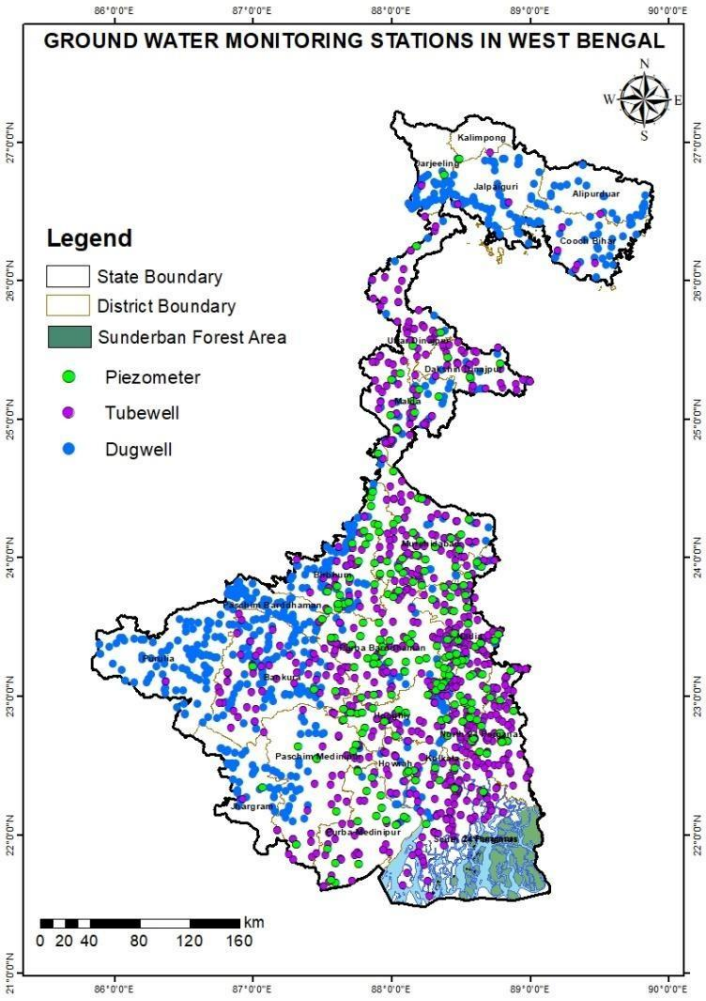

GROUND WATER LEVEL BULLETIN

August 2024

WEST BENGAL

ABSTRACT

Present Bulletin prepared on ground water scenario of West Bengal highlighting the findings, status of ground water level in different aquifers and its seasonal, annual and decadal fluctuation during August -2024.

CGWB, Eastern Region Kolkata

1.0 INTRODUCTION

Groundwater bulletin is prepared by Central Ground Water Board (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.

In West Bengal, ground water monitoring was started since 1976 when most of the ground water structures were mainly dug wells and the development of the ground water resource was very limited. It is only after 1985; actual ground water development started in irrigational sector and took its full swing from 90s. Accordingly, Ground Water Monitoring Stations (GWMS) for monitoring of water level data were also changed in different periods. However, from late 90s, these old wells are being replaced by well-defined piezometers in phased manner with an expectation that in near future, this effort will provide better result.

Groundwater levels are being measured by CGWB, ER four times a year in West Bengal viz., in the months of August (Pre-monsoon) (20^{th} to 30^{th}), August (Mid-monsoon), (20^{th} to 30^{th}), November (Post-monsoon) (1^{st} to 10^{th}) and January (1^{st} to 10^{th}) ; 2 times in Andaman and every month in Sikkim (through Participatory monitoring since June,2024).

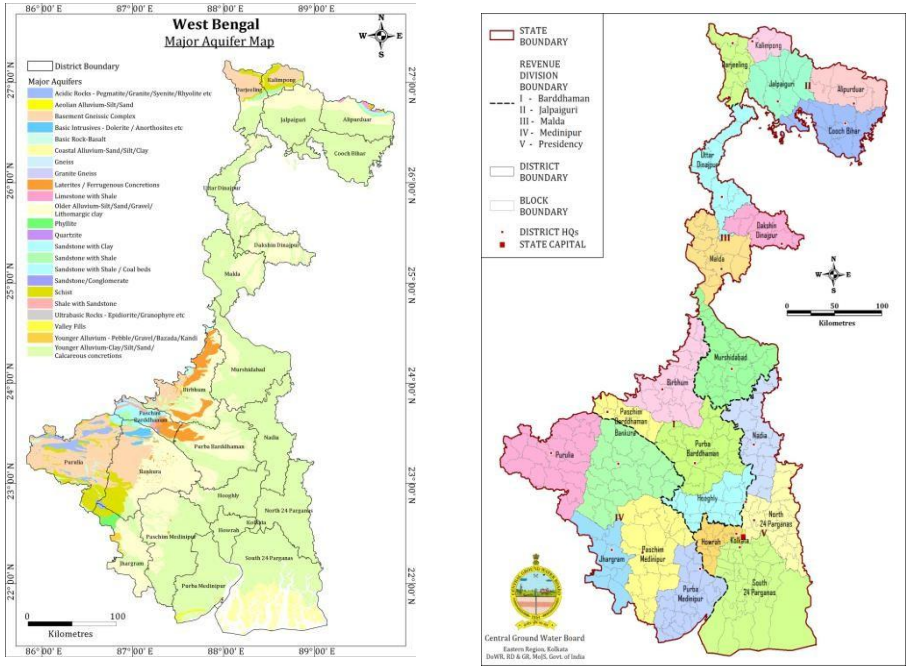

Figure-1: Map showing major aquifers and administrative divisions of West Bengal

2.0 STUDY AREA

The Eastern Region of Central Ground Water Board has jurisdiction over the State of West Bengal having an area of 88752 km^2, Andaman & Nicobar Islands (UT) having an area of 8,249 sq. km. (Andaman-6408 sq. km., Nicobar-1841 sq. km.) and Sikkim (7096 sq.km.).

The State of West Bengal is divided into 5 Divisions(Barddhaman, Jalpaiguri, Malda, Medinipur & Presidency) incorporating 23 Districts, which are further subdivided into 66 Sub-Divisions; 344 Community Development Blocks; 3,347 Gram Panchayats; 40,218 Villages(37,469 Inhabited villages with 2,03,80,118 Households); 924 Census Towns(127 Municipal & 785 Non-Municipal); 118 Municipalities and 7 Municipal Corporations. The state extends between N Latitudes, 21^0 31' 0", 27^0 33' 15" and E Longitudes, 85^0 45' 20", 89^0 33'0". Physiographically, the area incorporates extra – peninsular region of the north, peninsular mass of the south – west, and alluvial and deltaic plains of the south and south-east (figure-1).

Broadly, West Bengal has nine major physiographic divisions – Himalayan Zone, Sub-Himalayan Zone, Barind Uplands, Degraded Plateaus, Plateau Fringe Zones, Upper Gangetic Delta, Reclaimed Lower Gangetic Delta, Non-Reclaimed Lower Gangetic Delta and Medinipur Coastal Plains.

3.0 GROUND WATER LEVEL MONITORING

Central Ground Water Board, Eastern Region, has set up a network of 1732 monitoring wells known as National Hydrographic Network Stations (NHNS) in West Bengal which includes: Dugwells- 695, Handpumps-751 and Piezometers-286 {including 206-DWLR installed PZ}.

In the state of West Bengal during August 2024, 1594 wells were physically monitored while 206 wells are installed with DWLR (figure-2). Few wells could not be monitored due to various reasons like inaccessibility, filled up, installation of pump units, road damaged, gate locked, etc.

