CGWB, NORTH CENTRAL CHHATTISGARH REGION, RAIPUR

GROUNDWATERLEVELBULLETIN CHHATTISGARH

August 2024

ABSTRACT

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

1. 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, May, August and November. The regime monitoring started in the year 1969 by Central Groundwater Board.

2. STUDY AREA

Chhattisgarh, located between North Latitude 17°47’ to 24°06’ and East Longitude 80°14’ to 84°24’, is monitored for groundwater dynamics by the Central Ground Water Board's North Central Chhattisgarh Region in Raipur. Covering 1, 37, 360 sq. km, the state is predominantly tribal dominated, encompassing approximately 65.90% of its total area. Groundwater regime monitoring involves a network of observation wells and piezometers. Dug wells represent the shallow phreatic aquifer system, while piezometers gauge the shallow un-confined and deeper semi-confined aquifer systems.

This monitoring forms part of the All-India Network Hydrograph Stations, overseen by various regional offices nationwide. As of March 2024, Chhattisgarh's network includes 1308 nos. observation wells (dug wells and purpose-built piezometers) monitored quarterly for groundwater levels and quality. The objective is to assess groundwater behaviour across diverse hydrogeological environments, periodically estimating groundwater resources and tracking water quality changes.

3. PHYSIOGRAPHY

Chhattisgarh is geographically categorized into three distinct regions. The Bastar Plateau in the southern part of the state includes districts such as Bastar, Kondagaon, and Dantewada. Covered mostly by dense evergreen forests and hilly terrain, it features high-level plateaus, structural hills, valleys, and pediplains, with altitudes ranging from 400 to 600 meters above mean sea level (amsl).

The Chhattisgarh Plain occupies the central part and spans districts like Raipur, Bilaspur, and Durg. This region, formed on Proterozoic rocks, is characterized by a gently undulating and flat terrain, interspersed with remnants of hills and ridges. Altitudes vary from 284 meters amsl in the southeast to 750 meters amsl in the northwest.

The Northern Hilly Region covers the northern and north-central parts, encompassing districts like Raigarh and Bilaspur. It forms part of the Maikal and Hazaribagh hill ranges, featuring structural plains, pediplains, denudational plateaus, and hills. This area supports various river systems, including tributaries of the Mahanadi and Son rivers. The state's highest point, TulisiDongri in Dantewada district, reaches 1197 meters amsl, while its lowest point is 50 meters amsl at Konta, also in Dantewada district.

4. DRAINAGE

Chhattisgarh is traversed by major rivers including the Mahanadi, and its tributaries Seonath, Hasdeo, Mand, and Arpa, impacting several districts. The Indravati River, a Godavari tributary, flows through Kanker, Bastar, and Dantewada districts.

5. HYDROGEOLOGICAL CONDITIONS

The occurrence and movement of ground water is related to the existing geology of the area. The State is underlained by various rock types belonging to different geological ages, from Azoic to Quaternary. Nearly 58 % of the State is covered by Crystalline and metamorphic rocks; around 27 % of the area is covered by Chhattisgarh Group of rocks. The semi-consolidated Gondwana Supergroup of rocks covers 13 % of the area and the remaining 2 % by Deccan trap, Lameta, Laterite and River Alluvium.

