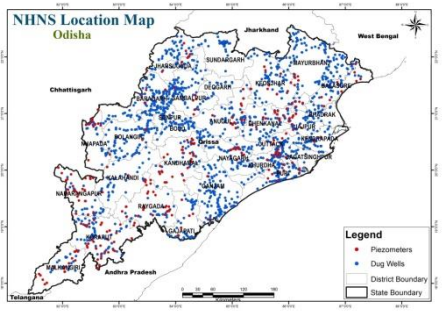

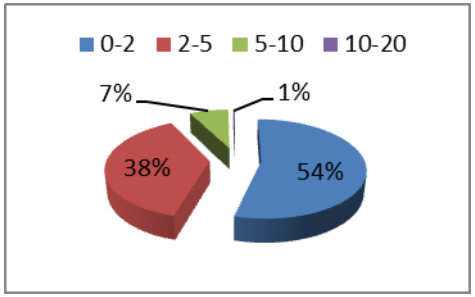

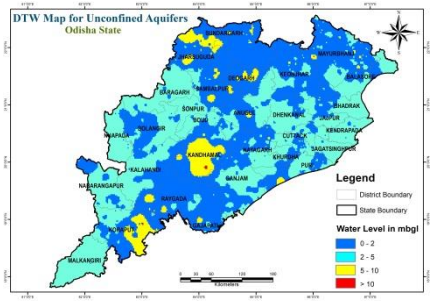

GROUNDWATER LEVEL BULLETIN

NOVEMBER 2024

ODISHA

ABSTRACT

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

CGWB, SOUTH EASTERN REGION, BHUBANESWAR

1.0 INTRODUCTION

Ground water bulletin is prepared by GWB depicting changes in ground water regime of the state through different seasons. It is an effort to obtain information on ground water levels through representative monitoring wells. The important attributes of ground water regime monitoring are ground water 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, South East Region four times a year during January, April, August and November. A network of 1760 observation wells called **National Hydrograph Network Stations (NHNS)**, as on 30.11.2024, located all over the state is being monitored.

2.0 STUDY AREA

Odisha State is the 8th largest state in India covering geographical area of 1, 55, 707 Km^2. It lies between NL 17° 49' and 22° 34' and EL 81° 24'and 87° 29'. The State is bordered on the east by Bay of Bengal (~575 km), south by Andhra Pradesh, west by Chhattisgarh and north by Jharkhand and West Bengal states. Administratively, the state is comprising of 3 revenue divisions, 30 districts, 58 subdivisions and 314 community development blocks. The population of Odisha is 41,947,358 (census 2011) having a decadal growth rate of 13.97% and the density of population is 269 persons per sq. km. The rural population constitute about 83.32% of the total population.

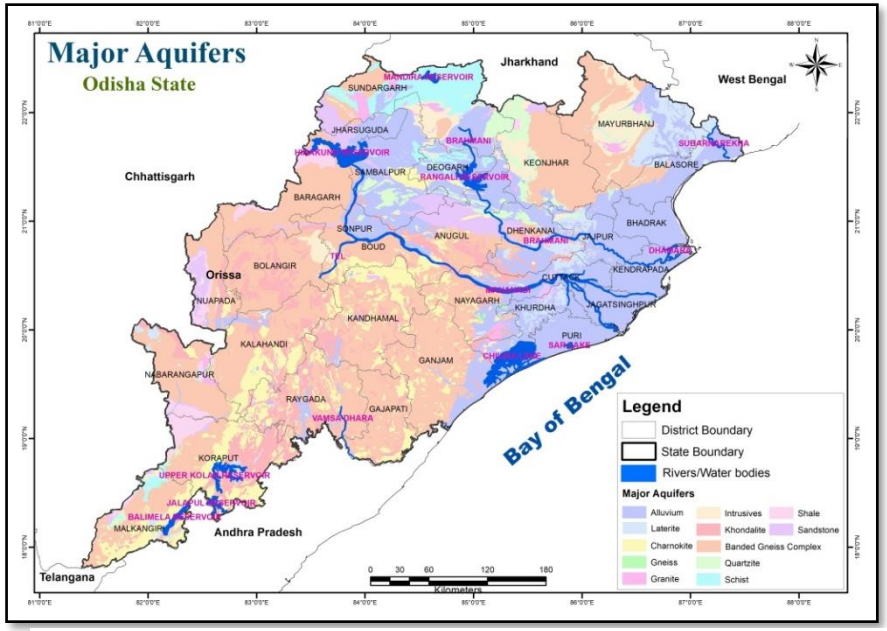

Fig. 1. Map showing major aquifers and administrative divisions of Odisha

Physiographically, the State presents varied and picturesque landforms. The Southern and Central parts of the State in Rayagada, Kalahandi, Kandhamal and Gajapati districts present a rugged hilly tract. Plateau occupies the Northern districts of Sundergarh, Keonjhar and Mayurbhanj and parts of Nabarangpur district in the Southwest. Undulating plains characterizes the major river valleys. A narrow coastal plain borders the Bay of Bengal.

Physiographically the state can be divided into five distinct units, namely (i) Coastal plains, (ii) Northern uplands, (iii) The erosional plains of Mahanadi and other river valleys (iv) South Western hilly region and (v) Subdued plateaus.

3.0 GROUNDWATER LEVEL MONITORING

Central Ground Water Board, South Eastern Region, is monitoring changes in groundwater regime in Odisha 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 August 2024 is 1760 which include 1480 dug wells and 280 piezometers. Among these, 1581 wells monitored and water level recorded, while 179 wells could not be monitored due to various reasons like in accessibility issues. The district-wise breakup of the water level monitoring stations is given in **Table-1**.