The district-wise breakup of the water level monitoring stations is given in Table-1

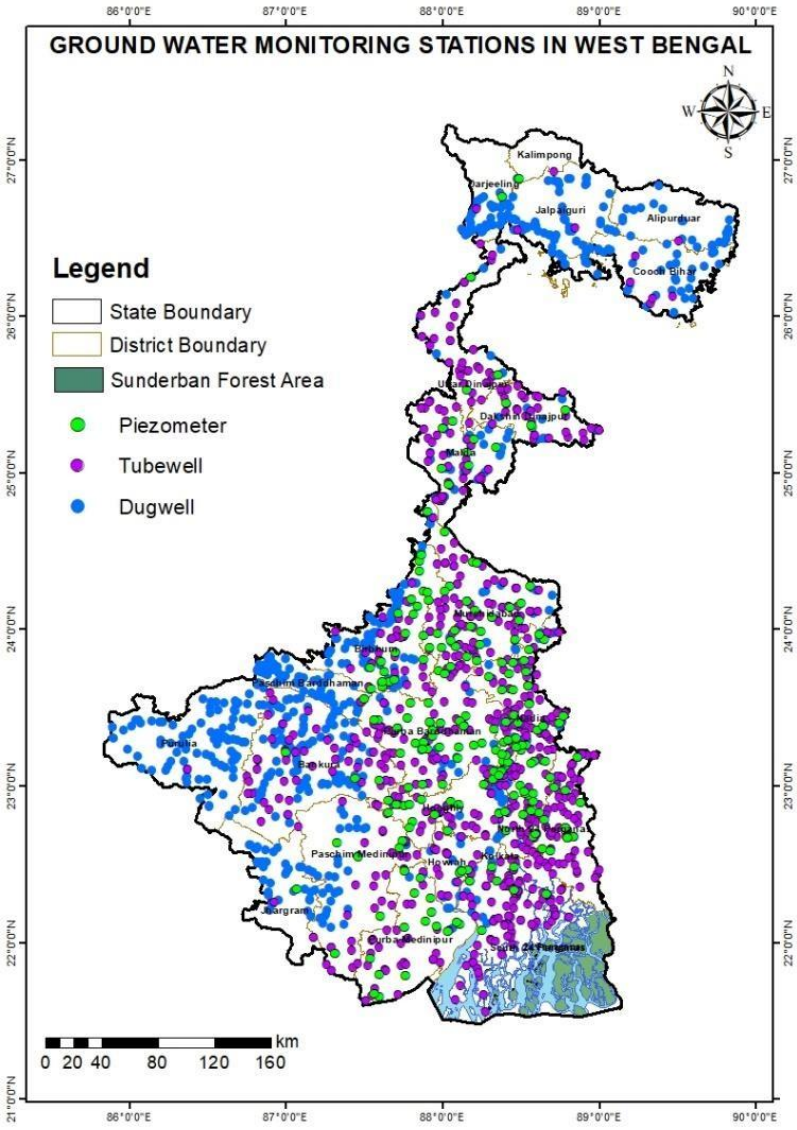

Figure- 2: Map showing locations of monitoring wells (NHNS) in West Bengal

Table-1: District-wise distribution of water level monitoring stations in West Bengal

Sl. No	Name of the District	Number of GW Monitoring Stations				
		Dug Well	Piezometer	Handpump	Spring	Total
West Bengal						
1	Alipurduar	23	0	1	0	24
2	Bankura	97	9	49	0	155
3	Birbhum	93	23	39	0	155
4	Dakshin Dinajpur	9	12	29	0	50
5	Darjeeling	40	1	2	0	43
6	Haora	18	1	15	0	34
7	Hugli	26	31	61	0	118
8	Jalpaiguri	48	0	3	0	51
9	Jhargram	30	5	5	0	40
10	Kochbehar	33	0	3	0	36
11	Kalimpong	0	0	2	0	2
12	Kolkata	4	4	12	0	20
13	Maldah	24	8	32	0	64
14	Murshidabad	18	54	72	0	144
15	Nadia	14	40	93	0	147
16	N- 24 Parganas	6	14	86	0	106
17	Paschim Barddhaman	59	9	3	0	71
18	Paschim Medinipur	32	7	31	0	70
19	Purba Barddhaman	17	21	61	0	99
20	Purba Medinipur	2	23	32	0	57
21	Purulia	89	8	0	0	97
22	S-24 Parganas	8	14	98	0	120
23	Uttar Dinajpur	5	2	22	0	29
	Total	**695**	**286**	**751**	**0**	**1732**

4.0 RAIN FALL

In 2024, monsoon wind delayed to hit West Bengal and Southern part of the state faced the deficient of rainfall. In North Bengal (Darjeeling, Kalimpong, Jalpaiguri, Alipurduar, Coach Behar, Uttar and Dakshin Dinajpur) total 6273 mm precipitation is occurred during June 2024 and it is 63.6% higher than the normal rainfall over the region. However, total 746.8 mm rainfall occurred over the western part (Birbhum, Bankura, Purulia, Pachim and Purba Burdwan) of West Bengal, which is -45.4% deficient rainfall compared to normal rainfall. Southern part (Howrah, Hugly, Pachim and Purba medinipur, Jhargram, Kolkata, North and South 24 Parganas) of state received 1158.4 mm rainfall and it is -53.75% lower than the normal rainfall. The middle part (Maldah, Mursidabad and Nadia) of the state received 524.7 mm rainfall and it is -35.3% lower than the normal rainfall. Coach Behar and Alipurduar received the highest rainfall during June 2024. While, Mursidabad and Pachim Medinpur received lowest rainfall during the month. District-wise status of rainfall is given in table-2.

Table-2: District wise rainfall data during June-July 2024

District	Cumulative rainfall (mm) during June-July 2024
Cooch Behar	1986.6
Darjeeling	1634.8
Jalpaiguri	1903.1
Malda	605.5
North Dinajpur	373.5
South Dinajpur	552
Bankura	391.2
Birbhum	266.8
Burdwan	300
East Midnapore	276.6
Hooghly	355.3
Howrah	320.6
Kolkata	412.3
Murshidabad	205.5
Nadia	196.1
North 24 Parganas	278
Purulia	316.3
South 24 Parganas	341.8
West Midnapore	323.9
Jhargram	287

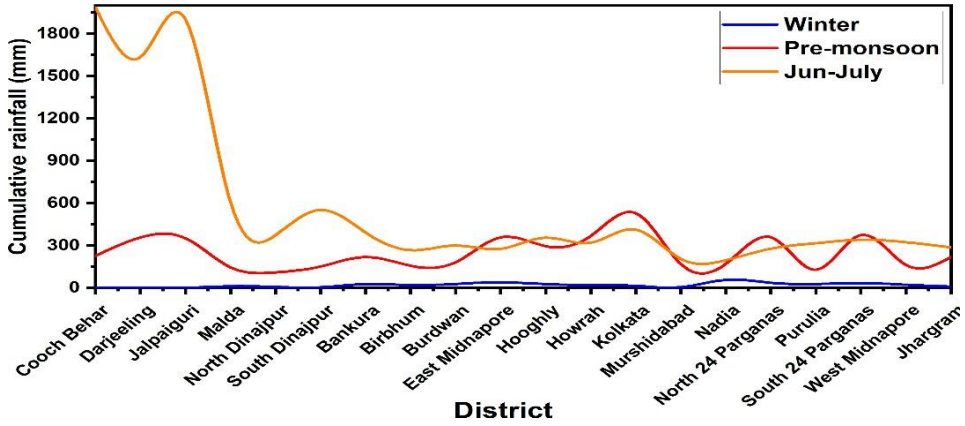

Figure-3: Rainfall distribution (in mm) over the different districts of West Bengal during winter, pre-monsoon and Jun-July seasons in 2024

5.0 GROUND WATER LEVEL SCENARIO (AUGUST 2024) for WEST BENGAL

5.1 SHALLOW AQUIFER (UNCONFINED)

5.1.1 DEPTH TO WATER LEVEL

Depth to Water Level in Unconfined Aquifer (August 2024)

Depth to water level during August 2024 was measured manually from 1594 ground water monitoring wells. A total of 754 numbers of GWMS in shallow aquifers were measured. Water level of less than 2 m bgl was recorded in 72% of wells in phreatic aquifers. Similarly in 23% of wells, water level was observed between 2-5 m bgl. 5-10 m bgl was recorded in 4% of wells and 10-20 m bgl in only 1% of wells. None of the wells in phreatic aquifers showing water level beyond 20 m bgl *(*Figure-4 & 5).

The depth to water level map of August 2024 depicts that water level in the entire state is within the range of 0-2 m bgl except for North Bengal and few isolated patches showing water level in the range of 2-5 m bgl.