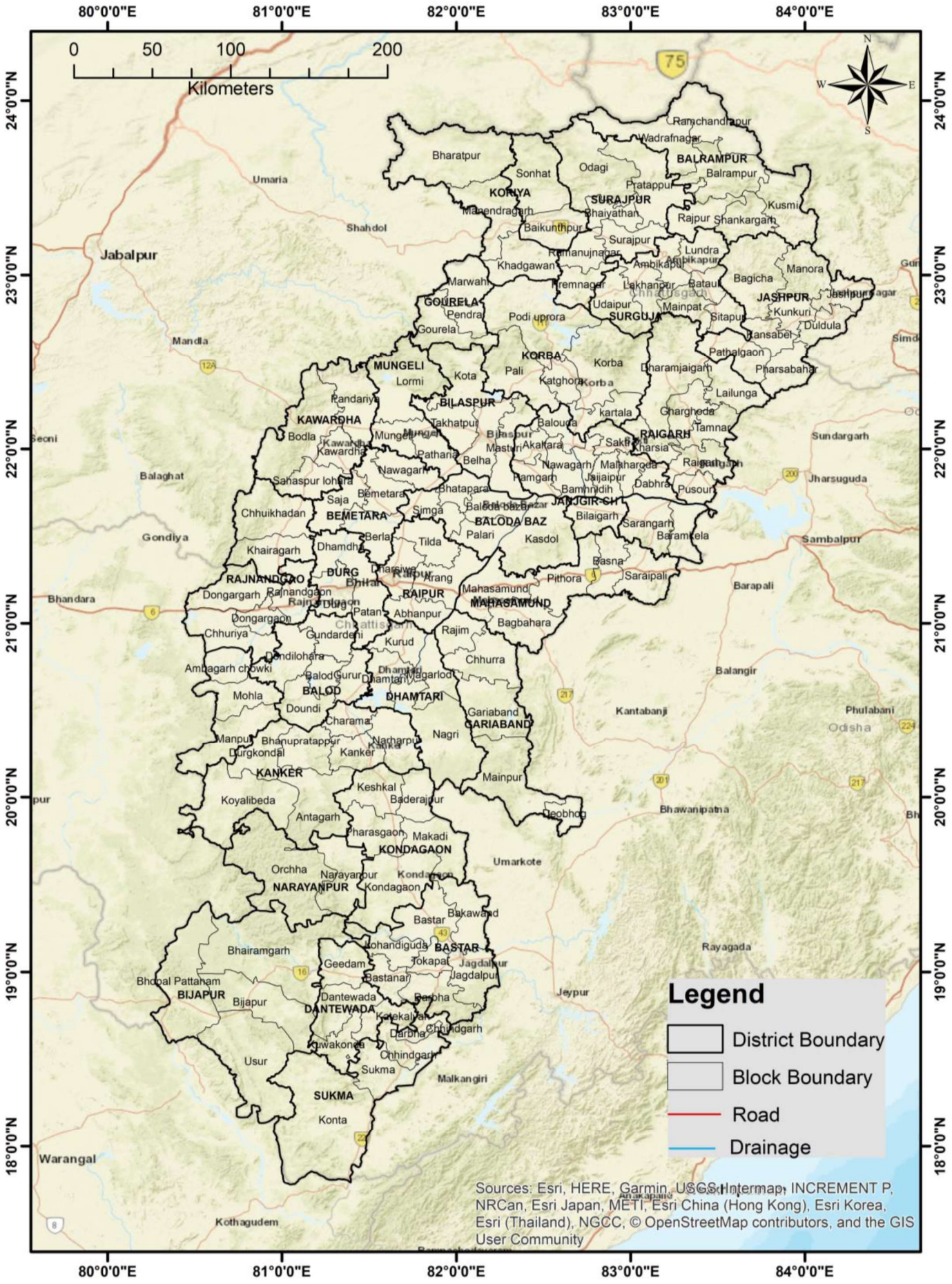


Figure-1: Map showing administrative divisions Chhattisgarh

6. GROUNDWATER LEVEL MONITORING

The Central Ground Water Board, North Central Chhattisgarh Region, conducts ongoing quarterly monitoring of groundwater regimes in Chhattisgarh state. This involves a network of monitoring stations situated across various hydrogeological and geomorphic units. **As of August 2024, there were 1308 operational wells, comprising 1062 dug wells and 246 piezometers.** The details of the wells are provided in Table 1.

Table-1: District-wise distribution of water level monitoring stations as per May 2024

State	District	DW	PZ	Total
Chhattisgarh	Balod	22	2	24
Chhattisgarh	Balodabazar	37	11	48
Chhattisgarh	Balrampur	16	7	23
Chhattisgarh	Bastar	24	11	35
Chhattisgarh	Bemetara	31	5	36
Chhattisgarh	Bijapur	0	0	0
Chhattisgarh	Bilaspur	89	9	98
Chhattisgarh	Dantewada	0	0	0
Chhattisgarh	Dhamtari	30	8	38
Chhattisgarh	Durg	88	20	108
Chhattisgarh	Gariaband	27	2	29
Chhattisgarh	Janjgir	56	14	70
Chhattisgarh	Jashpur	83	10	93
Chhattisgarh	Kabirdham	14	8	22
Chhattisgarh	Kanker	11	2	13
Chhattisgarh	Kondagaon	4	2	6
Chhattisgarh	Korba	87	31	118
Chhattisgarh	Koriya	64	5	69
Chhattisgarh	Mahasamund	32	31	63
Chhattisgarh	Mungeli	26	7	33
Chhattisgarh	Narayanpur	0	0	0
Chhattisgarh	Raigarh	107	12	119
Chhattisgarh	Raipur	39	17	56
Chhattisgarh	Rajnandgaon	65	18	83
Chhattisgarh	Sukma	0	0	0
Chhattisgarh	Surajpur	63	7	70
Chhattisgarh	Surguja	47	7	54
	Total	**1062**	**246**	**1308**

