of 2 to 4 m and 6.8% wells are showing rise in the range of more than 4 m. Among the 1970 (58.9%) wells showing decline in water level, 32.0% wells are showing decline in piezometric level in the range of 0 to 2 m. 12.3% wells are showing decline in piezometric water level in 2 to 4 m range and remaining 14.6% are in the range of more than 4 m. 4 wells are showing no change in their piezometric head. Fall in piezometric water level is observed in almost the entire country except Chhattisgarh, Goa, Gujarat, Jharkhand, Karnataka, Maharashtra, Tripura and West Bengal (Fig. 17).

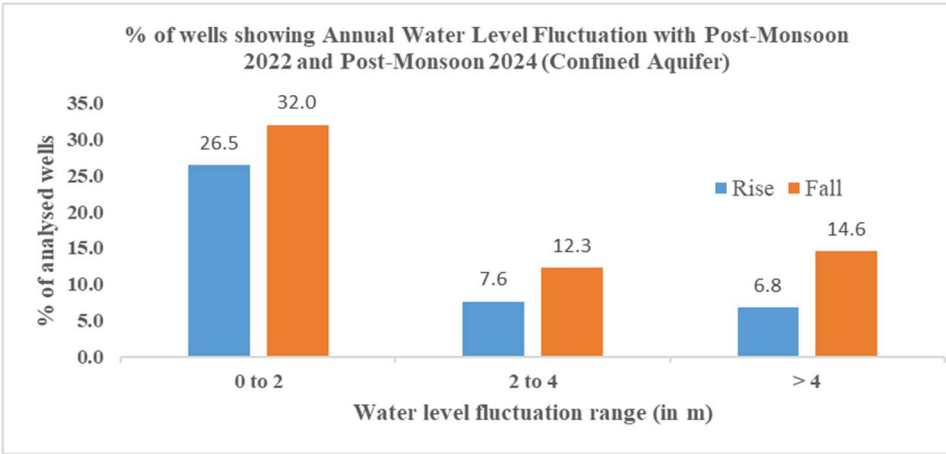


Figure 17: Annual Piezometric Water Level Fluctuation & Frequency Distribution of Different Ranges from Post-monsoon 2022 to Post-monsoon 2024 in confined aquifer, India

5.2.2 SEASONAL FLUCTUATION IN PIEZOMETRIC HEAD

Seasonal Fluctuation of Piezometric Water Level in Confined Aquifer (Pre-monsoon 2024 to Post-monsoon 2024)

A comparison of depth to piezometric water level of Pre-monsoon 2024 with Post-monsoon 2024 reveals that out of a total of 4604 wells analysed, 4022 (87.4%) of wells are showing rise in piezometric water level, among which 23.1% wells are showing rise of less than 2 m. About 23.2% wells are showing rise in water level in the range of 2 to 4 m and 41.0% wells are showing rise in the range of more than 4 m. Among the 576 (12.5%) wells showing decline in water level, 6.8% wells are showing decline in piezometric level in the range of 0 to 2 m. 2.4% wells are showing decline in piezometric water level in 2 to 4 m range and remaining 3.4% are in the range of more than 4 m. 6 wells are showing no change in their piezometric head. (Fig. 18).

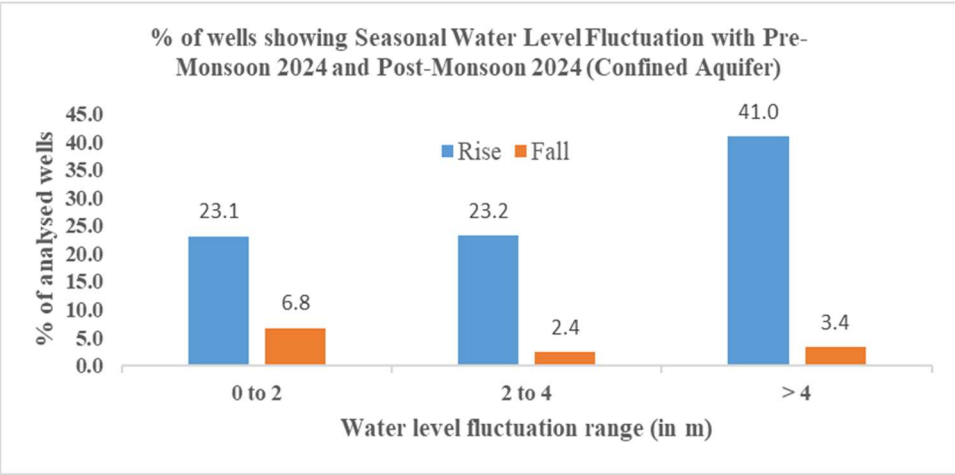


Figure 18: Annual Piezometric Water Level Fluctuation & Frequency Distribution of Different Ranges from Pre-monsoon 2024 to Post-monsoon 2024 in confined aquifer, India

Rise in piezometric water level in the majority of wells observed in almost all states except Haryana, Punjab and Chandigarh.