Deepest water level was recorded at Saranga, 16.8 m bgl in Raghunathganj-I block of Murshidabad District and shallowest water level 0.01 mbgl was found in Rajganj block Jalpaiguri district.

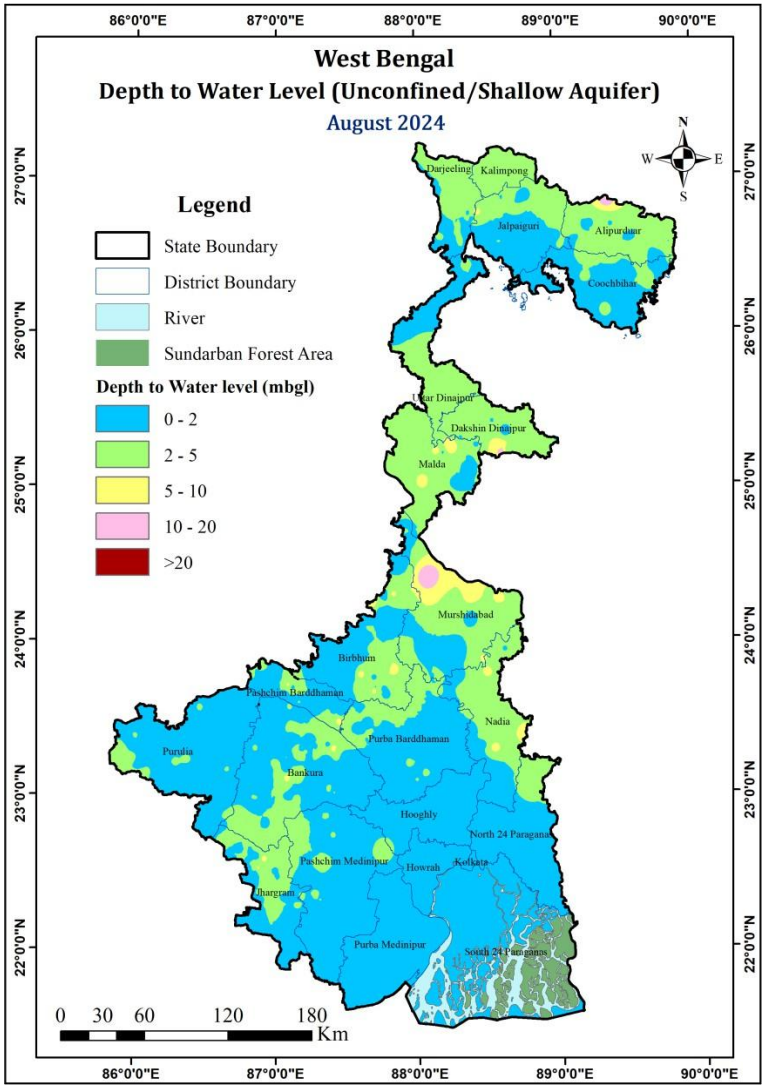

Figure-4: Depth to water level of unconfined aquifer during August 2024

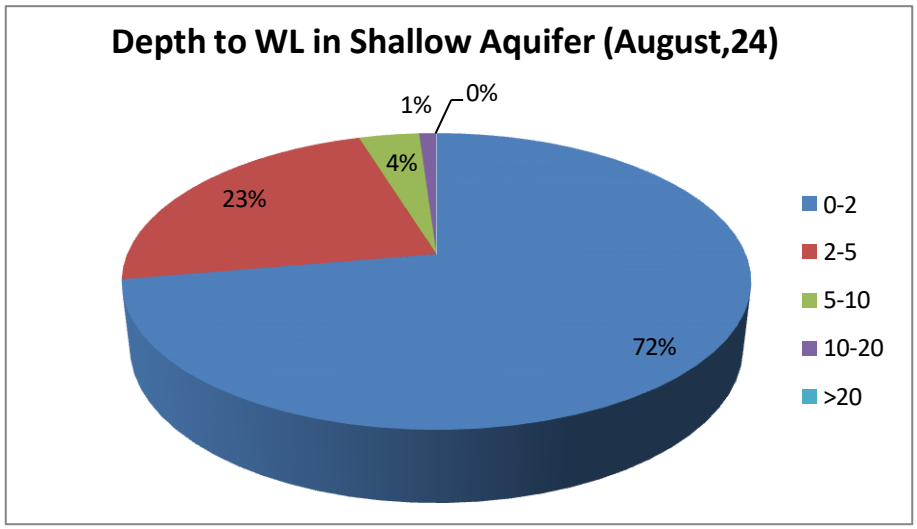

Figure-5: Percentage of wells in different water level ranges in Unconfined aquifer (August,24)

5.1.2 SEASONAL FLUCTUATION IN WATER LEVEL

Seasonal Fluctuation of Water Level in Unconfined Aquifer (April 2024 to August 2024)

In shallow aquifers out of 696 wells analyzed, 671 wells showing rise and only 25 wells shows falling water level (figure-6 &7).

In shallow aquifers in rising category 28% of wells are within the fluctuation of 0-2m, 33% are in 2-4m and 36% of wells are in the range of more than 4m. In the falling category 3% of wells are showing falling trend in 0-2m category, only 3 wells are in the range of 2-4m and 3 wells are showing >4m fluctuation of water level.

The rise in water level is observed in all the districts of the State during Monsoon season. Fall is observed only 3% of the well in the category of 0-2 m as isolated patches.

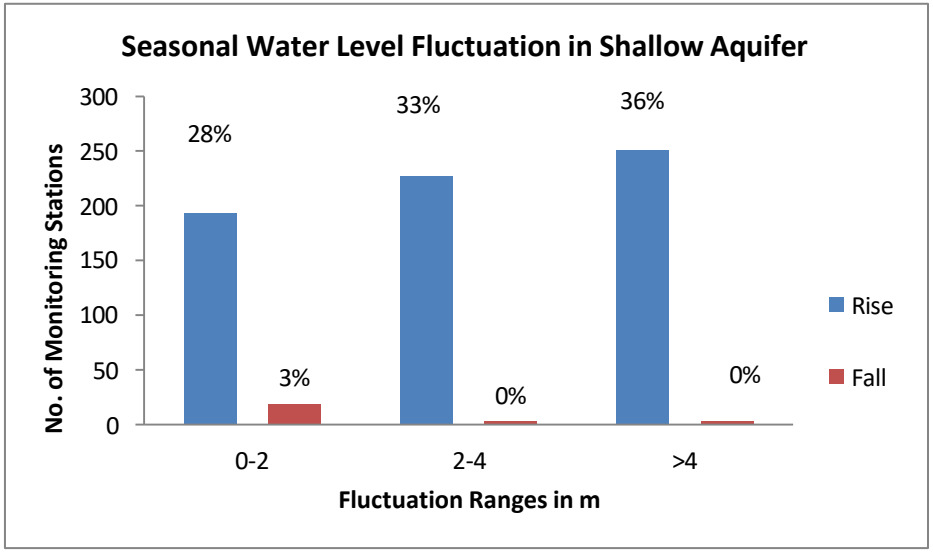

Figure-6: Percentage of wells showing rise and fall in WL in unconfined aquifer (April 2024 to August 2024)

