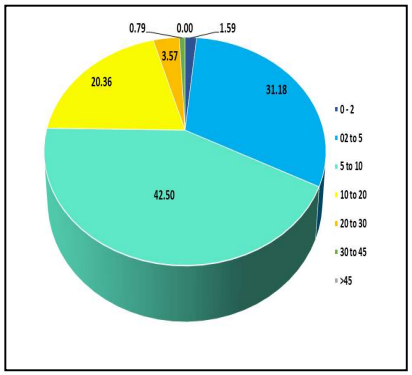

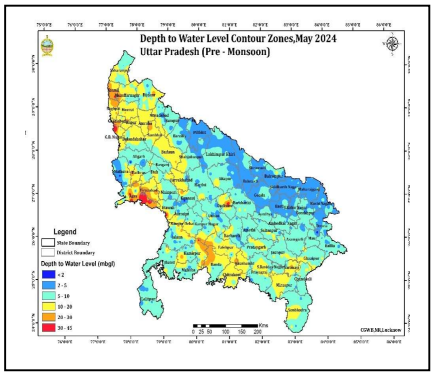

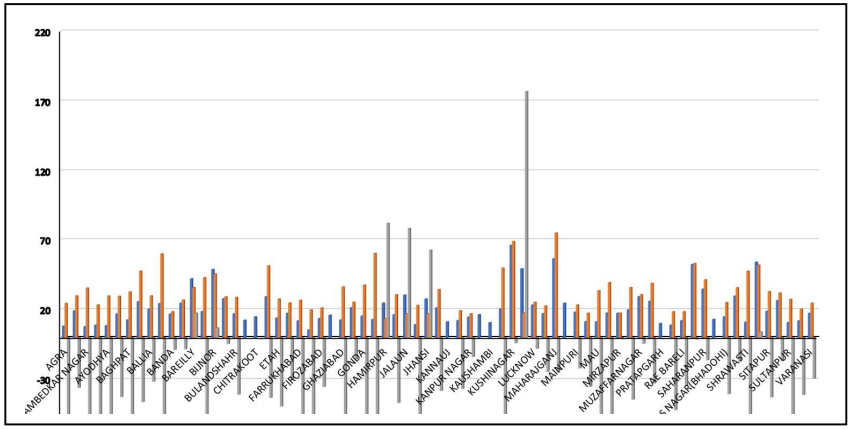

GROUND WATER LEVEL BULLETIN
UTTAR PRADESH
MAY 2024

ABSTRACT

Ground water level Scenario during May – 2024 highlighting the finding, status of ground water level in different aquifer and its seasonal, annual and decadal comparison.

CGWB, NORTHERN REGION LUCKNOW

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 in volve climatic parameters like rainfall, vapor transpiration etc. whereas anthropogenic in fluences 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. A network of 1464 observation wells called National Hydrograph Network Stations (NHNS), as on 30.05.2024, located all over the State is being monitored.

2.0. STUDYAREA

The State of Uttar Pradesh forms a part of vast Gangetic Alluvial Plain covering an area of 2,40,928 Sq. Km. and lies between North latitude $23^0$52'12" & $30^0$24'30" and East longitude $77^0$05'38" & $84^0$38'30". It is bounded by Uttarakhand on the NW, Nepal on the NE, Bihar on the East, Madhya Pradesh in the South, and Haryana, Delhi & Rajasthan in the Westas shown in figure 1.

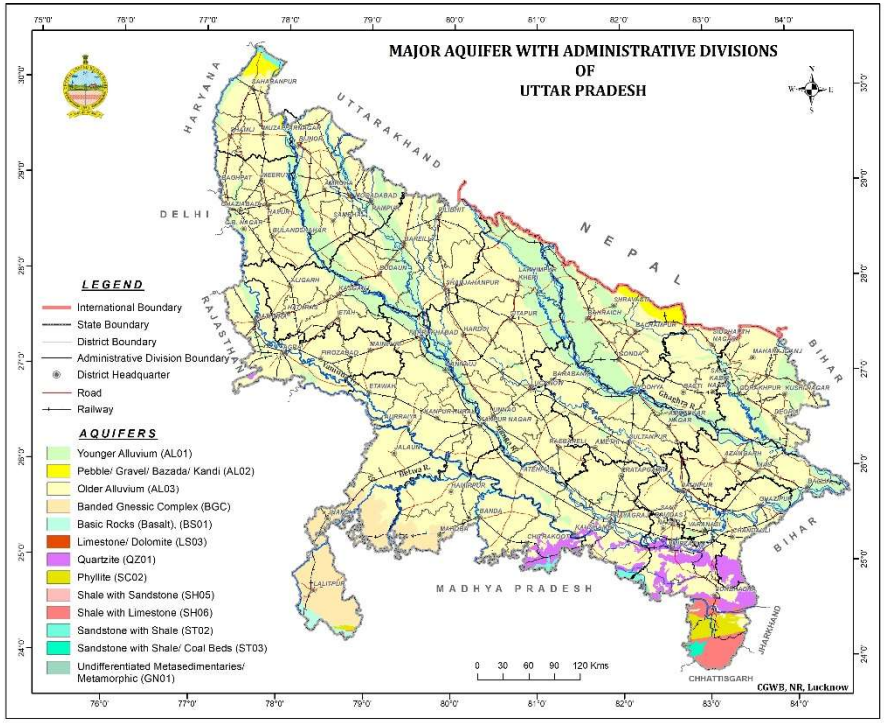

Figure-1: Map showing major aquifers and administrative divisions of UP

The state is covered with rich fertile soil and underlain by a large thickness of alluvium making it one of the richest grounds waterrepositories of the world. Ground water is a major source of fresh water on earth. It is the most dependable source of water, comparatively

free from the vagaries of nature, easily accessible, available at the point of use and economical. Hence it is being developed indiscriminately and the ground water reservoir is stressed. The State being the most populous in the country, with a population density of 829 persons per sq. km and a high rate of population growth (20%), its demand for water is soaring. Also due to industrialization, urbanization and modern farming practices, its quality is also at stake.

demand for water is soaring. Also due to industrialization, urbanization and modern farming practices its quality is also at stake.

The food production in Uttar Pradesh is commensurate with the self-sufficiency of the country. One of the major contributors for this sufficiency is irrigation. To meet this high irrigational requirement, water resources are being increasingly developed. Ground water contributes to about 71 % of the irrigation needs of the State. The indiscriminate development of ground water has resulted in depletion ofgroundwater storage and lowering of water level in certain areas on one hand. On other side the surface water development in are as having shallow water level has resulted in water logging and soil salinization. The geology and structure of the formations existing in an area control by occurrence and movement of ground water. The geomorphic conditions also have a great impact on ground water scenario. The larger part of the State is under lain by fluvial sediments laid do wn in the fore deep between Plateau region in south and Himalayas in north during the Quaternary period by the Indus-Ganga system of drainage over the Precambrian topography existing during geological past. These deposits owe their origin to riverine activity. The southern part of the State has entirely different geological conditions being underlain by Precambrian formations under a thin alluvial cover. Broadly, the State can be divided into two hydrogeological units.