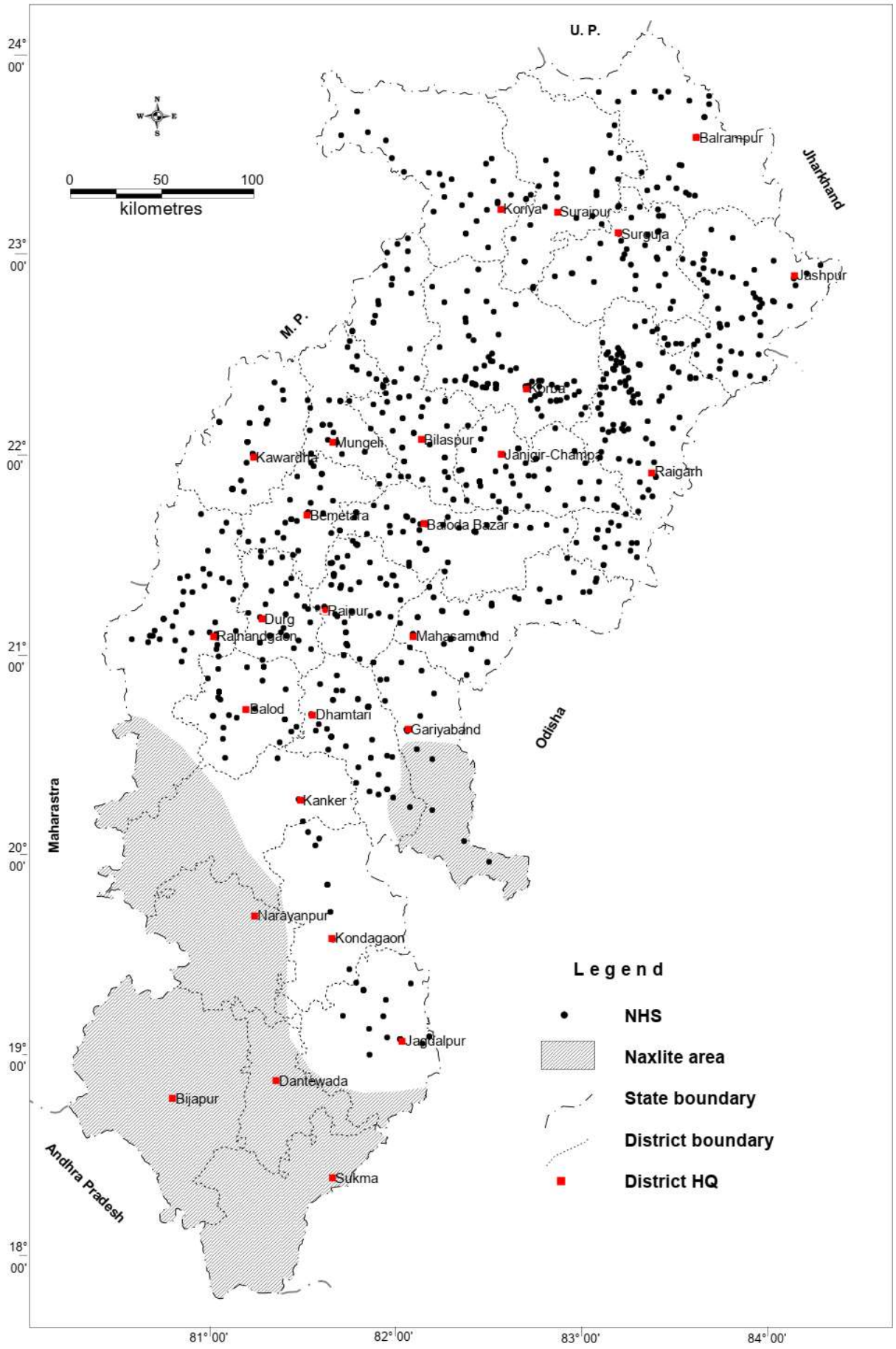


Figure-2: Map showing locations of monitoring Dug Wells (NHNS) in Chhattisgarh state