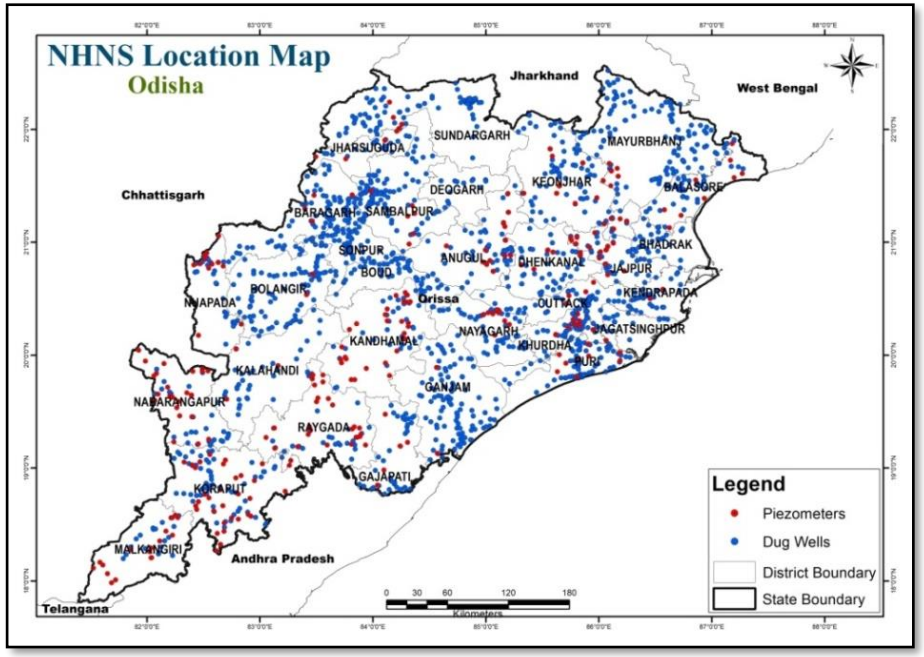

Fig. 2. Map showing locations of monitoring wells (NHNS) in Odisha state

Table 1 District-wise distribution of water level monitoring stations

Sl. No.	District	No. of Monitoring Stations		
		DW	BW	Total
1	ANUGUL	48	13	61
2	BALANGIR	80	2	82
3	BALESHWAR	37	9	46
4	BARGARH	73	3	76
5	BAUDH	54		54
6	BHADRAK	26		26
7	CUTTACK	69	5	74
8	DEBAGARH	11		11
9	DHENKANAL	41	6	47
10	GAJAPATI	37	5	42
11	GANJAM	96	3	99
12	JAGATSINGHAPUR	12		12
13	JAJAPUR	38	14	52
14	JHARSUGUDA	19	4	23
15	KALAHANDI	35	3	38
16	KANDHAMAL	31	29	60
17	KENDRAPARA	26	3	29
18	KENDUJHAR	70	14	84
19	KHORDHA	72	8	80
20	KORAPUT	60	36	96
21	MALKANGIRI	20	18	38
22	MAYURBHANJ	110	9	119
23	NABARANGAPUR	27	25	52
24	NAYAGARH	43	12	55
25	NUAPADA	25	12	37
26	PURI	81	9	90
27	RAYAGADA	25	27	52
28	SAMBALPUR	83	6	89
29	SONAPUR	48		48
30	SUNDARGARH	83	5	88
Grand Total		1480	280	1760

4.0 RAINFALL

The rainfall data collected and compiled from weekly and monthly weather reports from India Meteorological Department were used to analyze the rainfall for the period June 2024 - October 2024. Table-2 gives the district-wise rainfall data for the period June September 2023 & June October 2024, normal and the departure of June- October 2024 rainfall with other periods.

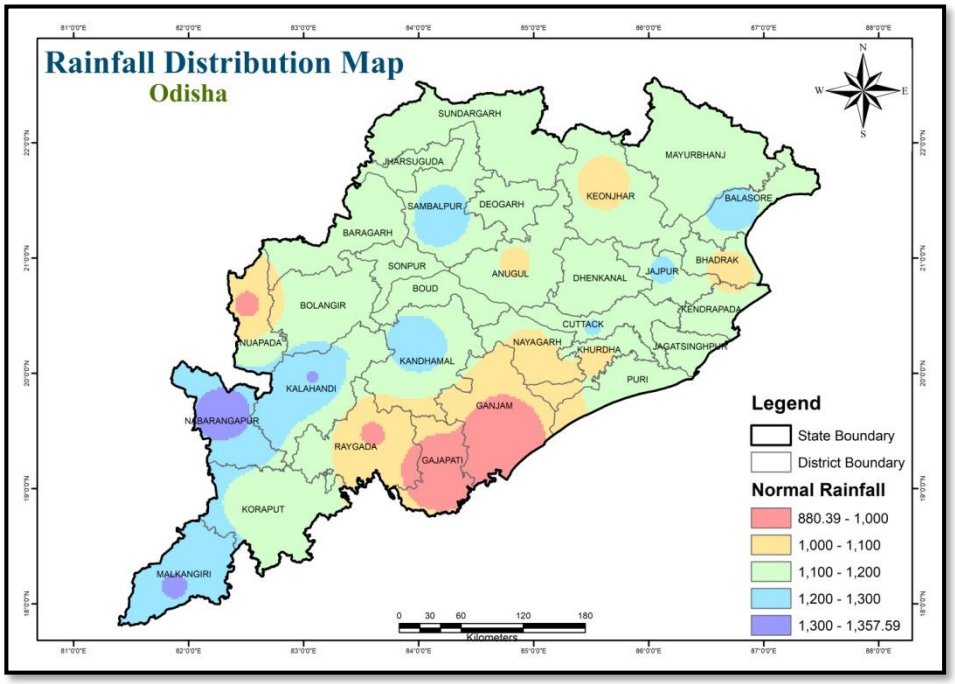

Fig. 3. Rainfall deviation (June 2024-October 2024) from normal rainfall

Table 2 District-wise rainfall data for the period of 2023-2024

Sl. No.	DISTRICT	Total Rain-fall_2024	Normal rainfall	Total Rain-fall_2023	Deviation from Nor-mal rainfall (%)	Deviation from rain-fall 2023 (%)
1	Angul	1042.28	1083.53	1165.09	-3.81	-10.54
2	Balasore	929.33	1252.70	1086.00	-25.81	-14.43
3	Bargarh	1097.79	1131.56	1236.98	-2.98	-11.25
4	Bhadrak	757.74	1048.12	1021.36	-27.70	-25.81
5	Balangir	968.26	1112.37	1031.17	-12.96	-6.10
6	Boudh	1221.13	1152.72	1293.73	5.93	-5.61
7	Cuttack	1237.54	1222.38	1031.83	1.24	19.94
8	Deogarh	936.33	1132.43	1272.13	-17.32	-26.40
9	Dhenkanal	1197.14	1107.82	1280.21	8.06	-6.49
10	Gajapati	850.13	940.31	864.75	-9.59	-1.69
11	Ganjam	810.69	880.37	701.66	-7.91	15.54
12	Jagatsinghp ur	1144.18	1101.36	912.89	3.89	25.34
13	Jajpur	955.66	1221.60	970.59	-21.77	-1.54
14	Jharsuguda	933.94	1169.42	1408.12	-20.14	-33.67
15	Kalahandi	1176.12	1305.19	1112.78	-9.89	5.69
16	Kandhamal	944.67	1275.24	1253.70	-25.92	-24.65
17	Kendrapara	895.07	1131.83	835.72	-20.92	7.10
18	Keonjhar	870.33	1072.20	1145.42	-18.83	-24.02
19	Khordha	1032.87	1055.27	946.82	-2.12	9.09
20	Koraput	1426.14	1187.47	1275.00	20.10	11.85
21	Malkanagiri	2035.96	1304.10	1444.30	56.12	40.97
22	Mayurbhanj	1106.48	1150.45	1056.79	-3.82	4.70
23	Na-warangpur	1245.78	1357.63	1027.31	-8.24	21.27
24	Nayagarh	1106.91	1067.96	1024.25	3.65	8.07
25	Nuapada	1201.10	979.33	1002.12	22.65	19.86
26	Puri	846.88	1140.85	816.44	-25.77	3.73
27	Rayagada	751.48	986.15	867.43	-23.80	-13.37
28	Sambalpur	1109.26	1283.59	1484.41	-13.58	-25.27
29	Subarnapur	1297.67	1196.29	1253.27	8.47	3.54
30	Sundargarh	978.13	1113.84	1139.90	-12.18	-14.19