1. Unconsolidated zone.
2. Consolidated, hardrock zone.

The hydrogeological conditions of the above two units widely differ andarediscussed subsequently in brief.

Unconsolidated Zone:

This unit covers nearly 85% of the State area. The unconsolidated formations comprising the area have been deposited through mighty rivers originating from the great Himalayan Mountains. These sediments are an admixture of pebble, gravel, sand, silt, clay and kankar. The sediments are generally coarser in the north and gradually become finer southeast ward along downstream of the drainage which is a typical feature of fluvial deposits. This zone consists of mainly two parts, the Terai and the Alluvial Plain. However, the foot hill zone is very small part of Bhaber belt and lies in the northern parts of Bijnore

and Saharanpur districts. The Terai is a narrow-disconnected belt along the northwestern fringe of the State. The Alluvial Plain occupies the area south of Terai and can further be divided into two sub units - Younger Alluvium and Older Alluvium.

The younger alluvium occurs mostly along the present-day flood plain area. The continuous shifting of the drainage network with time caused reworking of their earlier deposits giving rise to the younger alluvium. The older alluvium occupying comparatively high area covers major part of the Plain. A typical characteristic of older alluvium is formation of kankar within itself due to leaching of calcium carbonate under favourable climatic conditions. The kankar occasionally forms pans restricting downward movement of water.

The thickness of alluvial sediments is variable and generally goes upto 500m. below which occur the semi-consolidated Upper Siwalik formations. The Shallower basement occurs in isolated areas which are known as “Basement highs." This unconsolidated zone is porous and permeable with primary intergranular porosity and has good ground water potential. The sub- surface correlation of formations in the state has shown presence ofseveral aquifers down to a depth of 750 m below the ground. These aquifers mainly encountered in Central Ganga Plain have been grouped on the basis of lithological characters as well as based on interpretation of electrical logs of Boreholes drilled and are as follows:

1. First aquifer 0.0 – 150.00 mbgl
2. Second aquifer 160.00 – 210.00 mbgl
3. Third aquifer 250.00 – 360.00 mbgl
4. Forth deep aquifer 380.00 – 600.00 mbgl

The upper part of the first aquifer down to 50 mbgl is the main source ofdrinking water through hand pumps and dug wells and is unconfined in nature. The first aquifer as a whole which is under unconfined to semi-confined conditions, it is the most potential aquifer group which is the main source of groundwater in the State extensively exploited through private as well as Government tube wells to meet the drinking water and irrigation needs. The deeper aquifers are confined in nature being exploited to a very limited extent. The yield of the second aquifer is limited while the third aquifer is potential. The shallow and phreatic aquifers are under heavy stress.

Consolidated Zone:

The Bundelkhand Vindhyan plateau region is underlain by a variety of Precambrian formations, mostly granite and granite gneisses, Vindhyan sandstone, limestone & shale, under a thin a alluvial cover or without alluvial cover. As such these formations are hard and compact and devoid of any primary porosity. The ground water in these formations

occurs in the secondary porosity of these formations. The secondary porosity has developed due to cracks and fractures which are open at the surface and tighten at depth. The ground water occurs under unconfined or water level conditions in these formations.

The alluvial sediments of moderate depth along the river course sand in valleys form potential ground water repositories. The weathered mantle over the entire until so forms potential aquifers. These aquifers are being monitored mostly through open wells over the area.

3.0. GROUNDWATER LEVEL MONITORING

Central Ground Water Board, Northern Region, is monitoring changes in groundwater regime in Uttar Pradesh State on quarterly basis continuously. This is facilitated by a network of monitoring stations in the State located in diverse hydrogeological and geomorphic units. The number of operational wells till May 2024 was 1464 which include 1001 dug wells and 463 piezometers shown in **figure** 2. The district-wise breakup of the water level monitoring stations is given in **Table-1**.

Table-1: District-wise distribution of water level monitoring station

S.No	District	Number Of Water Level Monitoring Stations		
		2024		
		Dw	Pz	Total
1	Agra	6	11	17
2	Aligarh	9	4	13
3	Ambedkarnagar	9	16	25
4	Amethi	36	2	38
5	Amroha		9	9
6	Auraiya	9	2	11
7	Ayodhya	13	5	18
8	Azamgarh	22	10	32
9	Baghpat	2	9	11
10	Bahraich	20	15	35
11	Ballia	21	2	23
12	Balrampur	17	9	26
13	Banda	10	18	28
14	Barabanki	37	4	41
15	Bareilly	11	4	15
16	Basti	14	3	17
17	Bhadohi	7		7
18	Bijnor	6	14	20
19	Budaun		10	10

S.No	District	Number Of Water Level Monitoring Stations		
		2024		
		Dw	Pz	Total
20	Bulandshahr	2	14	16
21	Chandauli	15	4	19
22	Chitrakoot	10	14	24
23	Deoria	28	1	29
24	Etah	2	4	6
25	Etawah	11	2	13
26	Farrukhabad	1	4	5
27	Fatehpur	13	14	27
28	Firozabad		6	6
29	Gautam Buddha Nagar		8	8
30	Ghaziabad		3	3
31	Ghazipur	22	11	33
32	Gonda	25	4	29
33	Gorakhpur	15	16	31
34	Hamirpur	12	11	33
35	Hapur		4	4
36	Hardoi	16	7	23
37	Hathras	5	4	9

S.No	District	Number Of Water Level Monitoring Stations		
		2024		
		Dw	Pz	Total
38	Jalaun	32	6	38
39	Jaunpur	30	11	41
40	Jhansi	20	2	22
41	Kannauj	11	2	13
42	Kanpur Dehat	12	1	13
43	Kanpur Nagar	16	1	17
44	Kasganj	4	11	15
45	Kaushambi	9	2	11
46	Kheri	26	5	31
47	Kushinagar	28		28
48	Lalitpur	19	4	23
49	Lucknow	9	15	24
50	Mahoba	10	6	16
51	Mahrajganj	13	1	14
52	Mainpuri	4	5	9
53	Mathura	17	3	20
54	Mau	13	3	16
55	Meerut	1	12	13