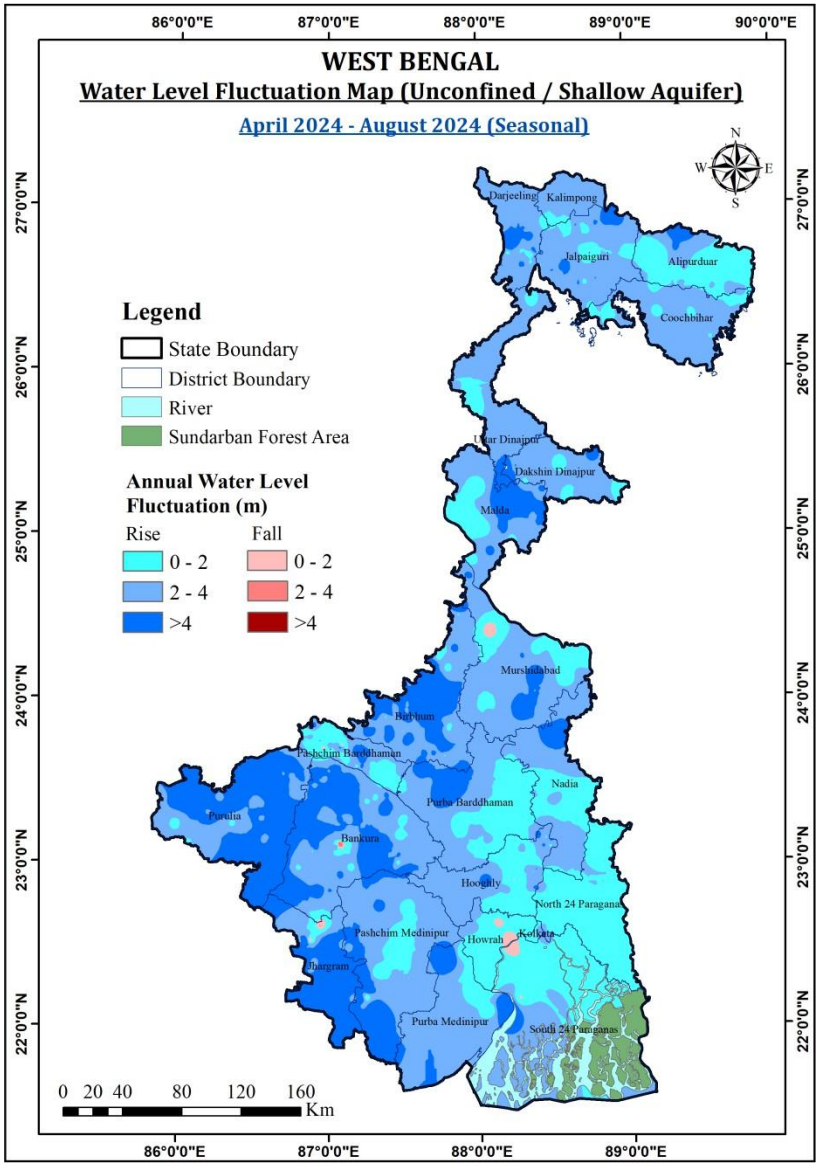

Figure-7: Seasonal water level fluctuation in unconfined aquifer (April 2024 to August 2024)

5.1.3 ANNUAL FLUCTUATION IN WATER LEVEL

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

In shallow aquifers out of 707 wells analyzed, 479 wells showing rise and 228 wells shows falling water level (figure-8 &9).

In shallow aquifers in rising category 55% of wells are within the fluctuation of 0-2m, 9% are in 2-4m and 4% of wells are in the range of more than 4m. In the falling category 30% of wells are showing falling trend in 0-2m category, 2% of wells are in the range of 2-4m and1% of wells are showing >4m fluctuation of water level.

Rise of less than 2 m in water level is seen in all the districts of the State, significantly in S-24 Parganas, Howrah, Hooghly, Nadia, Murshidabad, Malda, Purba Medinipur and parts of Paschim Medinipur, Coochbehar, Darjeeling, Alipurduar districts. Fall of less than 2 m in water level is mainly observed in North Bengal districts, parts of Purba Bardhaman, Paschim Medinipur, Jhargram, Purulia, Birbhum and Bankura districts. Fall of beyond 2 m is observed as isolated patches.

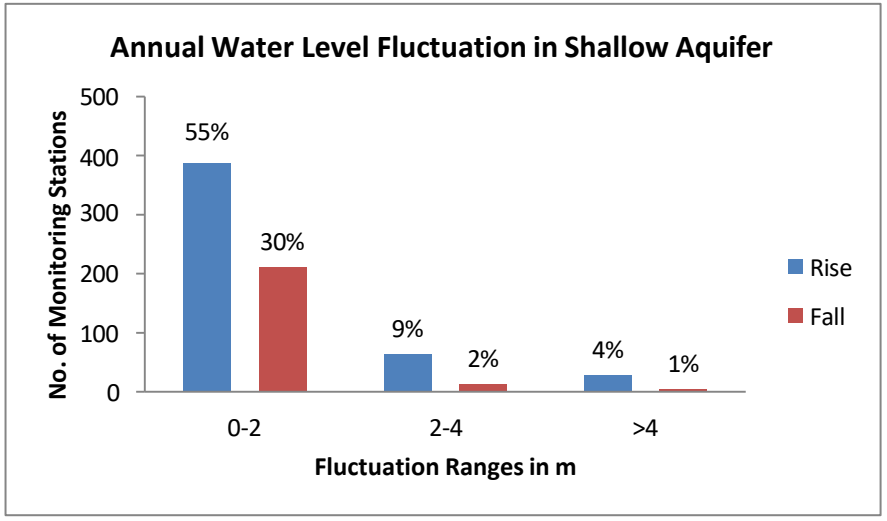

Figure-8: Percentage of wells showing rise and fall in WL in unconfined aquifer (August 2023 to August 2024)

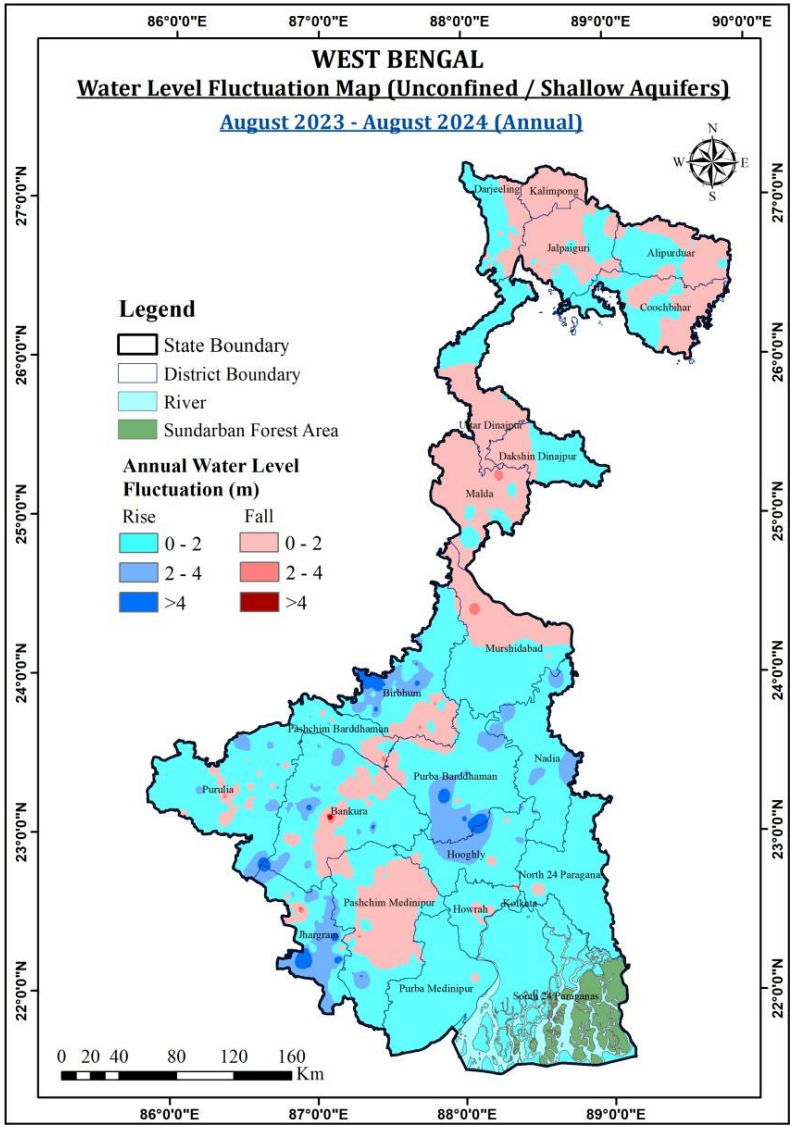

Figure-9: Annual water level fluctuation in unconfined aquifer (August 2023 to August 2024)

5.1.4 DECADAL FLUCTUATION IN WATER LEVEL

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

In shallow aquifers out of 712 wells analyzed, 468 wells showing rise and 244 wells shows falling water level (figure-10 & 11).