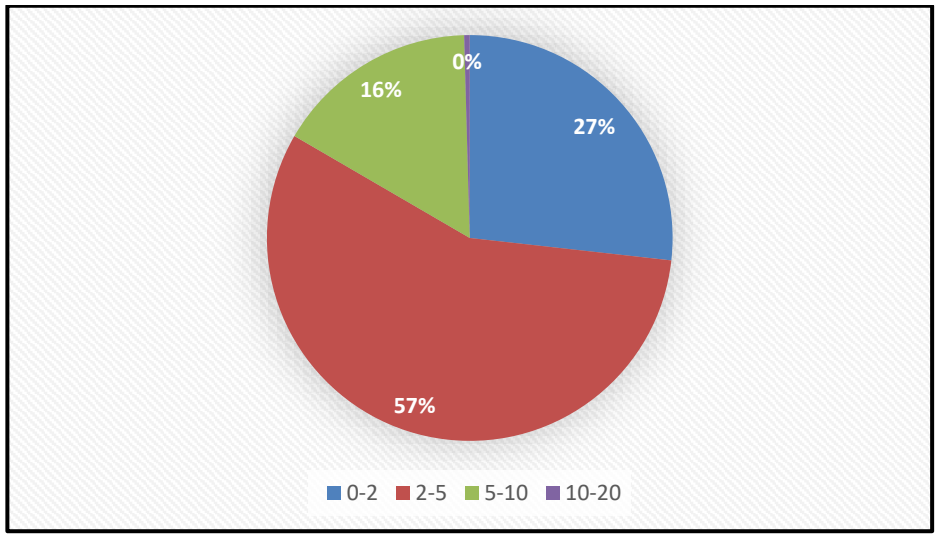

Fig. 4. Percentage of wells in different water level ranges in unconfined aquifer.

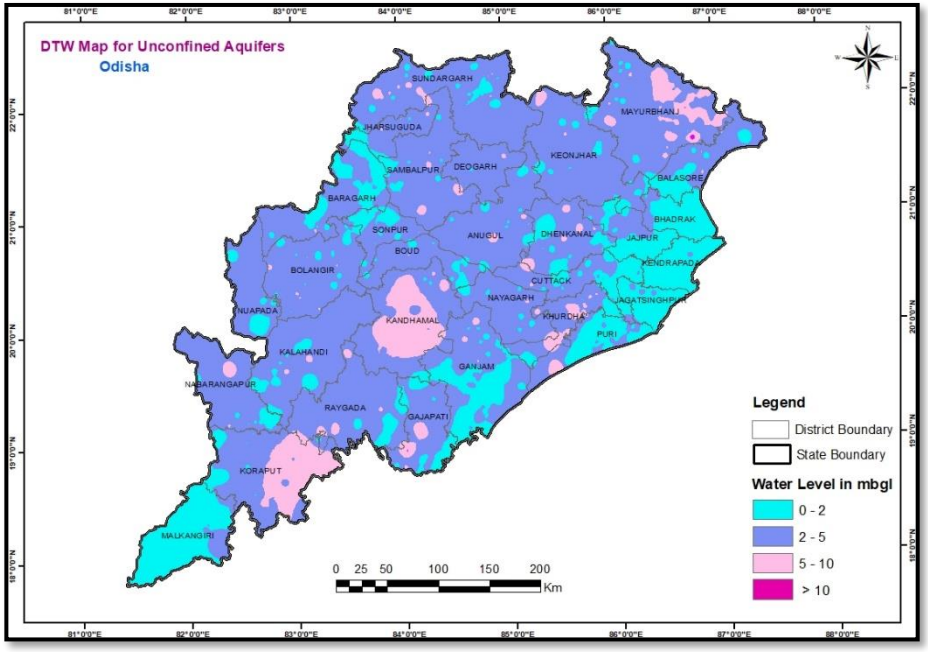

Fig. 5. Depth to water level of unconfined aquifer during November 2024.

4.1 SHALLOW AQUIFER (UNCONFINED)

4.1.1 DEPTH TO WATER LEVEL

Depth to Water Level in Unconfined Aquifer (November 2024)

The depth to water level of 1360 wells is used for the analysis. Analysis of depth to water level data of 1360 wells shows water level varies between 0.02 m bgl (Kalahandi district) to 14.36 m bgl (Mayurbhanj district).

Shallow water level of less than 2 m bgl is observed in 364 number of wells in all the districts covering 26.76% of the NHS wells of the State. About 56.62% of the NHS wells have shown water level in this range of 2–5 mbgl. All the districts have recorded water level in this range which is about 770 no. Of wells. The districts with the more than 70 percent of wells showing this range of water level are Kendujhar (83.33%), Nayagarh (76.19%), Anugul (72.92%), Boudh (72.00%) and Balangir (71.01%). The major command areas of the state like Hirakud, Mahanadi, delta stage I & II, Baitarani, Salandi and Anandpur have shown water level in this range. Around 16.18% of the total NHS wells (220 no. of wells) recorded water level in the range of 5-10 mbgl and present as isolated patches. Districts like Kandhamal (51.72%), Koraput (45.45%), Khordha (36.67%) and Deogarh (36.36%) showed water level of the wells in this range. The hard rock and hilly terrains of the state has recorded water level in this range in majority of wells. Only 6 wells (0.44%) of the wells of the state fall in the range of 10-20 mbgl. It is observed in 3 wells of Mayurbhanj, 1 well of Gajapati, 1 well of Kandhmal, and 1 well of Koraput. None of the monitored wells of August 2024 showed water level in more than 20 mbgl.