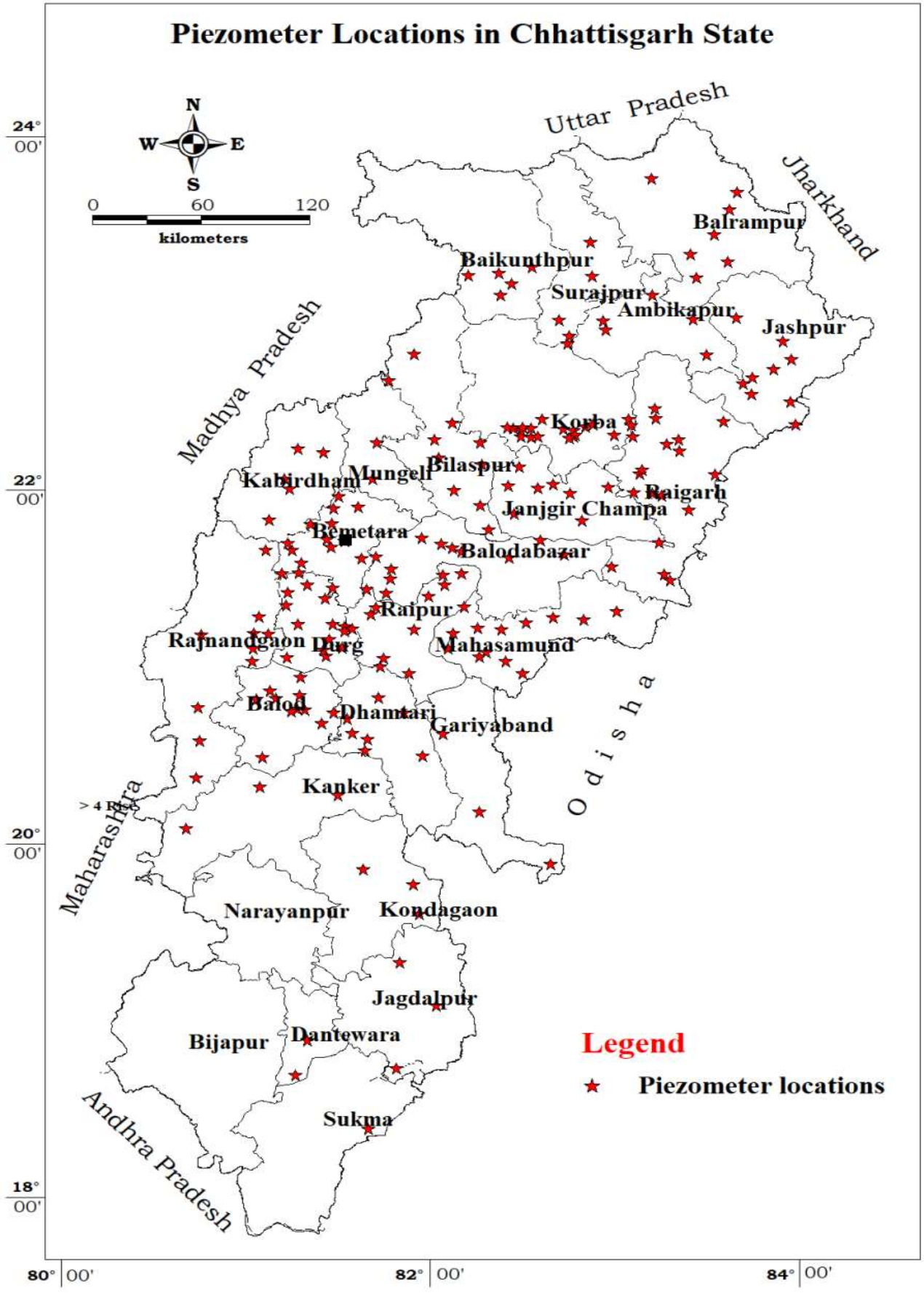


Figure-3: Map showing locations of Piezometers (NHNS) in Chhattisgarh state

7.0 RAINFALL

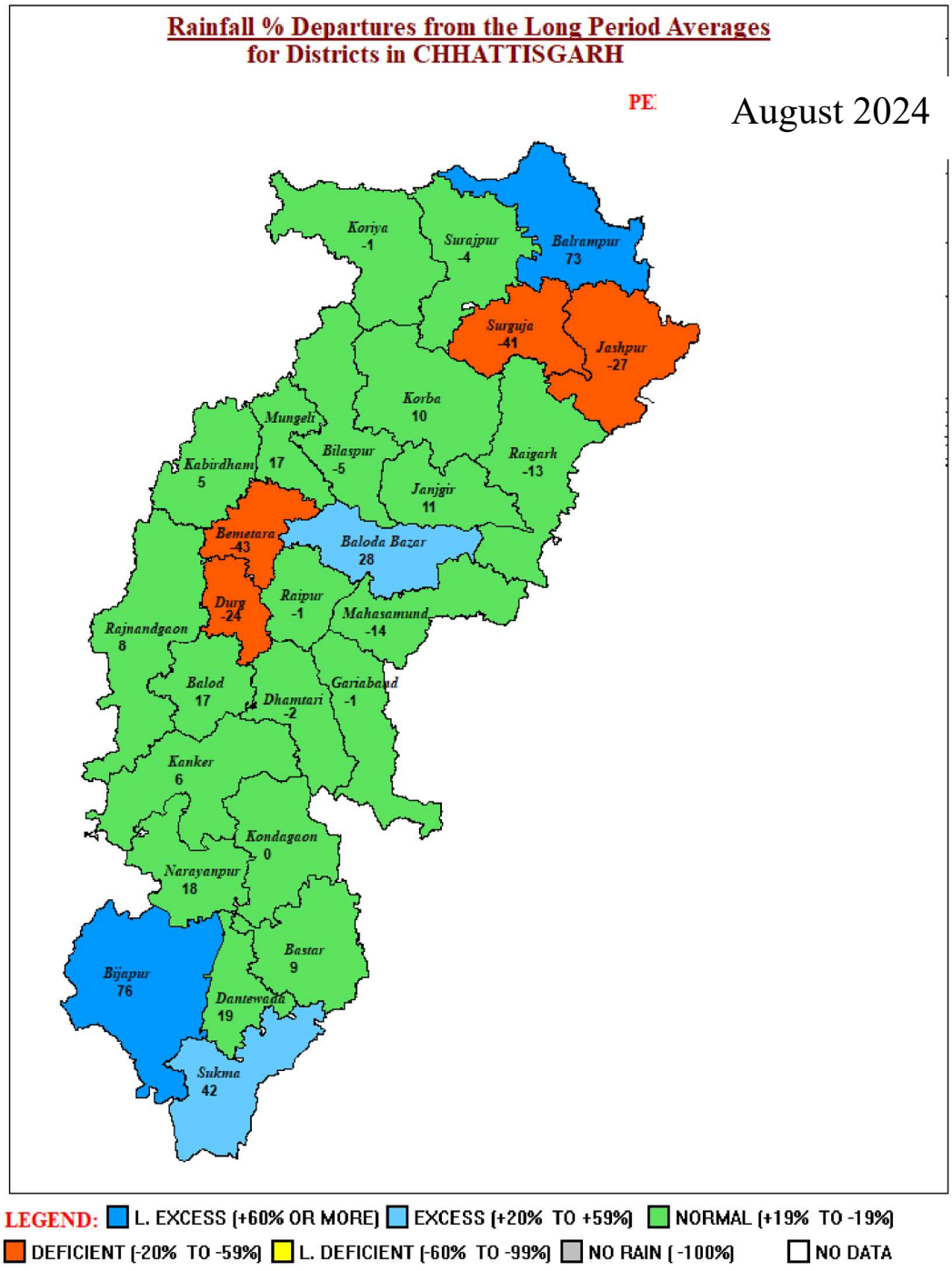
The region experiences a subtropical monsoon climate with distinct summer, monsoon, and winter seasons. The southwest monsoon prevails from June to mid-September, providing about 90% of the annual rainfall. Winter spans from October to February, while summer lasts from March to mid-June. Rainfall primarily recharges groundwater, with the Indian Meteorological Department (IMD), state departments, and agricultural universities maintaining over 200 rain gauge stations across the state. The average annual rainfall in the region is 1089.9 mm, varying across districts from a high of 2286.5 mm in Bijapur to a low of 560 mm in Bemetara.

Table-2: Districtwise variability of rainfall in Chhattisgarh (2024) (Source: IMD)