S.No	District	Number Of Water Level Monitoring Stations		
		2024		
		Dw	Pz	Total
56	Mirzapur	25		25
57	Moradabad	5	6	11
58	Muzaffarnagar	2	10	12
59	Pilibhit	8	3	11
60	Pratapgarh	29	2	31
61	Prayagraj	38		38
62	Rae Bareli	30	5	35
63	Rampur	4	6	10
64	Saharanpur	7	11	18
65	Sambhal		11	11
66	Sant Kabir Nagar	9	1	10
67	Shahjahanpur	3		3
68	Shamli		4	4
69	Shrawasti	13	6	19
70	Siddharthnagar	14	10	24
71	Sitapur	26	7	33
72	Sonbhadra	22		22
73	Sultanpur	31	6	37
74	Unnao	24	5	29
75	Varanasi	11	2	13
	Grand total	**1001**	**463**	**1464**

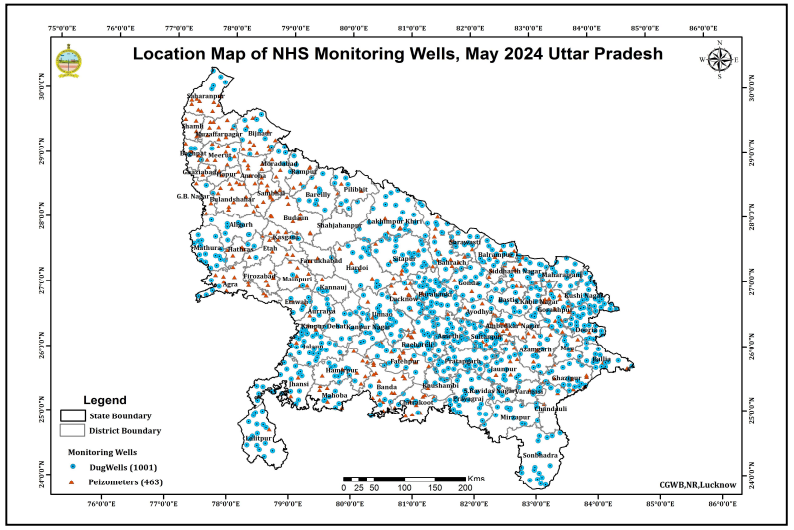

Figure-2: Map showing monitoring wells during May 2024

4.0. RAINFALL

The district wise monthly grided rainfall data collected from Indian Meteorological Department; India WRIS were used to analyzed the

rainfall pattern. Table-2 gives the district wise normal rainfall and actual rainfall of Pre-monsoon 2023 and Pre-monsoon 2024 with the departure from normal rainfall.

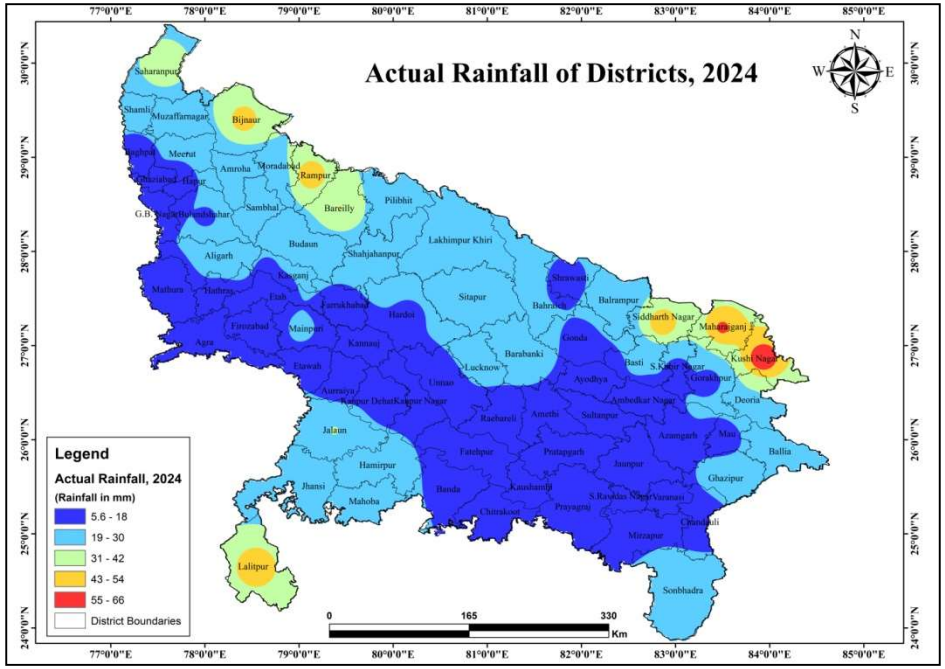

Figure-3: Actual Rainfall of the district during the period of March–May, 2024

Table-2: District wise variability of rainfall in Uttar Pradesh (2024)

S.No	District	Normal rainfall (mm)	Actual rainfall (mm) 2022	Deviation%	Actual rainfall (mm) 2023	Deviation%	% Deviation 2023 To 2022
1	Agra	24.5	65.69	168.12	8.23	-66.41	-698.18
2	Aligarh	29.9	87.68	193.24	19.18	-35.85	-357.14
3	Ambedkarnagar	35.5	49.37	39.07	7.92	-77.69	-523.36
4	Auraiya	23.4	34.96	49.40	8.96	-61.71	-290.18
5	Ayodhya	29.8	49.18	65.03	8.58	-71.21	-473.19
6	Azamgarh	29.6	39.85	34.63	17.04	-42.43	-133.86
7	Baghpat	32.7	108.1	230.58	12.67	-61.25	-753.20
8	Bahraich	47.6	90.18	89.45	25.7	-46.01	-250.89
9	Ballia	29.9	47.03	57.29	20.5	-31.44	-129.41
10	Balrampur	60	37.98	-36.70	24.4	-59.33	-55.66
11	Banda	18.5	54.78	196.11	16.87	-8.81	-224.72
12	Barabanki	26.9	86.88	222.97	24.7	-8.18	-251.74
13	Bareilly	35.9	186.4	419.22	42.18	17.49	-341.92
14	Basti	42.9	36.43	-15.08	18.66	-56.50	-95.23
15	Bijnor	45.6	161	253.07	48.79	7.00	-229.99
16	Budaun	29.2	83.23	185.03	27.88	-4.52	-198.53
17	Bulandshahr	28.8	109.11	278.85	17.06	-40.76	-539.57
18	Chandauli		78.94		12.48		-532.53
19	Chitrakoot		73.82		14.89		-395.77
20	Deoria	51.4	59.97	16.67	29.3	-43.00	-104.68
21	Etah	27.7	56.31	103.29	14.08	-49.17	-299.93
22	Etawah	24.9	41.13	65.18	17.46	-29.88	-135.57
23	Farrukhabad	26.8	57.43	114.29	12.07	-54.96	-375.81
24	Fatehpur	19.9	28.6	43.72	5.55	-72.11	-415.32
25	Firozabad	21.2	66.57	214.01	13.73	-35.24	-384.85
26	Gautam Buddhanagar		77.37		16.09		-380.86