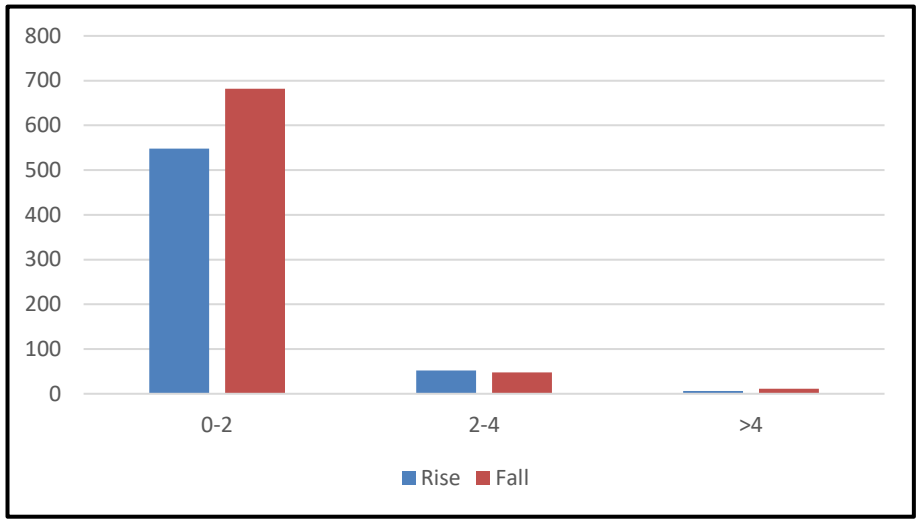

Fig.6.Wells showing rise and fall in WL in unconfined aquifer (April 2024 to November)

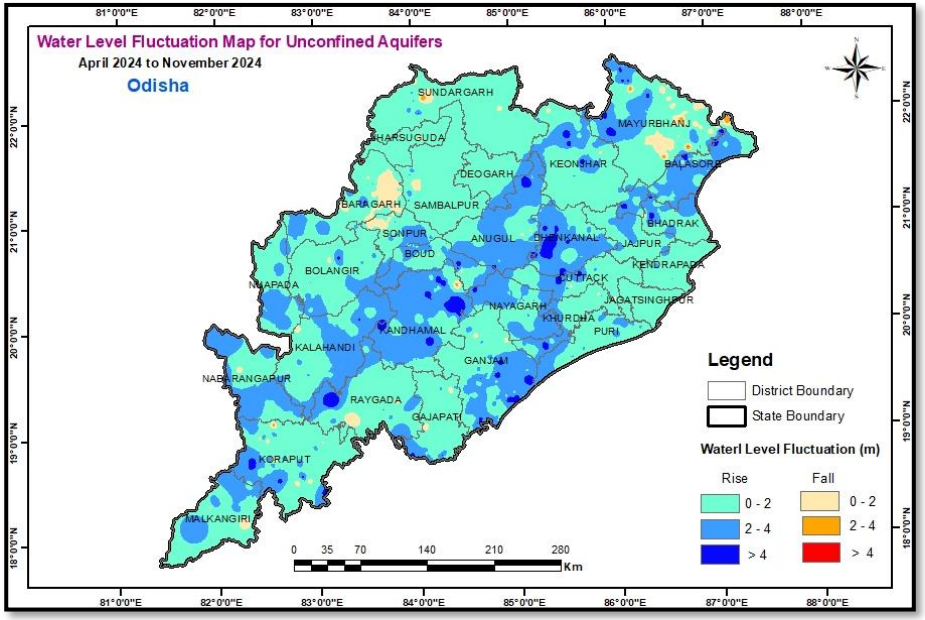

Fig.7. Annual water level fluctuation in unconfined Aquifer (April 2024 to November2024)

4.1.2 SEASONAL FLUCTUATION IN WATER LEVEL

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

Rise in Water Level:

Out of 1347 wells, 606 wells have showed rise in water level. Water level rise of less than 2 m is recorded in 40.68% wells, 2 to 4 m in 3.86% wells and more than 4 m in 0.45% of the wells. Water level rise of less than 2 m is seen in all the districts significantly in Gajapati, Rayagada, Nabarangpur, Baleshwar, Nayagarh, Puri, Sambalpur, Bargarh and Khordha districts. Water level rise in the range of 2 to 4m is some of the districts except in Angul, Bargarh, Bhadrak, Boudh, Dhenkanal, Jagatsinghpur, Jajpur, Kendrapara, Nuapada, Puri and Rayagada districts such as Kandhamal, Mayurbhanj, Jharsuguda and Deogarh districts. Rise of more than 4 m is only observed in Koraput, Mayurbhanj and Sundergarh districts.

Fall in Water Level:

Out of 1347 wells, 741 wells have showed fall in water level. Water level fall of less than 2 m is recorded in 50.63%, while 3.56% is in the range of 2 to 4 m and remaining 0.82% wells registered water level fall of more than 4m. Fall of less than 2m is observed as isolated patches, mainly parts of Kendrapara, Jagatsinghpur, Jajpur, Bhadrak, and Cuttack districts. Fall of water level in the range of 2 to 4 m is observed in Dhenkanal, Angul, Kendujhar, Mayurbhanj and Malkangiri districts. Fall of beyond 4 m is observed in Rayagada, Kandhamal, Jajpur, Angul, Koraput and Bargarh districts.

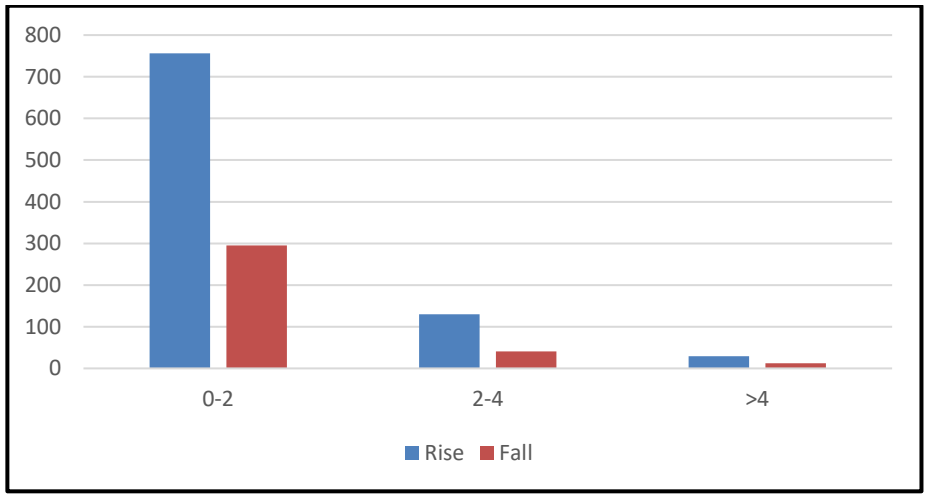

Fig.9. Annual water level fluctuation in unconfined Aquifer (November 2023 to November 2024)