DISTRICT NAME	ACTUAL (mm)	NORMAL (mm)	DEP (%)	STATE
BALOD	1129.7	964	17	NORMAL
BALODA BAZAR	1117	874.9	28	EXCESS
BALRAMPUR	1607.2	931.1	73	LARGE EXCESS
BASTAR	1188.9	1094.8	9	NORMAL
BEMETARA	560	980.5	-43	DEFICIENT
BIJAPUR	2286.5	1296.3	76	LARGE EXCESS
BILASPUR	943.5	993.3	-5	NORMAL
DANTEWADA	1451.4	1222.5	19	NORMAL
DHAMTARI	975.5	996.4	-2	NORMAL
DURG	697.5	920.5	-24	DEFICIENT
GARIABAND	981.3	995.4	-1	NORMAL
GAURELA PENDRA MARWAHI	1179.2	1028.8	15	NORMAL
JANJGIR	1136.9	1028.1	11	NORMAL
JASHPUR	917.1	1264.8	-27	DEFICIENT
KABIRDHAM	848.4	804.7	5	NORMAL
KANKER	1328.3	1252	6	NORMAL
KHAIRAGARH CHH GANDAI	819.1	689.9	19	NORMAL
KONDAGAON	1110.1	1108.9	0	NORMAL
KORBA	1310.2	1190.2	10	NORMAL
KORIYA	1036.6	1045.5	-1	NORMAL
MAHASAMUND	860.6	1002.8	-14	NORMAL
MANENDRAGARH BHARATPUR	1029.6	1045.3	-2	NORMAL
MOHALA MANPUR CHOWKI	1171.8	970.1	21	EXCESS
MUNGELI	1044.7	891.4	17	NORMAL
NARAYANPUR	1367.9	1162.5	18	NORMAL
RAIGARH	975.7	1124.3	-13	NORMAL

RAIPUR	942.4	953	-1	NORMAL
RAJNANDGAON	1050.7	970.8	8	NORMAL
SAKTI	942.1	1055.5	-11	NORMAL
SARANGARH BILAIGARH	622	877.9	-29	DEFICIENT
SUKMA	1598.5	1124.5	42	EXCESS
SURAJPUR	1082.2	1128.7	-4	NORMAL
SURGUJA	654.5	1103.8	-41	DEFICIENT
SUBDIVISION RAINFALL	1089.9	1077.5	7	NORMAL

Figure-4: Rainfall deviation from normal rainfall (Source: IMD)



8.0 GROUND WATER LEVEL SCENARIO (August 2024)

8.1 SHALLOW AQUIFER (UNCONFINED)

8.1.1DEPTHTOWATERLEVEL (August 2024 Weathered Aquifer)

The depth to water level of 635 wells is used for the analysis. Analysis of depth to water level data of 635 wells shows water levels vary between 0.30 m bgl (Bilaspur, Koriya and Raipur) to 19.20 m bgl (Durg). Water level of lessthan 2 m bgl is recorded in 48.34% % of wells, between 2 to 5 m bgl in 42.36% of wells,between 5 to 10 m bgl in 8.66 % of wells, between 10 to 20 m bgl in 0.63 % ofwells and there is no well showing WL more than 20m bgl. Shallow water level of less than 2 m bgl as isolated patches occurs in parts of Bastar, Bilaspur, Dhamtari, Durg, Janjgir Champa, Jashpur, Kanker, Kawardha, Korba, Koriya, Mahasamund, Raigarh, Raipur, Rajnandgaon and Surguja districts. Water level of 2 to 5 m bgl is observed mainly 269 wells distributed in districts ofBastar, Bilaspur, Dhamtari, Durg, Jashpur, Kanker, Kawardha, Korba, Koriya, Mahasamund, Raigarh, Raipur, Rajnandgaon and Surguja districts. Water level of 5 to 10 m bgl is observed in 55 wells throughout the state withinof Bilaspur, Durg, Jashpur, Kanker, Kawardha, Koriya, Raigarh, Raipur, Rajnandgaon and Surguja districts. Water level of 10 to 20 m bgl is in 04 wells distributed in Bilaspur, Dhamtari, Durg, Mahasamund and Raigarh. Deeper water levels of more than 20 m don't occur in any well.