27	Ghaziabad	36.3	96.55	165.98	12.67	-65.10	-662.04
28	Ghazipur	25.4	58.55	130.51	21.44	-15.59	-173.09
29	Gonda	37.6	63.01	67.58	15.5	-58.78	-306.52
30	Gorakhpur	60.3	43.84	-27.30	12.99	-78.46	-237.49
31	Hamirpur	13.6	53.35	292.28	24.73	81.84	-115.73
32	Hardoi	30.7	63.34	106.32	16.39	-46.61	-286.46
33	Jalaun	17.1	41.01	139.82	30.47	78.19	-34.59
34	Jaunpur	23.1	73.56	218.44	9.28	-59.83	-692.67
35	Jhansi	17	22.93	34.88	27.65	62.65	17.07
36	Jyotiba Phulenagar	34.4	154.36	348.72	21.31	-38.05	-624.35
37	Kannauj		72.06		11.31		-537.14
38	Kanpurdehat	19.3	55.99	190.10	12.24	-36.58	-357.43
39	Kanpurnagar	17.1	67.27	293.39	14.74	-13.80	-356.38
40	Kansiramnagar		53.34		16.5		-223.27
41	Kaushambi		54.72		10.72		-410.45
42	K he ri	49.8	98.48	97.75	20.57	-58.69	-378.76
43	Kushinagar	68.8	45.3	-34.16	66.15	-3.85	31.52
44	Lalitpur	17.8	31.14	74.94	49.27	176.80	36.80
45	Lucknow	25.3	87.98	247.75	23.31	-7.87	-277.43
46	Mahmaya Nagar	22.7	70.16	209.07	17.17	-24.36	-308.62
47	Maharajganj	74.9	51.7	-30.97	56.5	-24.57	8.50
48	Mahoba		52.95		24.65		-114.81
49	Mainpuri	23.4	60.66	159.23	18.27	-21.92	-232.02
50	Mathura	17.5	82.22	369.83	11.36	-35.09	-623.77
51	M au	33.6	31.24	-7.02	11.36	-66.19	-175.00
52	Meerut	39.4	165.06	318.93	17.66	-55.18	-834.65
53	Mirzapur	17.6	62.22	253.52	17.51	-0.51	-255.34
54	Moradabad	35.8	141.44	295.08	19.95	-44.27	-608.97
55	Muzaffarnagar	30.7	164.88	437.07	29.38	-4.30	-461.20
56	Pilibhit	38.8	144.29	271.88	26.08	-32.78	-453.26
57	Pratapgarh		68.65		10.2		-573.04
58	Prayagraj	18.5	59.7	222.70	8.93	-51.73	-568.53
59	Rae Bareli	18.6	47.94	157.74	12.18	-34.52	-293.60
60	Rampur	53.1	190.89	259.49	52.45	-1.22	-263.95
61	Saharanpur	41.4	164.25	296.74	34.72	-16.14	-373.07
62	Sant Kabir Nagar		35.36		13.06		-170.75
63	Sant Ravi Das Nagar	25.1	108.75	333.27	14.97	-40.36	-626.45
64	Shahjahanpur	35.7	79.1	121.57	29.75	-16.67	-165.88
65	Shrawasti	47.6	51.09	7.33	11.04	-76.81	-362.77
66	Siddharth Nagar	51.9	31.92	-38.50	54.01	4.07	40.90
67	Sitapur	33	86.74	162.85	18.92	-42.67	-358.46
68	Sonbhadra	32	46.55	45.47	26.65	-16.72	-74.67
69	Sultanpur	27.4	70.46	157.15	10.91	-60.18	-545.83
70	Unnao	20.4	64.72	217.25	12.05	-40.93	-437.10
71	Varanasi	24.7	85.49	246.11	17.47	-29.27	-389.35
	Average	**32.26**	**74.97**	**158.07**	**20.84**	**-28.19**	**-329.33**

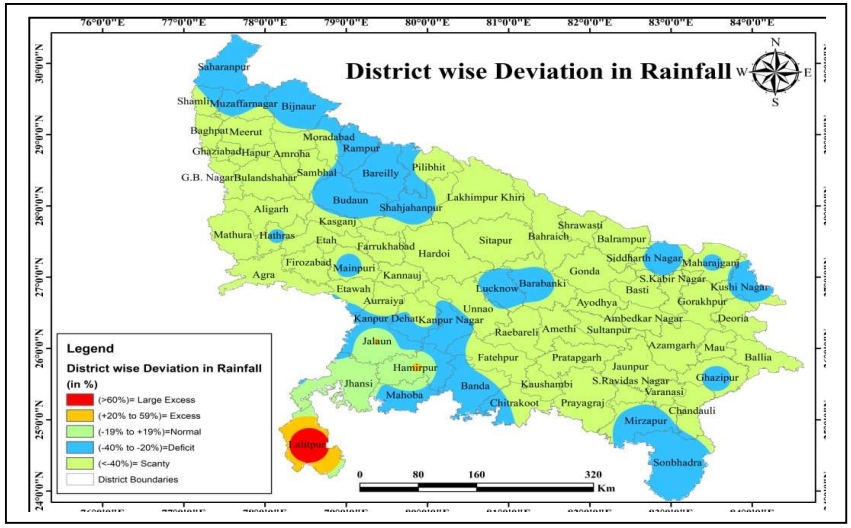

Figure-4: District wise deviation % in Rainfall during the period of March–May,2024

5.0. GROUNDWATER LEVEL SCENARIO (May 2024)
5.1. SHALLOW AQUIFER (UNCONFINED)
5.1.1. DEPTH TO WATER LEVEL

Depth To Water Level in Unconfined Aquifer (May2024)

The depth to water level of 971 wells is used for the analysis. It shows that water levels vary between 0.01mbgl (Aligarh district) to 44.56 mbgl (Gautam Buddh Nagar district). Water level of less than 2 mbgl is recorded in 1.59% of wells, between 2 to 5 mbgl in 31.18% of wells, between 5 to 10 mbgl in 42.50% of wells, between 10 to 20 mbgl in 20.36% of wells, between 20-30 mbgl in 3.57% of well and water level between 30-40 mbgl is registered in 0.79% of wells. Percentage of wells shown in Figure No. 6 for unconfined aquifers and Depth to Water level of unconfined aquifers is shown in Figure – 5. Shallow water level of less than 2 mbgl is seen in isolated patches in parts of Mathura, Aligarh, Kannauj, Mau, Moradabad, districts covering only an area of 1.5% of the State. Water level of 2 to 5 mbgl is majorly observed in the parts of Moradabad, Rampur, Bareilly, Pilibhit, Shahjahanpur, Lakhimpur Kheri, Sitapur, Shrawasti, Bahraich, Balrampur, Gonda, Sidhdharth Nagar, Basti, Sant Kabir Nagar, Gorakhpur, Maharajganj, Kushinagar, Deoria, Mau, Ballia and isolated patches are seen in the parts of Ghazipur, Chandauli, Sonbhadra, Mirzapur, Varanasi, Prayagraj, Jaunpur, Sultanpur, Amethi, Raebareli, Barabanki, Unnao, Kanpur Nagar, Kannauj, Jalaun, Aurraiya, Etawah, Mainpuri, Hardoi, Farrukhabad, Lalitpur, Mahoba districts of Uttar Pradesh covering the area of 31% the State.