Seasonal Fluctuation of Piezometric Water Level in Confined Aquifer (August 2024 to Post-monsoon 2024)

A comparison of depth to piezometric water level of August 2024 with Post-monsoon 2024 reveals that out of a total of 4479 wells analysed, 2715 (60.62%) of wells are showing rise in piezometric water level, among which 30.7% wells are showing rise of less than 2 m. About 12.0% wells are showing rise in water level in the range of 2 to 4 m and 17.9% wells are showing rise in the range of more than 4 m. Among the 1755 (39.18%) wells showing decline in water level, 24.8% wells are showing decline in piezometric level in the range of 0 to 2 m. 7.1% wells are showing decline in piezometric water level in 2 to 4 m range and remaining 7.3% are in the range of more than 4 m. 9 wells are showing no change in their piezometric head. (Fig. 18).

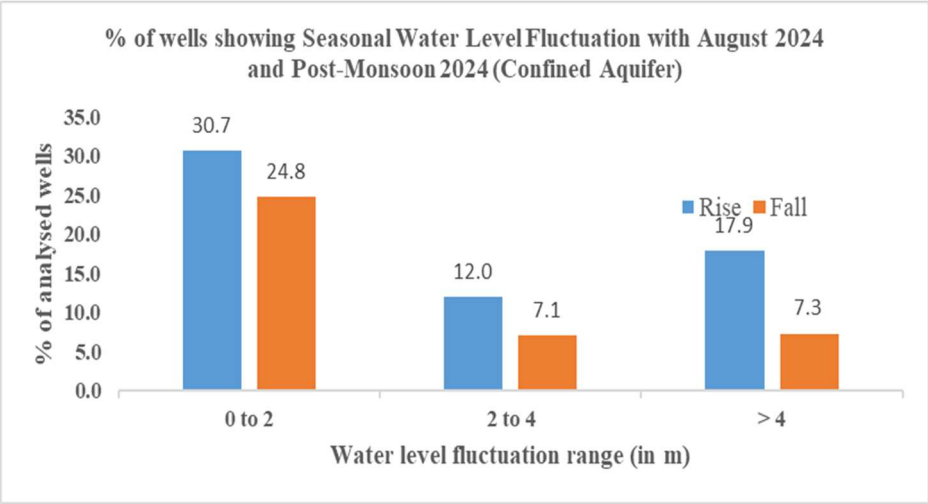


Figure 18: Annual Piezometric Water Level Fluctuation & Frequency Distribution of Different Ranges from August 2024 to Post-monsoon 2024 in confined aquifer, India

Rise in piezometric water level in the majority of wells observed in almost all states except Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Karnataka, Punjab, Tamil Nadu, Telangana and West Bengal

5.2.4 DECADAL FLUCTUATION IN PIEZOMETRIC HEAD

Decadal Fluctuation of Water Level in Confined Aquifer (Decadal Mean Post-monsoon (2014-2023) to Post-monsoon 2024)

A comparison of depth to piezometric water level of post-monsoon 2024 with decadal mean of post-monsoon (2014-2023) indicates that, out of total 1853 wells analysed, 1101 (59.42%) of wells are showing rise in piezometric head, among which 28% wells are showing rise of less than 2 m. About 12.8% wells are showing rise in piezometric head in the range of 2 to 4 m and 18.6 % wells are showing rise in the range of more than 4 m. Among the 747 (40.31%) wells showing decline in piezometric head, 20.2% wells are showing decline in piezometric head in the range of 0 to 2 m. 10.9 wells are showing decline in piezometric head in 2 to 4 m range and remaining 9.2% are in the range of more than 4 m. (Fig. 19).

Rise in piezometric head in majority of wells observed in all states except Goa, Haryana, Odisha, Punjab, and West Bengal.

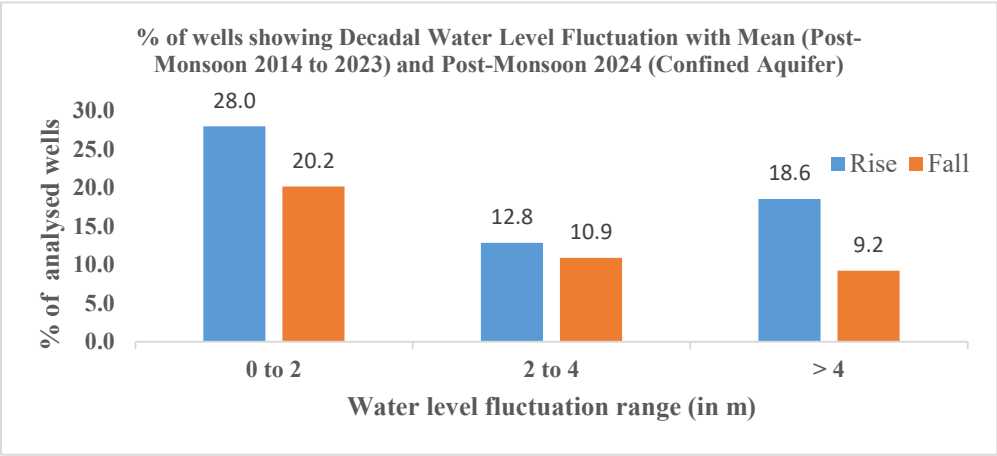


Figure 19: Decadal Piezometric Water Level Fluctuation with mean (post-monsoon 2014 to 2023) and post-monsoon 2024 in confined aquifer, India

6.0 SUMMARY

As a component of the National Ground Water Monitoring Programme, the CGWB conducts monitoring of the groundwater conditions on a quarterly basis: in January, pre-monsoon May, post-monsoon August, and November. As of March 2024, the Central Ground Water Board supervises total 27163 monitoring stations. This comprehensive effort aims to portray the variations in the country's ground water conditions across different aquifers.