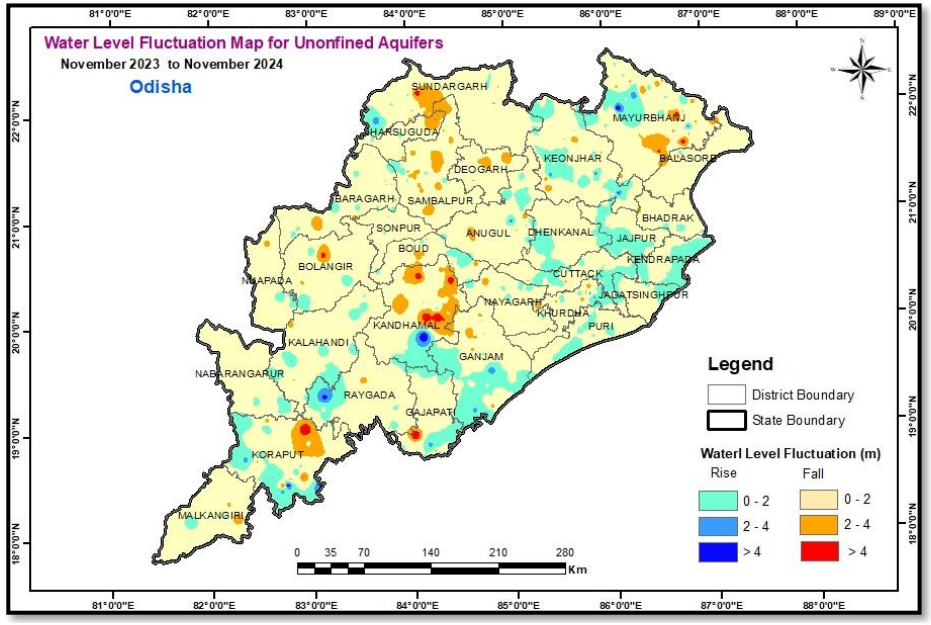

Fig.8.Wells showing rise and fall in WL in unconfined aquifer (November 2023 to November 2024)

4.1.3 ANNUAL FLUCTUATION IN WATER LEVEL

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

Rise in Water Level:

Out of 1263 wells, 915 wells showed rise in water level. water level rise of less than 2 m is recorded in 59.86% wells, 2 to 4 m in 10.29% wells and more than 4 m in 2.30% of the wells. Water level rise of less than 2 m is seen in all the districts, significantly in Sonepur, Bhadrak, Nuapada, Baleshwar, Balangir, Bargarh and Jagatsinghpur districts. Water level rise in the range of 2 to 4m is observed mainly in districts such as Deogarh, Boudh, Jharsuguda, Kandhamal and jagatsinghpur districts. Rise of more than 4 m is significantly observed in Kandhamal, Koraput, JharsugudaBaleshwar and Mayurbhanj districts.

Fall in Water Level:

Total 348 wells that have registered fall in water level out of 1263 wells from which 23.36% have recorded less than 2 m while 3.25% in the range of 2 to 4 m and remaining 0.95% wells registered water level fall of more than 4m. Fall of water level less than 2m is observed in some of the districts, except Bargarh, Bhadrak, Boudh, Cuttack, Deogarh, Dhenkanal, Gajapat, Ganjam, Jagatsinghapur, Jajapur, Jharsuguda, Kalahandi, Kandhamal, Kendrapara, Kendujhar, Khordha, Koraput, Malkangiri, Mayurbhanj, Nabarangpur, Nayagarh, Nuapada, Puri, Rayagada, Sambalpur, Sonepur, Sundargarh districts. Fall of water level in the range of 2 to 4 m is observed mainly in Cuttack, Gajapati, Koraput, Ganjam and Kendujhar districts. Fall of beyond 4 m is observed as isolated patches in Khordha, Rayagada, Kandhmal and Angul districts.

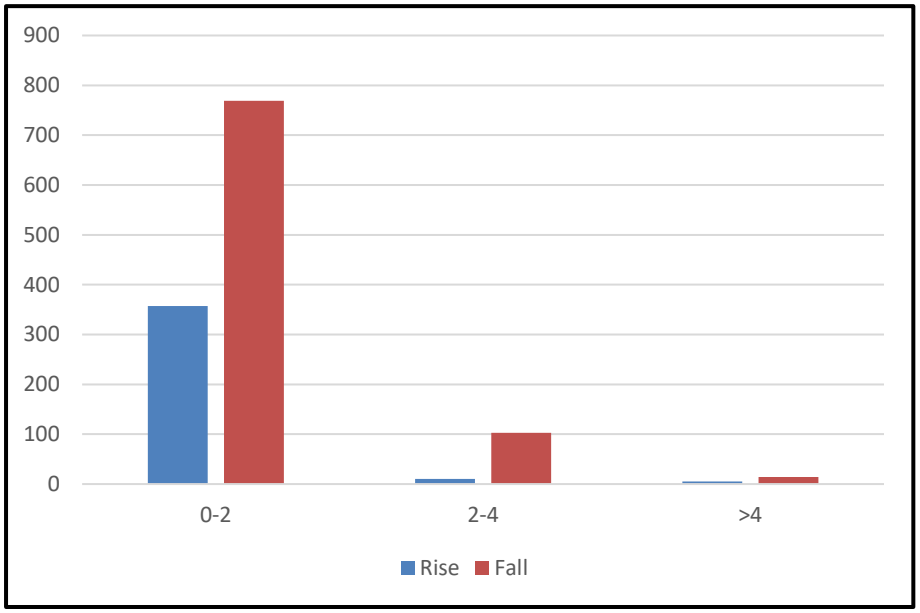

Fig.10. Wells showing rise and fall in WL in unconfined Aquifer (Decadal Mean November (2014-2023) to November 2024)