For shallow aquifers, in rising category 58% of wells are within the fluctuation of 0-2m, 6% are in 2-4m and 2% of wells are in the range of more than 4m. In the falling category 31% of wells are showing falling trend in 0-2m category, 2% of wells are in the range of 2-4m and 1% of wells are showing >4m fluctuation of water level. From the water level fluctuation map it can be seen water level fluctuation is mainly in the range of 0-2 m and can be observed in most of the district of the State. 2-4 m fluctuation is observed in isolated pockets.

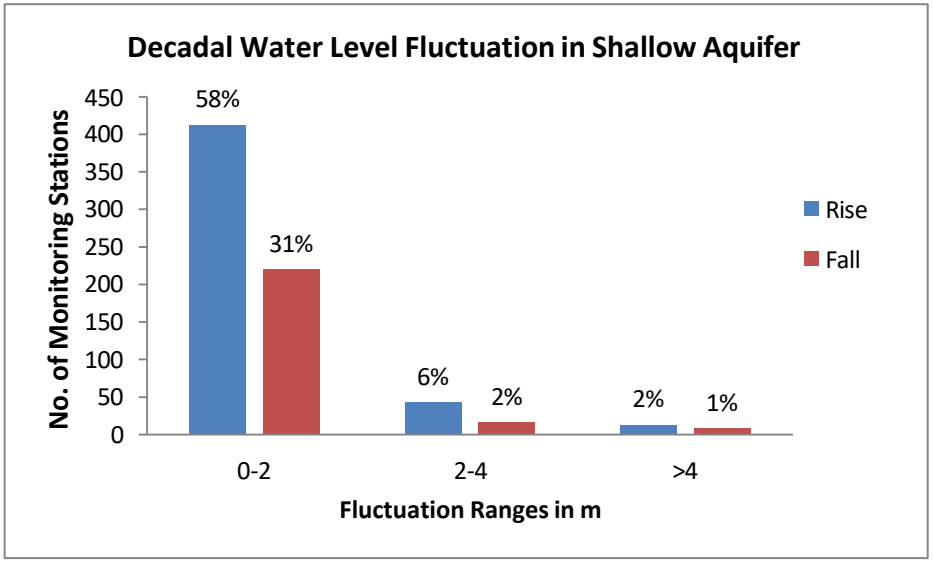

Figure-10: Percentage of wells showing rise and fall in WL in unconfined aquifer (Decadal Mean August (2014-2023) to August 2024)

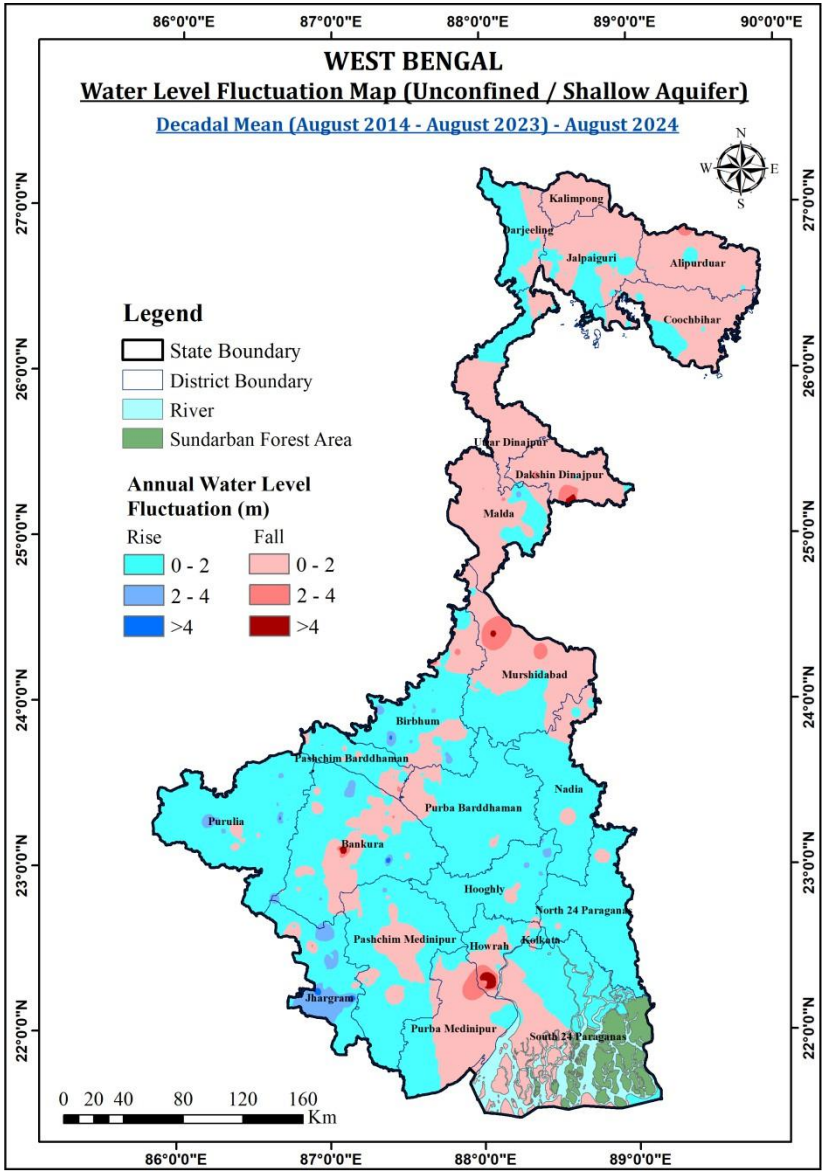

Figure-11: Decadal water level fluctuation in unconfined Aquifer (Decadal Mean August (2014-2023) to August 2024)

5.2 DEEPER AQUIFER (CONFINED/ SEMI-CONFINED)

5.2.1 DEPTH TO PIEZOMETRIC LEVEL

Depth to Piezometric Level in Confined/Semi-Confined Aquifer (August 2024)

The ground water level data August 2024 in deeper aquifers indicate that out of the total 840 wells analysed, only 5% of wells are showing water level less than 2 m bgl, 25 % wells are showing water level in the depth range of 2-5 m bgl, 25% number of wells are showing water level in the depth range of 5-10 m bgl, 34% wells are showing water level in the depth range of 10-20 m bgl and 11% wells showing water level in the depth range beyond 20m bgl. The maximum depth to water level of 32.86 m bgl is observed at Habibpur in Habibpur block of Malda district and lowest water level 0.83 m bgl was found at Sutia in Chapra block of Nadia District (Figure-12 & 13).

From the depth to water level map of August 2024 for deeper aquifers, the water level within 0-2 m bgl occurs as isolated patches. The water level in the range of 2-5 m bgl is in northern parts of the district covering Darjeeling, Alipurduar, Jalpaigudi and Kochbehar districts and in scattered parts in Purulia, Nadia, Murshidabad, N 24 Parganas, Bankura districts. Water level between 5-10 m bgl is found mostly in eastern and western part of the State in parts of Paschim Medinipur, Jhargram, Bankura, Nadia, Murshidabad N 24 Parganas and Darjeeling, Alipurduar, Jalpaigudi district in the north. In the central part of the state water level is mostly deep beyond 10 to 20 m bgl covering the districts of Purba Bardhaman, Hooghly, Howrah, Bhirbhum, Murshidabad, Paschim & Purba Medinipur Malda, Dakshin Dinajpur Darjeeling and Kalimpong districts. Deepest water level >20 m bgl covered the central part of the State.