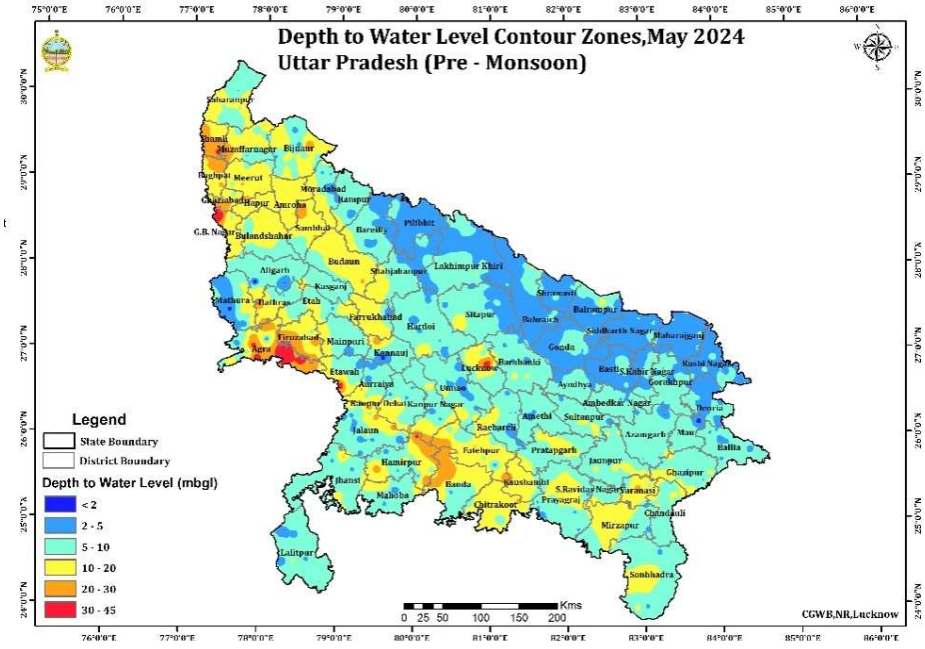

Figure-5: Depth to water level of unconfined aquifer during May2024

The 42.5% area has depth to water level of 5 to 10 mbgl which is observed in the parts of Saharanpur, Bijnaur, Muzaffarnagar, Moradabad, Rampur, Bareilly, Shahjahanpur, Lakhimpur Kheri, Hardoi, Sitapur, Lucknow, Barabanki, Raebareli, Amethi, Ayodhya, Pratapgarh, Sultanpur, Ambedkar Nagar, Prayagraj, Jaunpur,

Azamgarh, Gorakhpur, Mau, Ballia, Ghazipur, Chandauli, Mirzapur, Sonbhadra, Unnao, Kanpur Nagar, Kanpur Dehat, Banda, Mahoba, Hamirpur, Jhansi, Lalitpur, Jalaun, Aurraiya, Kannauj, Etawah, Mainpuri, Kasganj, Etah, Aligarh, Hathras, Mathura.

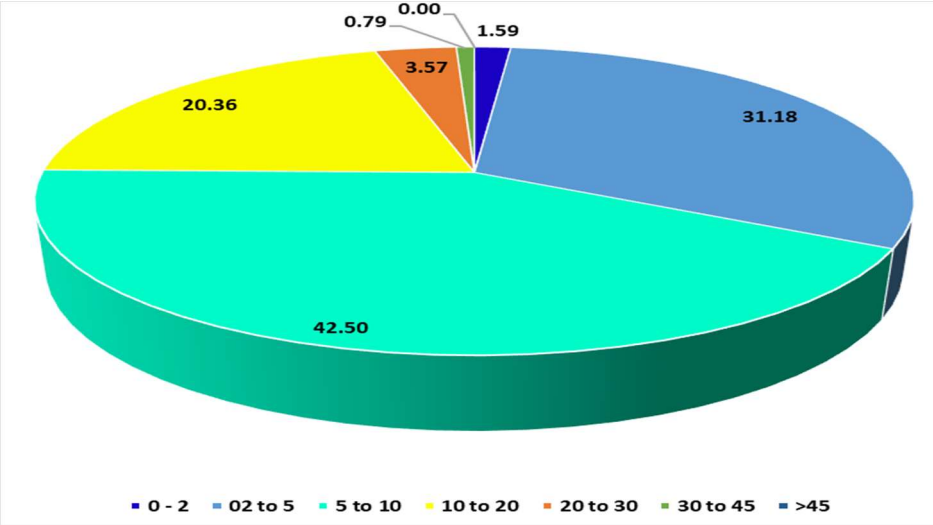

Figure-6 Percentage of wells in different water level ranges in Unconfined aquifer

20% of the area falls under Water level of 10 to 20 mbgl and are observed in parts of Saharanpur, Shamli, Baghpat, Ghaziabad, Muzaffarnagar, Bijnor, Meerut, Hapur, Amroha, Sambhal, Gautam Budh Nagar, Bulandshahar, Budaun, Shahjahanpur, Farrukhabad, Etah, Hathras, Mathura, Agra, Firozabad, Mainpuri, Etawah, Aurraiya, Kanpur Dehat and Nagar, Jalaun, Hamirpur, Mahoba, Banda, Fatehpur, Raebareli, Lucknow, Kaushambhi, Chitrakoot, Pratapgarh, Prayagraj, Mirzapur, Varanasi, Ghazipur, Sonbhadra. Deeper water levels of more than 20mbgl cover 4% area mainly in the parts of Baghpat, Shamli, Muzaffarnagar, Ghaziabad, G.B. Nagar, Sambhal, Agra, Firozabad, Etawah, Lucknow, Hamirpur, Fatehpur and Banda.

5.1.2 ANNUAL FLUCTUATION IN WATER LEVEL

Rise in Water Levels: Out of 874 wells analyzed, it is observed that, the rise in water level of less than 2m is recorded in 20.71% wells, 2 to 4 in 4% wells and more than 4 m in 11.1% of the wells. Water level rise of less than 2m is seen in parts of Bijnore, Sambhal, Moradabad, Rampur, Bareilly Firozabad, Mainpuri, Etawah, Aurraiya, Kannauj, Farrukhabad, Kanpur Dehat and Nagar, Jhansi, Hamirpur, Mahoba, Lalitpur, Lakhimpur Kheri, Shahjahanpur, Hardoi, Lucknow, Barabanki, Gonda, Sidhdharth Nagar, Balrampur, Basti, Maharajganj, Kushinagar, Ballia, Ghazipur, Chandauli, Sonbhadra, Chitrakoot districts. Water level rise of 2 to 4 m is observed mainly in Baghpat, Meerut, Ghaziabad, Agra, Firozabad, Mainpuri, Etawah, Aurraiya, Kanpur Nagar, Lucknow, Chitrakoot, Fatehpur, Balrampur, Varanasi, Ghazipur, Chandauli, Sonbhadra etc. Rise of more than 4m is significantly observed in Baghpat, Meerut, Ghaziabad, Firozabad, Lucknow, Chitrakoot, Fatehpur, Balrampur and Varanasi districts.