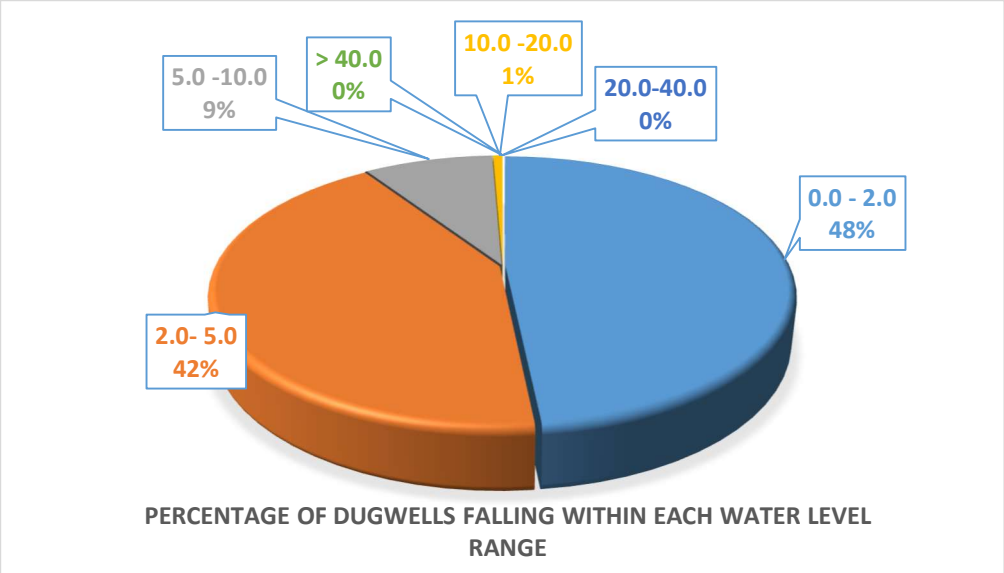


Fig: 5 Percentage of wells showing water level range in Unconfined Aquifer (ranges in mbgl)