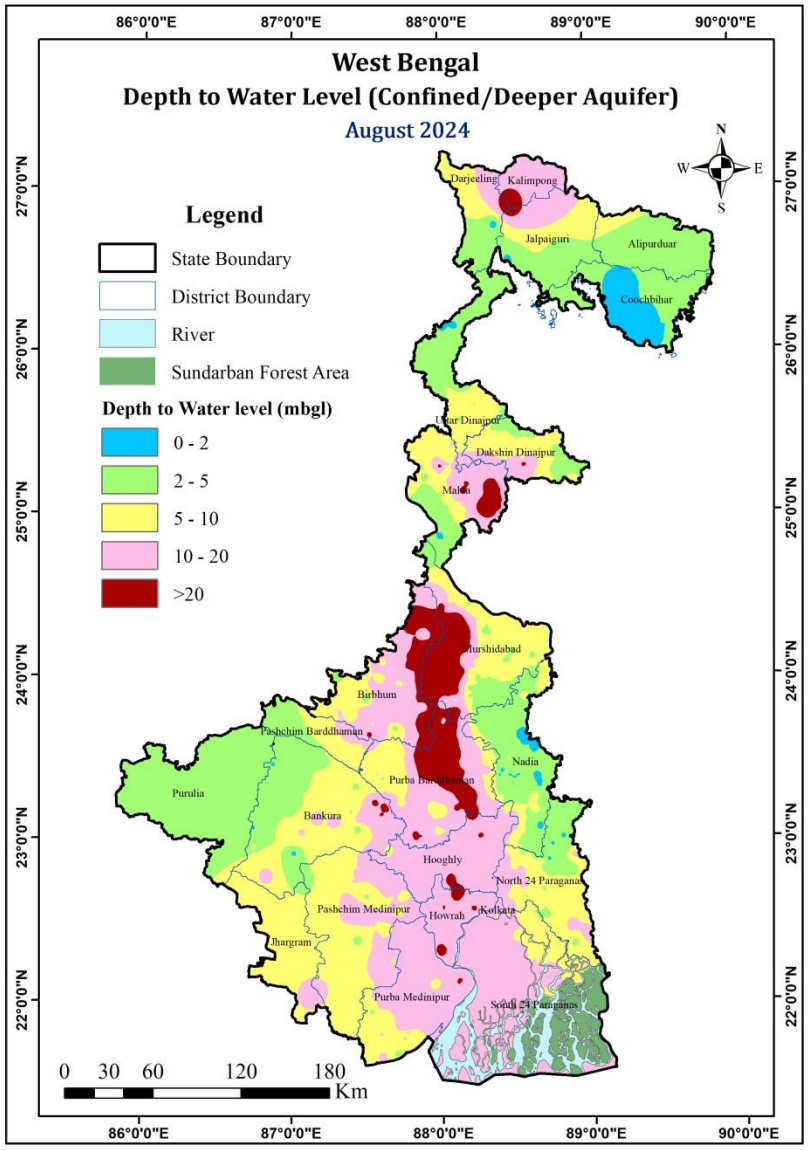

Figure-12: Depth to piezometric Level in deeper aquifer in August 2024

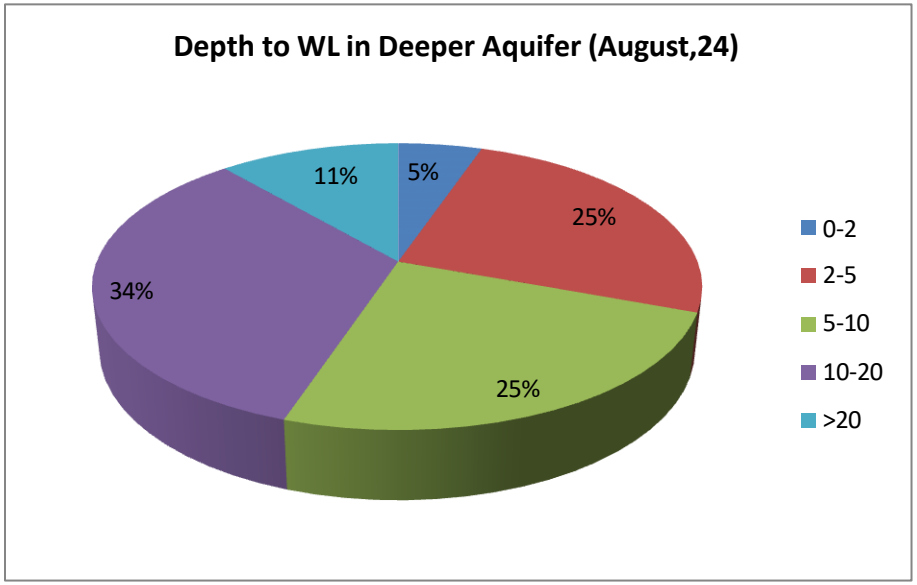

Figure-13: Percentage of wells in different piezometric levels (August 2024)

5.2.2 SEASONAL FLUCTUATION IN PIEZOMETRIC LEVEL

Seasonal Fluctuation of Piezometric Level in Confined/ Semi- Confined Aquifer (April 2024 to August 2024)

In deeper aquifers out of 736 wells analyzed, 555 wells showing rise and 181 wells shows falling water level (figure-14 &15).

In deeper aquifers in rising category 26% of wells are showing 0-2m fluctuation, 24% showing 2-4m fluctuation and 26% of wells are in the range of more than 4m. In the falling category 13% of wells are showing falling trend in 0-2m category, 6% of wells are in the range of 2-4m and 5% of wells are showing >4m fluctuation of water level.

The rise in water level is observed in all the districts of the State during Monsoon season. Fall is observed only 3% of the well in the category of 0-2 m as isolated patches.

Fall in water level is observed in Central districts of the State as isolated patches.

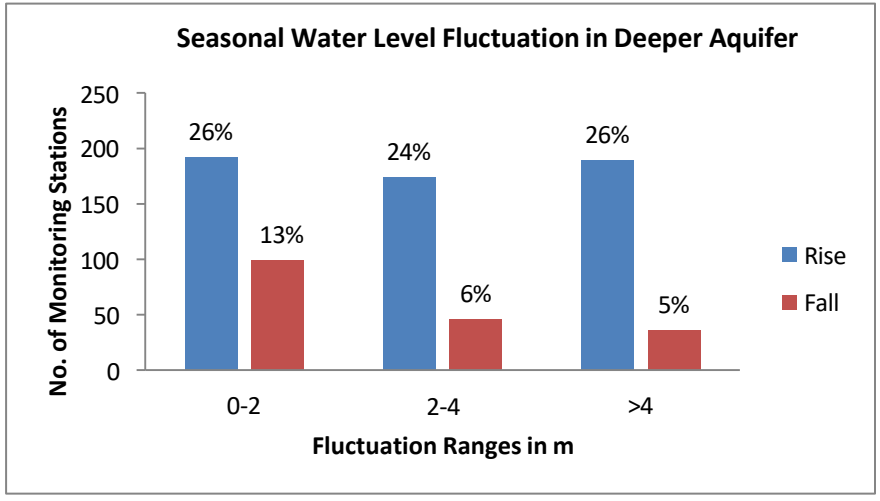

Figure-14: Percentage of wells showing rise and fall in WL in Confined aquifer/ semi-confined aquifer (April 2024 to August 2024)