In Post-monsoon 2024, around 89% of the country's monitoring stations exhibited a depth to water level within 10 meters below ground level. Deeper water levels of more than 20 m are observed in around 5 % of stations of the country covering mainly the western states, especially Western Rajasthan, Punjab, Haryana and Chandigarh.

The deeper groundwater level in the states like Western Rajasthan, Punjab, Haryana and Chandigarh during Post-monsoon 2024 has been significantly influenced by the deficient rainfall compared to other parts of country during the monsoon period.

Annual water level comparison with the previous year November 2023 to November 2024 has shown that about 60% of total analyzed stations of the country experienced rise in annual water level fluctuation because of the higher rainfall in 2024 compared to 2023 in Monsoon period.

About 63% of analyzed stations of the shallow aquifer experienced a rise of water level in decadal mean water level fluctuation of 2014-2023 with respect to post-monsoon 2024, whereas about 59% of analyzed stations in the deeper aquifers experienced rise in the decadal mean piezometric level of 2014-2023 with respect to Post-monsoon 2024.

Rain water is the primary source for recharging the aquifers. Monsoon period in 2024 witnessed significant fluctuations in rainfall patterns across the country. The evident rise in annual groundwater level during Post-monsoon 2024 in the country can be attributed to a substantial 14% excess rainfall when comparing monsoon 2024 to monsoon 2023.

7.0 RECOMMENDATIONS

1. **Deeper Ground Water level in Post-Monsoon 2024 (Area suitable for AR & RWH)**

The ground water level in the country is deeper in the north western and southern parts covering the states of Punjab, Haryana, Rajasthan , Delhi and Tamil Nadu. Deeper water level and annual decline in water level during post-monsoon indicates poor recharge condition due to insufficient rainfall or higher groundwater pumping resulting in insignificant replenishment of the aquifers due to the monsoon rainfall. Such areas are suitable for Rain Water Harvesting and Artificial recharge. Depending on the area and feasibility, the structures suitable for RWH or AR can be planned with state-specific focus.

2. **Recommendations on Management of depletion in Ground Water Levels**

Based on the nature of aquifer, ground water levels and recharge/discharge characteristics and demand/ supply scenario the ground water management aspects are to be planned. The following practices can be taken into consideration for ground water management planning.

- **Focus on Western States with Deeper Water levels:** In Rajasthan, Punjab, Haryana, and Chandigarh, it is essential to harvest monsoon rainwater and utilize it for artificial recharge. Regular maintenance of recharge structures is recommended to maintain efficiency.
- **Master Plan for Site Selection:** The [MASTER PLAN FOR ARTIFICIAL RECHARGE TO GROUND WATER IN INDIA-2020](#) should be referenced to identify optimal sites for artificial recharge structures.
- **Urban Recharge:** In urban areas with reduced natural recharge, rooftop rainwater harvesting structures would be effective for groundwater recharge and storage.
- **Point Recharge Structures:** These are recommended for recharging deeper aquifers effectively through recharge tubewell/borewells.

2. **Efficient Water Use Practices**

- **Micro-Irrigation:** Promote efficient micro-irrigation practices, especially for water-intensive crops such as paddy and sugarcane.
- **Crop Diversification:** Encourage farmers to shift from water-intensive crops to less water-demanding varieties suitable for local climatic conditions.

- **Water-Efficient Fixtures:** Advocate for the adoption of water-efficient fixtures and low-flow plumbing systems in residential and commercial buildings. Technologies include low-flow faucets, aerators, showerheads, and toilets.
3. **Community-Based Water Management**
 - **Water Budgeting:** Implement water budgeting by Village Panchayats to promote responsible water usage.
 - **Participatory Groundwater Management:** Foster community involvement in groundwater management at the grassroots level to create a sense of ownership and accountability.
 4. **Re-Use of Treated Water**
 - **Treated Sewage Water:** Encourage the reuse of treated sewage water after secondary or tertiary treatment for groundwater recharge, ensuring compliance with water quality standards.
 5. **Reviving Traditional Water Bodies**
 - **Restoration Projects:** Restore traditional water bodies such as ponds, lakes, and historical water harvesting structures to support natural recharge processes.
 6. **Policy and Incentives**
 - **Incentives for Conservation:** Provide financial incentives to industries and farmers adopting water-saving technologies and sustainable water management practices.
 - **Regulatory Measures:** Enforce groundwater extraction regulations, especially in over-exploited regions, to prevent unsustainable depletion.



Central Ground Water Board
 Ministry of Jal Shakti
 Department of Water Resources,
 River Development and Ganga Rejuvenation
 Government of India