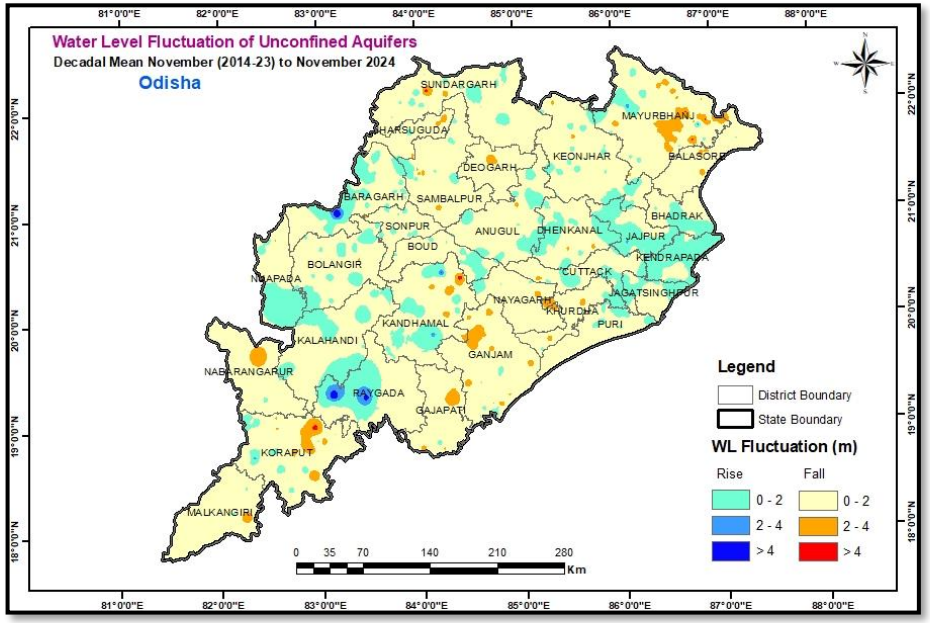

Fig.11. Decadal water level fluctuation in unconfined Aquifer (Decadal Mean November (2014-2023) to November 2024)

4.1.4 DECADAL FLUCTUATION IN WATER LEVEL

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

Rise in Water Level:

Out of 1262 wells, Rise in water level is recorded from 372 wells. Water level rise of less than 2 m is recorded in 28.29% wells, 2 to 4 m in 0.79% wells and more than 4 m in 0.40% of the wells. Water level rise of less than 2 m is seen in all the districts except Deogarh district, significantly in Kendrapara, Jajpur, Nuapada, Kalahandi, Dhenkanal and Cuttack districts. Water level rise of 2 to 4 m is observed only in Balangir, Boudh, Jajpur, Kandhamal , Koraput, Mayurbhanj, Nuapada and Sambalpur districts and rise of more than 4 m is observed in 4 wells of Bargarh, Jajapur, Kandhamal and Rayagada districts.

Fall in Water Level:

Out of 1262 wells, fall in water level is recorded from 886 wells and no fluctuation is observed in 4 wells which are Bargarh, Jajpur, Kendrapara and puri. Out of the 886 wells that have registered fall in water levels, 60.09% have recorded less than 2 m while 8.16% in the range of 2 to 4 m and remaining 1.11% wells registered water level fall of more than 4 m. Fall of less than 2 m is observed in all districts except Bargarh, Bhadrak, Jagatsinghpur, Jajpr and Kendrapara, mainly in parts of Nabarangpur, Deogarh, Nayagarh, Malkangiri, Sonepur, Rayagada, and Bhadrak districts. Fall of 2 to 4m, recorded in Gajapati, Baleshwar, Deogarh, Mayurbhanj, Jharsuguda, Kandhamal and Koraput districts. Fall beyond 4 m recordedmainly in Mayurbhanj, Ganjam and Koraput districts.

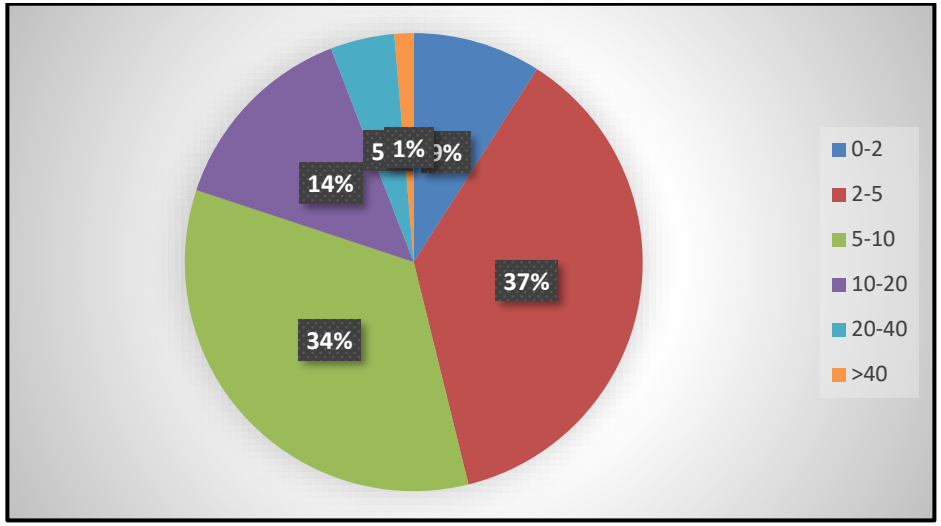

Fig.12. Percentage of wells in different water level ranges in Seim-confined and Confined

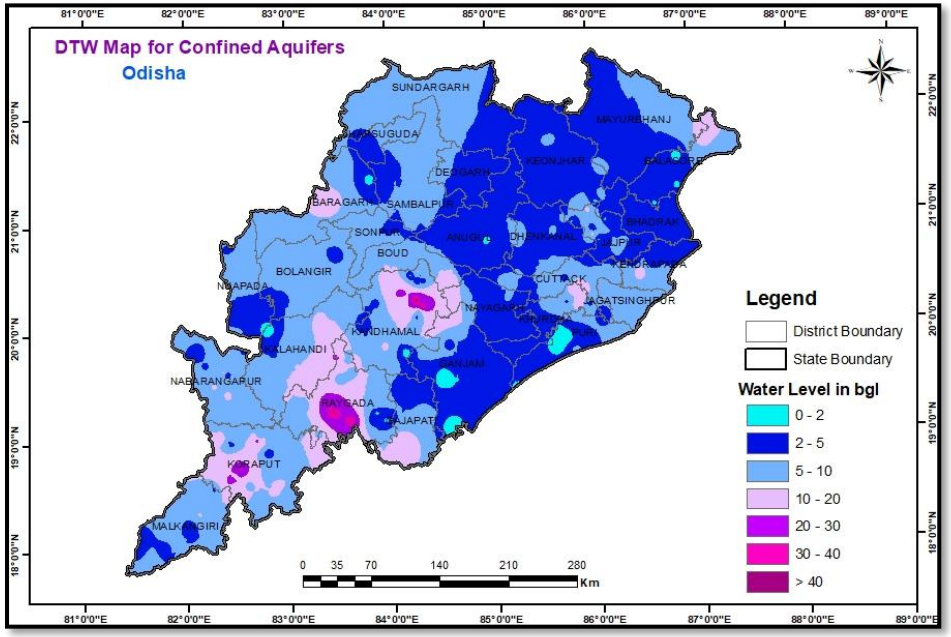

Fig.13. Depth to piezometric Level in deeper aquifer in November 2024

4.2 DEEPER AQUIFER (CONFINED/SEMI-CONFINED)

4.2.1 DEPTH TO PIEZOMETRIC LEVEL

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

Analysis of piezometric level data of 221 wells shows, piezometric levels vary between 0.1 mbgl (Puri district) to 46.29 mbgl (Kandhamal district). Piezometric level of less than 2 m bgl is recorded in 9.05% of wells, between 2 to 5 m bgl in 37.10% of wells, between 5 to 10 m bgl in 33.94% of wells, between 10 to 20 m bgl in 14.03% of wells, between 20-40 m bgl in 4.52% of wells.