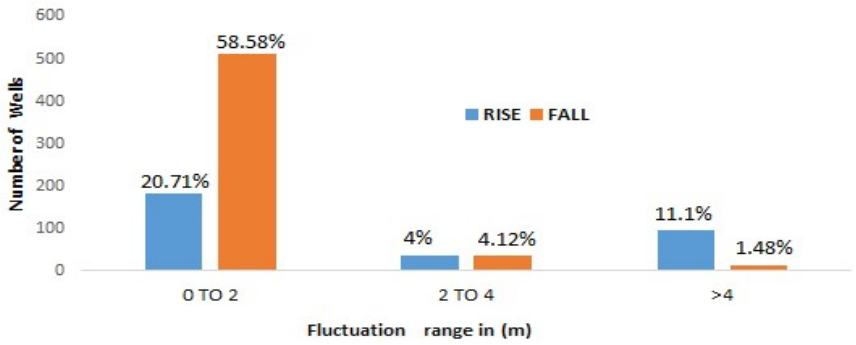

Figure-7: Percentage of wells showing rise and fall in WL in unconfined aquifer (May 2023 to May 2024)

Falling Water Levels:

Out of 874 wells analyzed, 58.58% of the area shows fall in water levels and recorded water level of less than 2m fall, while 4.12% of wells are in the range of 2 to 4m and remaining 1.48% shows fall of more than 4m. Fall of less than 2m is mainly observed in Bareilly, Budaun, Aligarh, Kasganj, Hardoi, Sitapur, Pilibhit, Lakhimpur kheri, Lucknow, Unnao, Fatehpur, Banda, Hamirpur, Pratapgarh, Prayagraj, Jaunpur, Azamgarh, Mau, Deoria, Mirzapur and Sonbhadra etc.

Fall of 2 to 4 m is observed mainly in isolated patches of G.B. Nagar, Mathura, Etah, Kasganj, Agra, Jalaun, Kanpur Nagar, Jhansi, Banda, Pratapgarh and Mirzapur etc. Fall of more than 4m is observed in isolated patches of G.B. Nagar, Mathura, Kasganj, Jalaun, Jhansi, Banda and Pratapgarh districts. Annual water level fluctuation in unconfined aquifer (May 2023 -May2024) is shown in Figure- 8 and Percentage of wells showing rise and fall in WL for unconfined aquifer (May2023 to May2024) in Figure – 7.

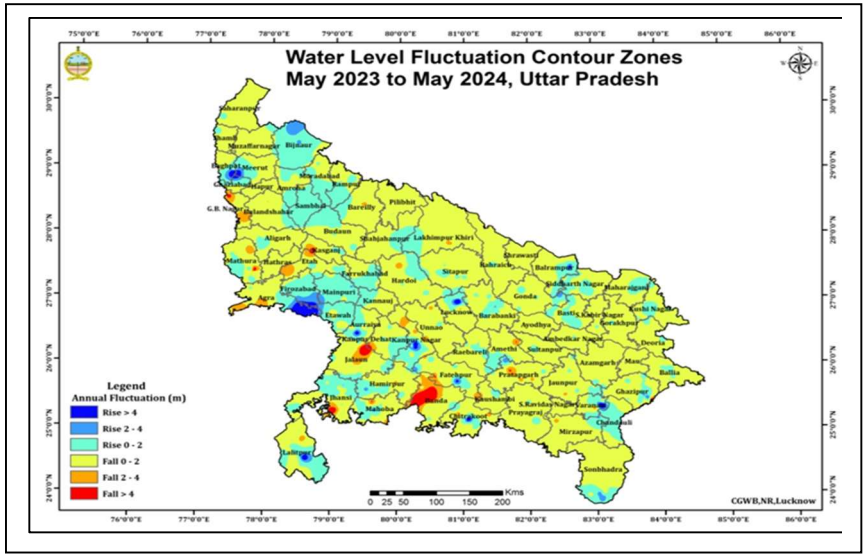

Figure-8: Annual water level fluctuation in unconfined aquifer (May 2023 -24)

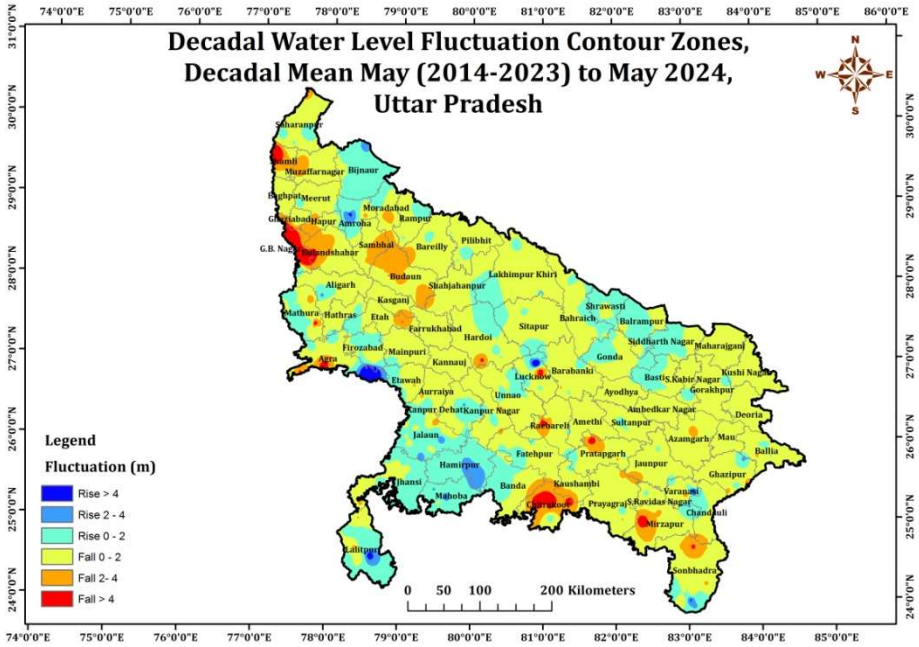

Figure-9: Decadal water level fluctuation in unconfined aquifer (May 2014 -May2023 with respect to 2024)

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

Rise in Water Levels:

Out of 554 analyzed wells, the rise in water level of less than 2m is recorded in 28.52%wells, 2 to 4 m in 3.24 % wells and more than 4m in 0.9% of the wells. Water level rise of less than 2m is seen in Bijnor, Aligarh, Firozabad, Kanpur Dehat, Jalaun, Hamirpur, Jhansi, Mahoba, Banda, Basti, Siddharth Nagar, Balrampur, Shrawasti, Bahraich, Gonda and Chaundali regions. Water level rise of 2 to 4 m is observed mainly in isolated patches of Bijnor, Agra, Lalitpur, Hamirpur, Sonbhadra and Lucknow districts etc and rise of more than 4m is significantly observed in isolated patches of Agra, Amroha, Lalitpur, Lucknow and Varanasi districts.