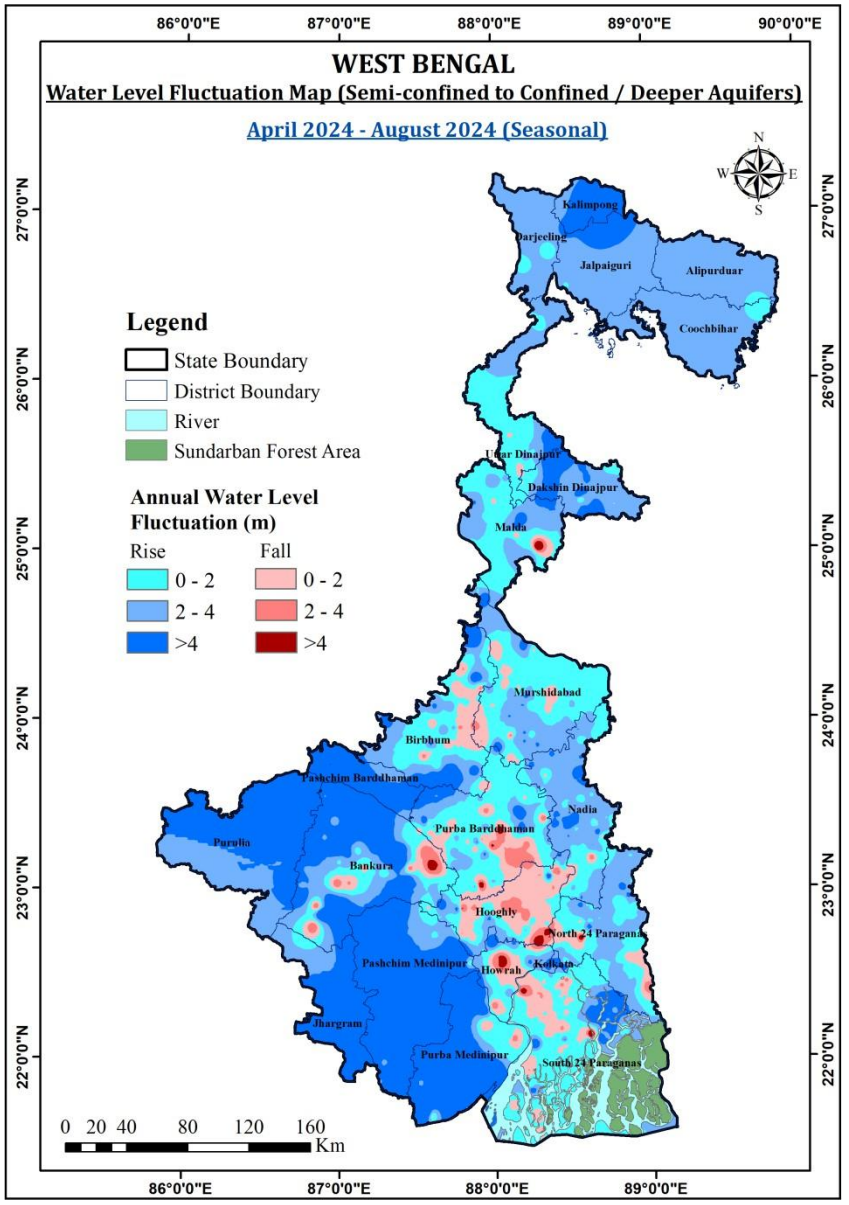

Figure-15: Seasonal water level fluctuation in in Confined aquifer/ semi-confined aquifer(April 2024 to August 2024)

5.2.3 ANNUAL FLUCTUATION IN PIEZOMETRIC LEVEL

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

In deeper aquifers out of 770 wells analyzed, 426 wells showing rise and 344 wells shows falling water level (figure-16 &17).

In deeper aquifers in rising category 31% of wells are within the fluctuation of 0-2m, 15% are in 2-4m and 9% of wells are in the range of more than 4m. In the falling category 24% of wells are showing falling trend in 0-2m category, 9% of wells are in the range of 2-4m and 11% of wells are showing >4m fluctuation of water level.

Rise of upto 2-4 m in water level is seen in Eastern and Western parts of the State significantly in Nadia, N-24 Parganas Purulia, and parts of Purba & Paschim Medinipur, Bankura Howrah, Hooghly, Murshidabad, Malda and Coochbehar district. Rise of >4 m is observed as isolated patches.

Fall upto 2-4 m in water level is observed in Central part of the State. Fall of beyond 4 m is observed as isolated patches.

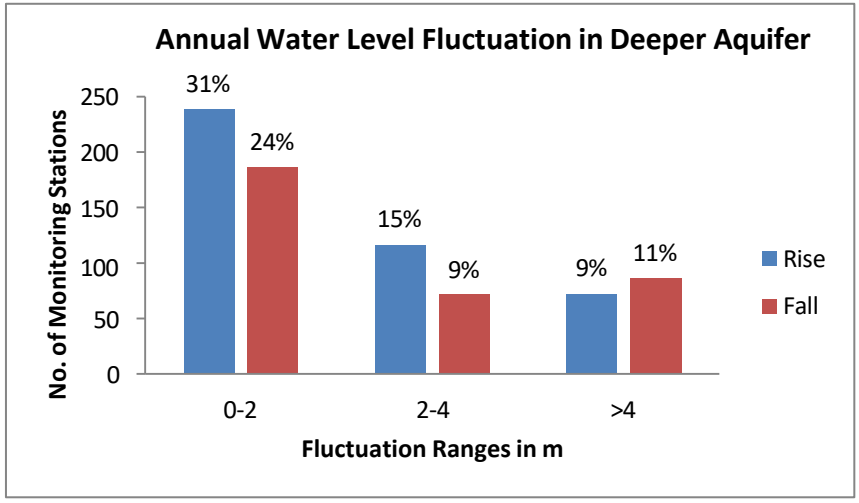

Figure-16: Percentage of wells showing rise and fall in piezometric level in confined/semi-confined aquifer (August 2023 to August 2024)

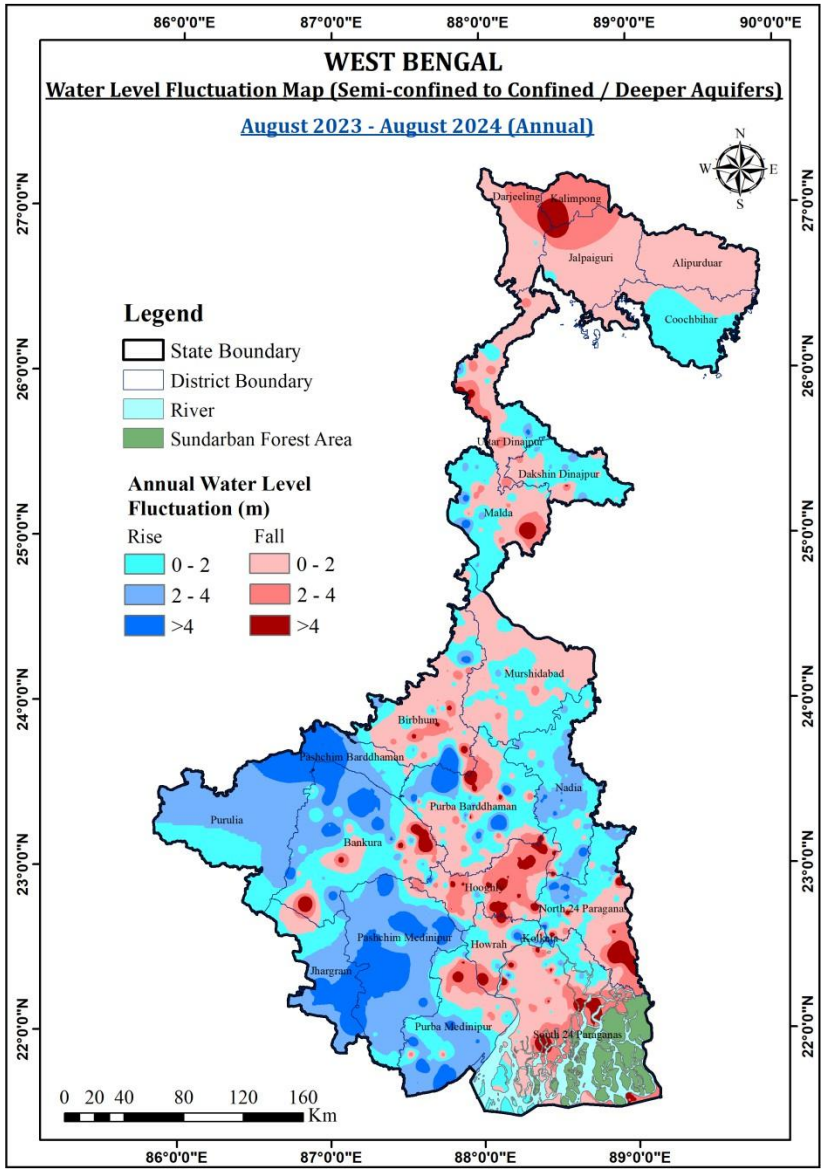

Figure-17: Annual water level fluctuation in Confined aquifer (August 2023 to August 2024)

5.2.4 DECADAL FLUCTUATION IN PIEZOMETRIC LEVEL

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

In deeper aquifers out of 678 wells analyzed, 227 wells showing rise and 451 wells shows falling water level (figure-18 &19).

For deeper aquifers, in rising category 23% of wells are within the fluctuation of 0-2m, 8% are in 2-4m and 3% of wells are in the range of more than 4m. In the falling category 28% of wells are showing falling trend in 0-2m category, 17% of wells are in the range of 2-4m and 22% of wells are showing >4m fluctuation of water level. From the water level fluctuation map it can be seen water level fluctuation is mainly in the range of 0-2 m and can be observed in most of the district of the State. 2-4 m fluctuation is observed in isolated pockets. Fall of >4m is observed in Central part of the State.