Shallow piezometric level of less than 2 m bgl is noticed in isolated patches mainly in Puri (75%) and Kandhamal (16%) districts. Piezometric level of 2 to 5 m bgl mainly observed in parts of Kendrapara, Gajapati, Koraput, Nabarangpur, Dhenkanal, Mayurbhanj, Kendujhar, Khordha, Malkangiri, Balangir, Anugul, Nuapada, Ganjam and Jharsuguda districts. The districts covered by depth to piezometric levelof 5 to 10 m bgl with significant area in Jajpur, Bargarh, Puri, Kalahandi, Dhenkanal, Kendujhar Sundargarh, Sambalpur, Myurbhanj, Ganjam, Angul and Nuapada districts. Piezometric level of 10 to 20 m bgl is significantly found in parts of Jajpur, Balangir, Malkangiri, Nabarangpur, Nayagarh, Kendrapara, Baleshwar, Bargarh, Gajapati districts. Deeper piezometric levels of 20 to 40m mainly observed in Kendrapara and Koraput districts. Deeper piezometric level of more than 40 m is observed in Kandhamal and Rayagada districts only.

4.2.2 SEASONAL FLUCTUATION IN PIEZOMETRIC LEVEL

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

Rise in piezometric level:

Out of 220 wells, 116 wells showed rise in water level. Piezometric level rise of less than 2 m is recorded in 34.55% wells, 2 to 4 m in 10.00% wells and more than 4 m in 8.18% of the wells. Piezometric level rise of less than 2m is seen in most of the districts, significantly in Bargarh, Kalahandi, Kendujhar, Jharsuguda, Jajpur, Sundargarh and Puri districts. Piezometric level rise of 2 to 4m is observed mainly in districts such as Jajpur, Kendrapara, Ganjam and Balangir districts. Rise of more than 4m is observed in Kandhamal, Kendrapara, Gajapati and Koraput districts.

Fall in Piezometric Level:

Out of 104 wells that have registered fall in piezometric levels, 37.73% have recorded less than 2 m while 6.36% are in the range of 2 to 4 m and remaining 3.18% wells registered piezometric level fall of more than 4 m. Fall of lesst han 2 m is mainly observed in parts of Angul, Dhenkanal, Nayagarh, Myurbhanj, and Cuttack districts. Piezometric level fall of 2 to 4m is observed mainly in districts such as Angul, Mayurbhanj, Kalahandi, Ganjam and Dhenkanal districts. Fall beyond 4 m is observed in wells of Bargarh, Cuttack, Baleshwar and Sambalpur districts.

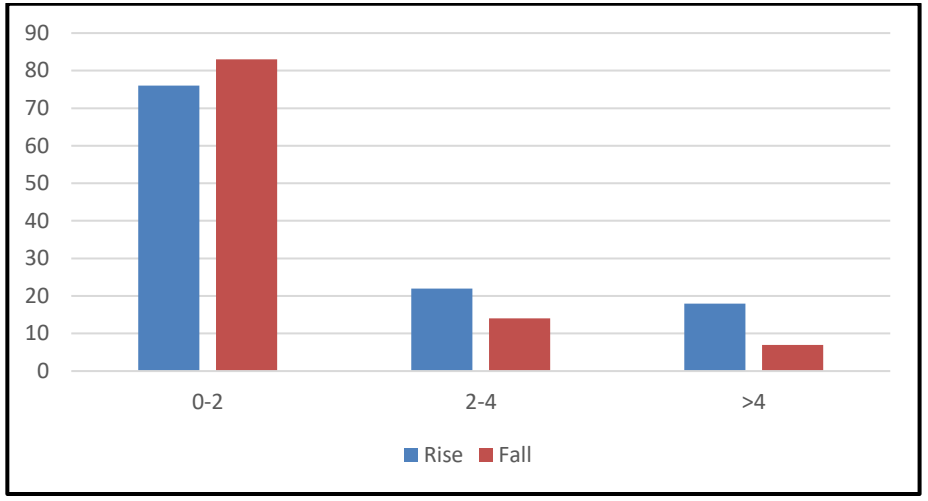

*Fig.14. Wells showing rise and fall in piezometric level in **confined/ semi-confined** aquifer (April 2024 to November 2024)*

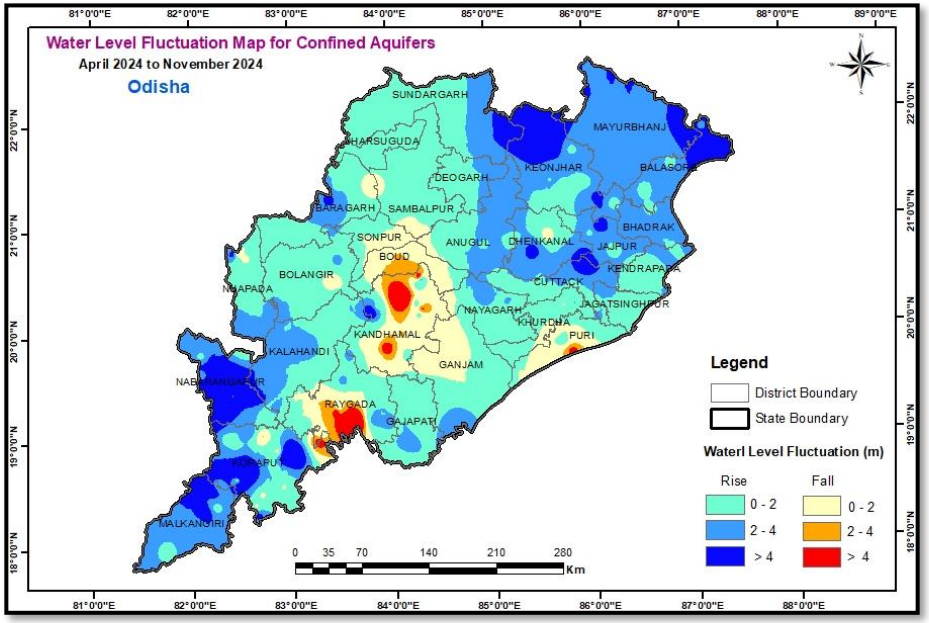

Fig.15. Annual water level fluctuation in Confined/Semi-confined Aquifer (April 2024 to November 2024)

4.2.3 ANNUAL FLUCTUATION IN PIEZOMETRIC LEVEL

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

Rise in piezometric level:

Out of 212 wells, piezometric level rise of less than 2 m is recorded in 37.74% wells, 2 to 4 m in 9.91% wells and more than 4 m in 9.43 % of the wells. Piezometric level rise of less than 2m is seen in most of the districts, significantly in Kendujhar, Jharsuguda, Jajpur, Puri and Bargarh districts. Piezometric level rise of 2 to 4m is observed mainly in districts such as Ganjam, Balangir, Jajpur and Kendrapara districts. Rise of more than 4m is observed in Kendrapara, Gajapati and Kandhamal districts.