Fall in Water Levels:

Out of the 554 analyzed wells, 55.77% of the area shows, fall in water levels of less than 2m while 8.3% in the range of 2 to 4m and remaining 3.24% wells registered water level fall of more than 4m. Fall of less than 2 m is observed in major parts of Eastern Uttar Pradesh such as Sonbhadra, Ghazipur, Ballia, Mau, Jaunpur, Deoria, Ayodhya and Central parts of Uttar Pradesh such as Kannauj, Hardoi, Sitapur, Farrukhabad and Kasganj districts etc. Fall of 2 to 4m is observed in isolated patches of Shamli, Ghaziabad, Gautam Budh Nagar, Bulandshahar, Sambhal Budaun, Hardoi. Chitrakoot, Pratapgarh, Mirzapur and Sonbhadra districts etc. Fall more than 4m is observed in isolated patches of Shamli, Gautam Budh Nagar, Bulandshahar, Hardoi, Raebareli, Chitrakoot, Pratapgarh, Mirzapur and Sonbhadra districts etc. Decadal Water level fluctuation form (May 2014- 2023) with respect to May 2024 is shown in the Figure – 9 and percentage of wells showing

rise and fall in WL for unconfined Aquifer (Decadal fluctuation (2014-2023) w.r.t. May 2024) is shown in Figure-10.

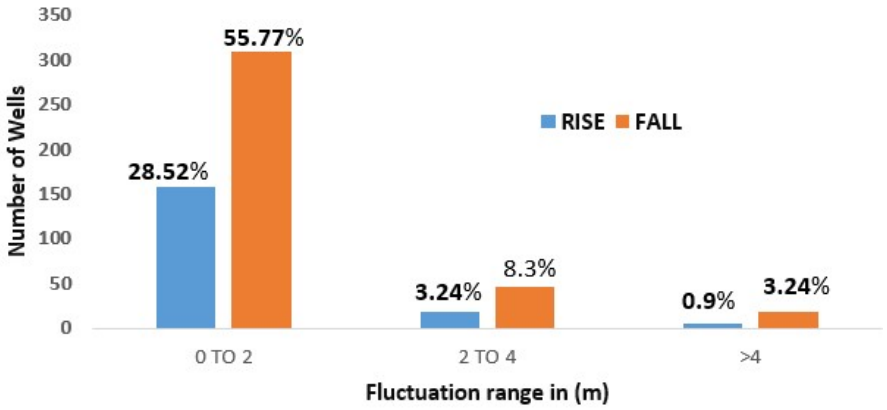

Figure-10: Percentage of wells showing rise and fall in WL in unconfined Aquifer (Decadal Fluctuation (2014-2023) w.r.t. May 2024)

5.2 DEEPER AQUIFER (CONFINED/SEMI-CONFINED)

5.2.1 DEPTH TO WATER LEVEL

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

Analysis of piezometric level data of 205 wells shows piezometric levels vary between 0.57 mbgl (Mau) to 39.11 mbgl (Agra district). Piezometric level of less than 2 mbgl is recorded in 0.88% of wells, between 2 to 5 mbgl (17.70%) of wells, between 5 to 10 mbgl in 31.42% of wells, between 10 to 20 mbgl in 38.50% of wells, between 20-30 mbgl in 9.29% of wells, between 30 – 45 mbgl in 2.21% and none of the wells have registered piezometric level more than 40 mbgl. Percentage of wells in different water level ranges for Confined aquifer is shown in Figure-11. Shallow piezometer level of less than 2 mbgl is noticed in isolated patches of Azamgarh and Mau districts of the State. Piezometric level of 2 to 5 mbgl mainly observed in parts of Bahraich, Barabanki, Gonda, Shrawasti, Balrampur, Sidhdharth Nagar, Maharajganj, Kushinagar, Gorakhpur etc. districts of the State.

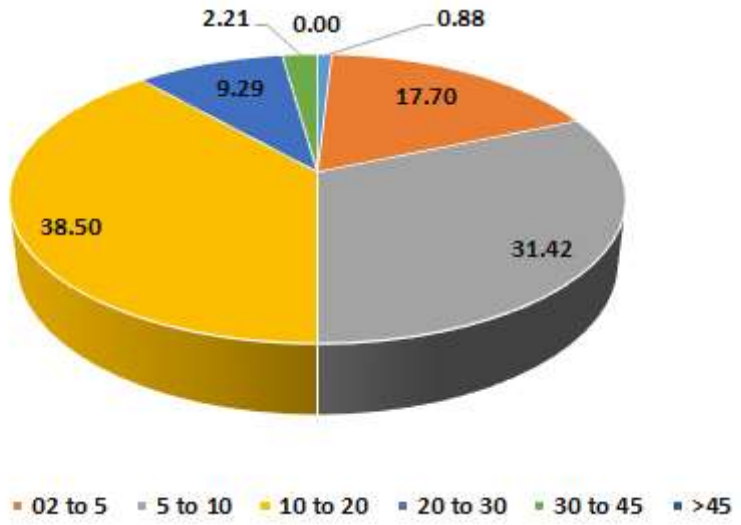

Figure-11: Percentage of wells in different water level ranges in Confined aquifer

Eastern to North-Eastern part of the State falls under piezometric level of 5 to 10 mbgl with significant area of Ambedkar Nagar, Azamgarh, Bahraich, Sitapur, Kheri, Meerut districts etc. Piezometric level of 10 to 20 mbgl is observed mostly in North western parts of the state that is in Saharanpur, Shamli, Muzaffarnagar, Baghpat, Meerut, Ghaziabad, Bulandshahar, Bijnor, Moradabad, Sambhal, Bareilly, Budaun, Pilibhit, Shahjahanpur, Unnao, Pratapgarh, Varanasi etc. districts. The peizometric level of 20-30 mbgl is observed in the isolated patches of Baghpat, Banda, Fatehpur, Hamirpur, Hathras, Moradabad, Muzaffarnagar, Sambhal, Shamli, Varanasi etc and peizometric level of 30 – 45 mbgl observed mainly in areas of Agra, Hamirpur, Mathura, Muzaffarnagar district.