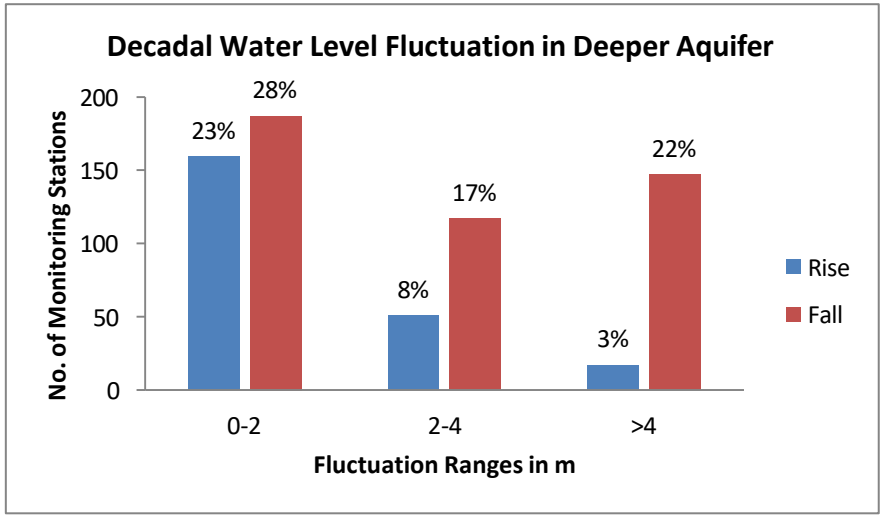

Figure-18: Percentage of wells showing rise and fall in piezometric level in confined/semi-confined Aquifer (Decadal Mean August (2014-2023) to August 2024)

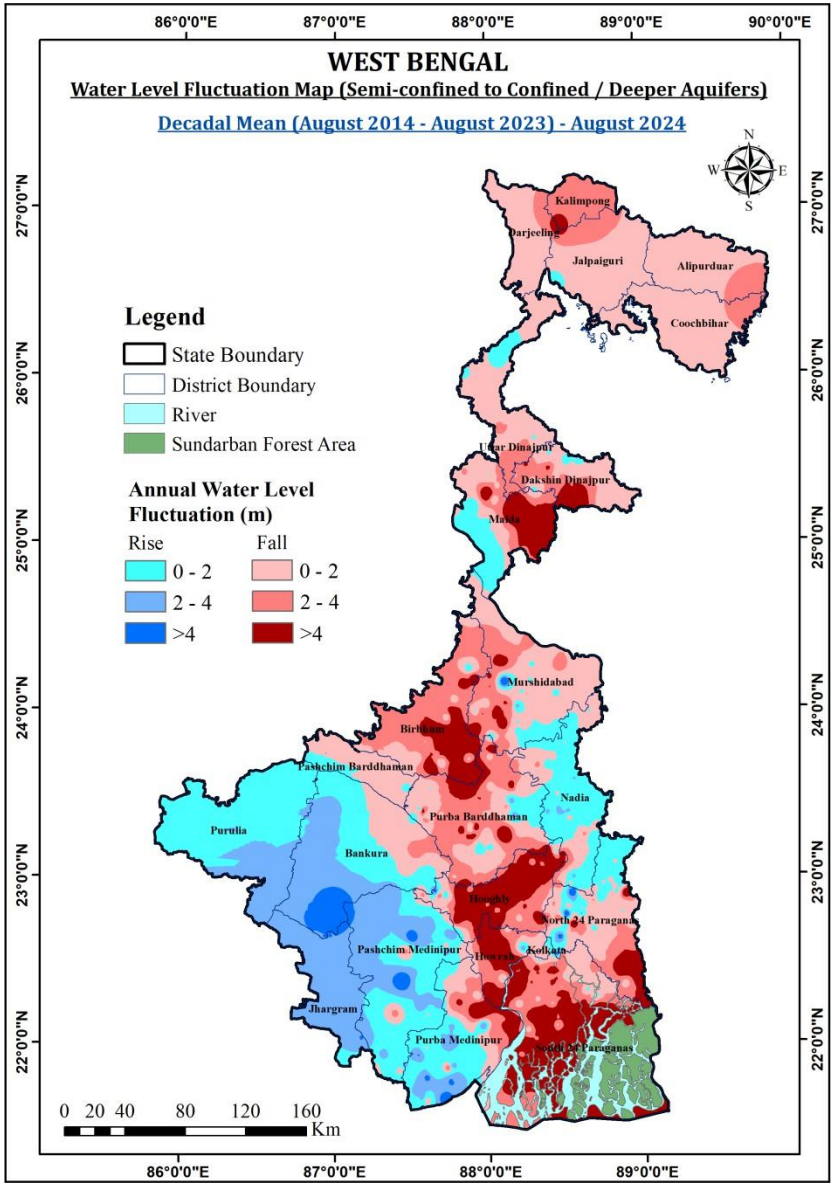

Figure-19: Decadal water level fluctuation in Confined Aquifer (Decadal Mean August (2014-2023) to August 2024)

6.0 SUMMARY

As a component of the National Ground Water Monitoring Programme, CGWB, ER, Kolkata conducts ground water monitoring on quarterly basis in West Bengal: during January, August (pre-monsoon), August, and November (post- monsoon). As on March 2024, the Eastern Region, Kolkata has 1732 GWMS in the State of West Bengal.

During August 2024, around 94% of the West Bengal's monitoring wells exhibit depth to water level within 20 meters below ground level. Deeper water levels of more than 20 m covers only 6% monitoring wells of the State. The ground water level in West Bengal during August 2024 has been significantly influenced by rainfall during June-July. **This period witnessed a deficient rainfall that has led to the decline of groundwater level in Shallow aquifers during August 2024.** Central region of West Bengal experiences significant decline as this region is considered as the rice belt of West Bengal with major irrigation draft. **The high rainfall during September and the cyclonic effects of DANA cyclone in 4th week of October leads to the increase the GWL of unconfined aquifer over the region.**

Seasonal water level fluctuation (April 2024 to August 2024) shows that 86% rise and 14% fall in seasonal water level fluctuation which when compared to the previous year Seasonal fluctuation (April 2023 to August 2023) having 83% rise and 17% fall in water level indicating the effect of rainfall during monsoon season in West Bengal.

Annual water level fluctuation August 2023 to August 2024 shows that 61% rise and 39% fall in annual water level fluctuation which when compared to the previous year Annual fluctuation (August 2022 to August 2023) having 43% rise and 57% fall in water level indicating the effect of ground water recharge in the State.

Similarly, Decadal fluctuation in water level of mean (2014-2023) with respect to August-2024 shows 50% of the area experienced rise and 50% fall in water level, which when compared to the previous year Decadal mean (2013-2022) to August-2023 having 30% rise and 70% fall in water level indicating significant recharge of the aquifer system in the West Bengal State.

7.0 RECOMMENDATIONS

The improvement in groundwater levels across West Bengal, with 50% of the area experiencing a rise and 50% a fall (Decadal mean (2014-2023) with respect to August-2024), indicates a significant recharge of the aquifer system. To sustain and further enhance this positive trend, the following recommendations are proposed:

- **Implementation of Percolation Tanks and Check Dams:** Construction of percolation tanks and check dams across suitable locations to facilitate the infiltration of rainwater into the aquifer. These structures should be designed based on detailed hydrological studies to ensure effective recharge.
- **Rainwater Harvesting Systems:** Encouragement of the installation of rainwater harvesting systems in urban and rural areas to capture and store rainwater, reducing surface runoff and enhancing groundwater recharge.
- **Incentives for Sustainable Practices:** Provide incentives for farmers and industries adopting water-efficient technologies and practices, such as drip irrigation and water recycling, to reduce dependency on groundwater.
- **Integrated Water Resource Management:** Develop and implement comprehensive water management plans that integrate surface water and groundwater resources, considering the unique hydrogeological conditions of different regions within the state.
- **Data Sharing Platforms:** Establish platforms for sharing groundwater data among stakeholders, including government agencies, researchers, and the public, to facilitate informed decision-making.

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आज़ादी का अमृत महोत्सव

CONSERVE WATER FOR FUTURE

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