Fall in Piezometric Level:

Out of 212 wells that have registered fall in piezometric levels, 31.93% have recorded less than 2 m while 4.82% in the range of 2 to 4 m and remaining 4.22% wells registered piezometric level fall of more than 4 m. Fall of less than 2 m is mainly observed in parts of Anugul, Dhenkanal, Nabarangpur, Nayagarh, Ganjam and Cuttack districts. Fall of 2 to 4 m is observed mainly in Ganjam, Dhenkanal, Kalahandi and Angul districts. Fall beyond 4 m is observed in 2 wells of Bargarh, Cuttack, Baleshwar and SambalpurJajpur and Rayagada districts.

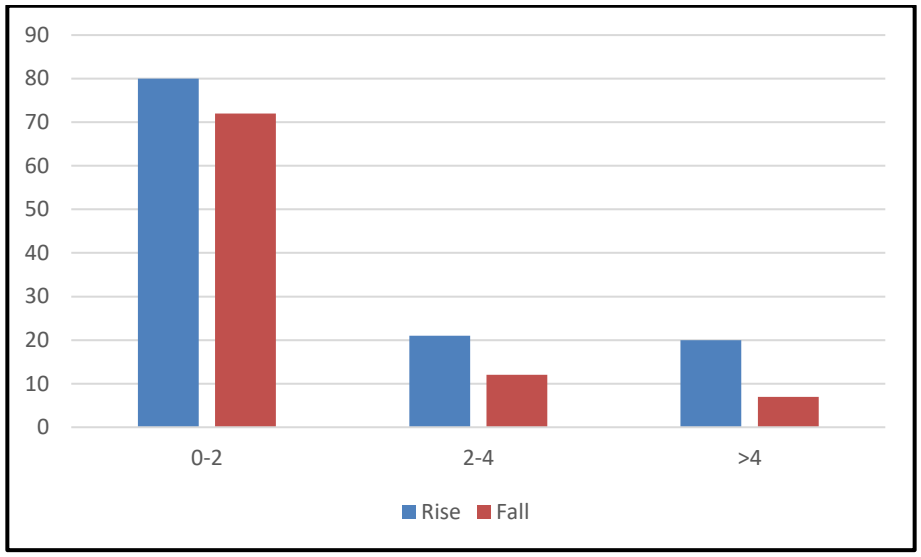

Fig.16. Wells showing rise and fall in piezometric level in confined/ semi-confined aquifer (November 2023 to November 2024)

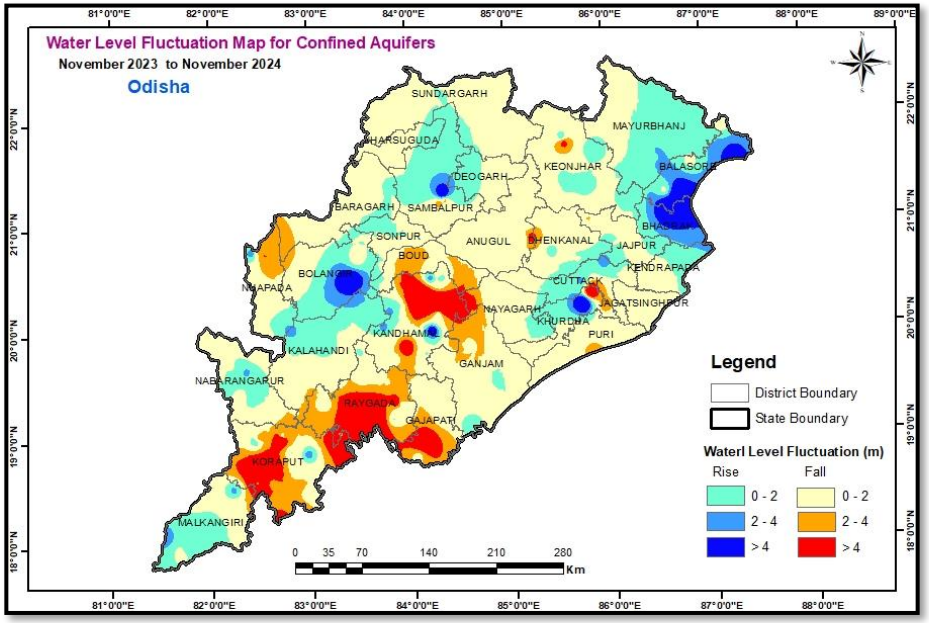

Fig.17. Annual water level fluctuation in Confined/Semi-confined Aquifer (November 2023 to November 2024)

5.0 SUMMARY

As a component of the National Ground Water Monitoring Program, the Central Ground Water Board, South Eastern Region, Bhubaneswar conducts monitoring of the ground water conditions on a quarterly basis: in January, pre-monsoon in April, August, and post-monsoon in November. Additionally, a yearly assessment of ground water quality is performed in April. As of September 30, 2024, theSouth Eastern Region of the Central Ground Water Board supervises 1371 dugwells and 188 piezometers. This comprehensive effort aims to portray the variations in the state's ground water conditions across different aquifers.

In August 2024, the state recorded water level in 0-5mbgl range in almost all the districts. Some wells in the hilly districts recorded water level in 5-10 mbgl range.

Seasonal water level comparison with pre monsoon period (April -2024) to August-2024 has shown that about 93.68% monitoring stations of the state experienced rise in seasonal water level fluctuation and only 6.32 % experienced fall in seasonal water level fluctuation due to monsoon rainfall.

Annual water level comparison with previous year (August -2023) to August-2024 has shown that about 52.51% monitoring stations of the state experienced rise in annual water level fluctuation and 47.49 % experienced fall in annual water level fluctuation. In general, a rise in water level has been observed in August 2024 with respect to August 2023.

Decadal mean comparison of August 2014-2023 to August 2024 has shown 43.62% of wells experienced rise in decadal mean water level fluctuation and 56.38% wells experienced fall in decadal mean water level fluctuation. In general, a fall in water level has been observed in August 2024 with respect to decadal mean (August 2014 – 2023).