5.2.3 ANNUAL FLUCTUATION IN PIEZOMETRIC LEVEL

Annual Fluctuation of Piezometric Level in Confined / Semi-confined Aquifer (May 2023 to May 2024)

Rise in piezometric levels:

Out of 96 wells, the rise of less than 2m piezometric level is recorded in 7.3% wells and more than 2m – 4m in 1.04% of the wells. Piezometric level rise more than 4m in 7.3% wells. Piezometric level rise of less than 2m is seen in the districts, of Chitrakoot, Fatehpur, Rampur, Sambhal, districts. Peizometric level rise from 2 – 4m is seen significantly in Unnao district. Piezometric level rise greater than 4m is seen in parts of Banda, Chitrakoot, Fatehpur, Hamirpur, Mahoba, Rampur and Sambhal districts.

Fall in Piezometric Levels: Out of 96 analyzed wells 75% of wells shows fall in piezometric levels of less than 2m while 4.16% wells registered piezometric level for fall of more than 2m. Fall of less than 2m is mainly observed in parts of Ambedkar Nagar, Amroha, Fatehpur, Ballia, Banda, Baghpat, Chitrakoot, Gorakhpur, Mau, Meerut, Sidhharth Nagar, Sitapur, Unnao etc. districts. Piezometric level fall of 2 – 4m in minor parts of Ambedkar Nagar, Bulandshahar, Banda and Moradabad districts. Piezometric level fall of >4m is seen in Banda, Fatehpur and Mahoba districts. Percentage of wells showing rise and fall in piezometer level of confined aquifer (May 2023 to May2024) is shown in the Figure – 12.

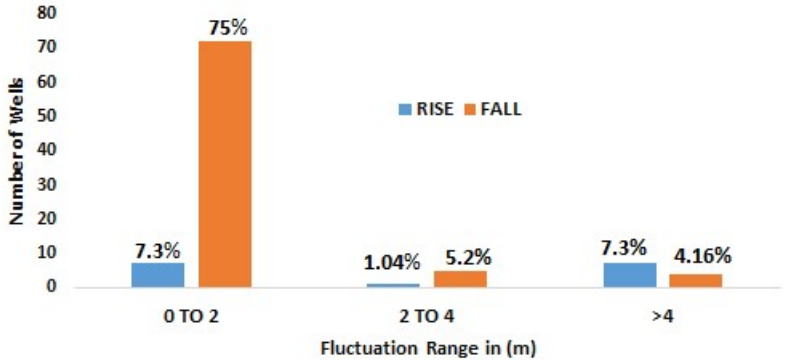

Figure12: Percentage of wells showing rise and fall in piezometer level in unconfined (May 2023 to May 2024)

Decadal Fluctuation of Piezometric Level in Confined/Semi-confined Aquifer (Decadal Mean May (2014-2023) to May 2024)

Rise in piezometric levels:

Out of 6 wells, that have registered rise in piezometric levels, 16.67 % have recorded less than 2m and remaining 16.67% wells registered piezometric level rise of more than 4m. Fall of less than 2m is observed 50% and fall of 2 – 4m range is seen in 16.67% and none of the districts is observed in fall of greater than 4m decadal fluctuation. Out of 6 wells rise of water level fluctuation less 2m is seen in Rampur district, whereas rise of more than 4m is typically seen in Amroha district. Fall of less than 2m is observed in all districts mainly in parts of Ghaziabad, Meerut districts, which covered 50% of the area shows fall of more than 4 m. Percentage of wells showing rise and fall in piezometric level in confined/semi- confined Aquifer (Decadal Mean May (2014-2023 to May2024) in Figure – 13.

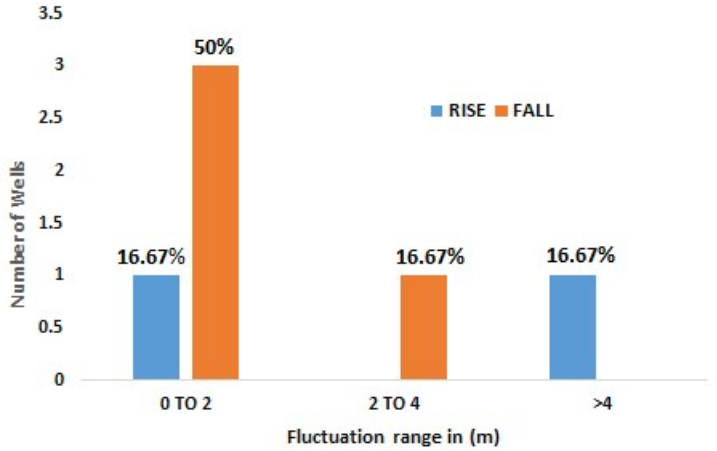

Figure-13: Percentage of wells showing rise and fall in piezometric level in confined/semi- confined Aquifer (Decadal Mean May (2014-2023 to May 2024).

6.0. SUMMARY

As a component of the National Ground Water Monitoring Programme, the CGWB, NR, Lucknow conducts monitoring of the ground water conditions on a quarterly basis: in January, pre-monsoon May, August, and post-monsoon November. Additionally, a yearly assessment of ground water quality is performed in May. As of May 31, 2024, the Northern Region-Central Ground Water Board supervises

1001 dug wells and 463 piezometers. This comprehensive effort aims to portray the variations in the states ground water conditions across different aquifers. In May 2024, around 75% of the state's area exhibited a depth to waterlevel within 10 meters below ground level for unconfined aquifers. And around 49% for confined. Deeper water levels of more than 20m cover 4% area of the State covering mainly Agra, Gautam Buddha Nagar, Lucknow, Baghpat, Hamirpur, Jhansi districts.

The ground water level in Uttar Pradesh during May 2024 has been significantly influenced by rainfall patterns from March 2024 to May 2024.This period witnessed a departure of -28.19% from the normal, classifying most of the region in the category of deficit rainfall. This has result in fall in the water level in many districts of UP. Annual water level comparison with previous year May-2023 to May-2024 has shown fall in about 63% area of the state in unconfined aquifer and 84% in confined aquifer because of the rainfall deficit in 2024. Around 32% of the area experienced rise of water level in decadal mean water level fluctuation of May, 2013-2024, with respect to May,2024, in unconfined aquifer whereas 49% of the area experienced rise in decadal mean water level of May2014-2023 with respect to May,2024 in confined aquifer. The monsoon in 2024 witnessed significant fluctuations in rainfall pattern across the state. The evident fall in annual ground water level during May 2024 in Uttar Pradesh can be attributed to a substantial deficit in rainfall when comparing 2024 to 2023. Rainfall distribution varied with major region of Uttar Pradesh receiving deficit in rainfall while region of Lalitpur experienced comparatively excess rainfall.