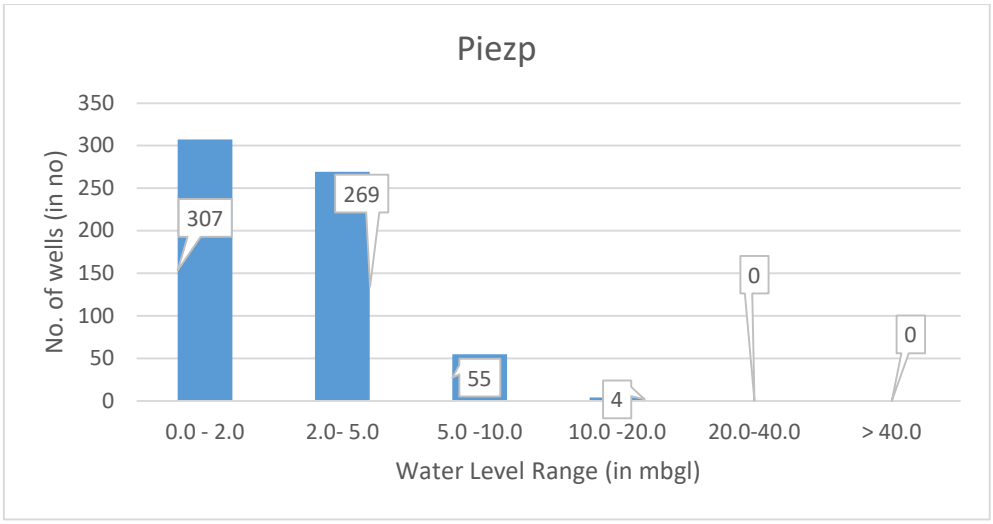


Fig: 6 Nos of wells showing water level range (in mbgl) in Unconfined Aquifer

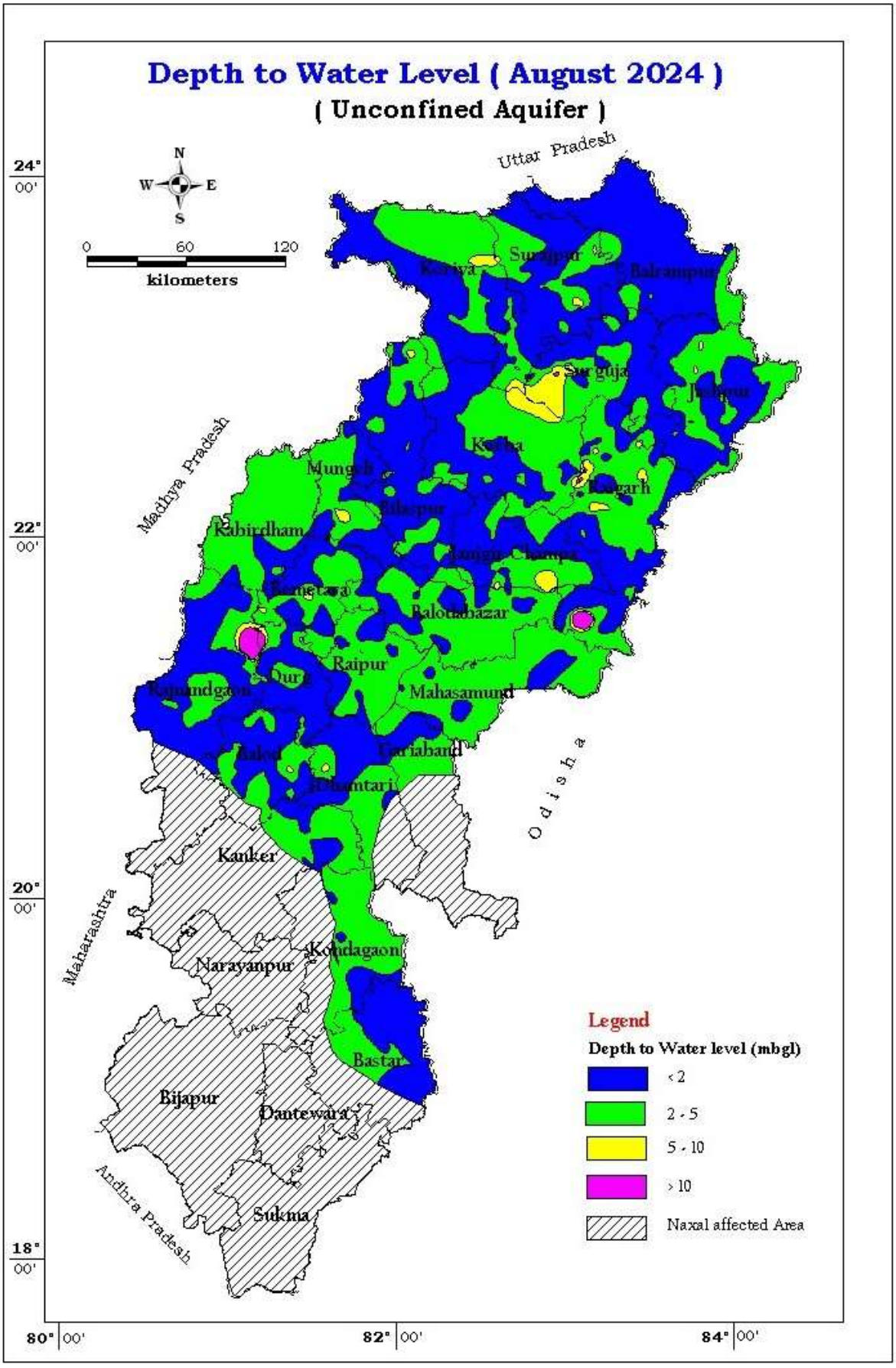


Fig: 7 Depth to Water Level Map of Unconfined Aquifers inAugust 2024

District Name	No of wells	Minwl	Maxwl	0.0 -2.0 m bgl	2.0 -5.0 m bgl	5.0-10.0 m bgl	10.0-20.0 M bgl	20.0-40.0 m gbl	> 40.0 m bgl
BASTAR	26	0.8	4.8	10 38.46%	16 61.54%	0	0	0	0
BILASPUR	92	0.3	10.95	54 58.70%	23 25.00%	14 15.22%	1 1.09 %	0	0
DHAMTARI	4	0.8	2.2	3 75.00%	1 25.00%	0	0	0	0
DURG	96	0.7	19.2	57 59.38%	31 32.29%	7 7.29%	1 1.04 %	0	0
JANJGIR CHAMPA	1	0.8	0.77	1 100.00%	0	0	0	0	0
JASHPUR	27	0.4	6.5	11 40.74%	15 55.56%	1 3.70%	0	0	0
KANKER	7	0.8	5.4	2 28.57%	4 57.14%	1 14.29%	0	0	0
KAWARDHA	11	0.9	5.4	1 9.09%	9 81.82%	1 9.09%	0	0	0
KORBA	13	0.7	5	10 76.92%	3 23.08%	0	0	0	0
KORIYA	42	0.3	6.9	25 59.52%	15 35.71%	2 4.76%	0	0	0
MAHASAMUND	24	1.1	16.8	2 8.33%	21 87.50%	0	1 4.17 %	0	0
RAIGARH	87	0.5	10.75	37 42.53%	34 39.08%	15 17.24%	I 1.12 %	0	0
RAIPUR	84	0.3	7.2	24 28.57%	52 61.90%	8 9.52%	0	0	0
RAJNANDGAON	58	0.4	5.6	35 60.34%	22 37.93%	1 1.72%	0	0	0
SURGUJA	63	0.4	9.5	35 55.56%	23 36.51%	5 7.94%	0	0	0
Total	635	0.3	19.2	307	269	55	4	0	0

Table-3: Distribution of Percentage of wells showing water level range in Unconfined Aquifer for August 2024

8.1.3 Annual Fluctuation in water Level: -

Annual Fluctuation in water Level in unconfined Aquifer (August 2023 vs August 2024)

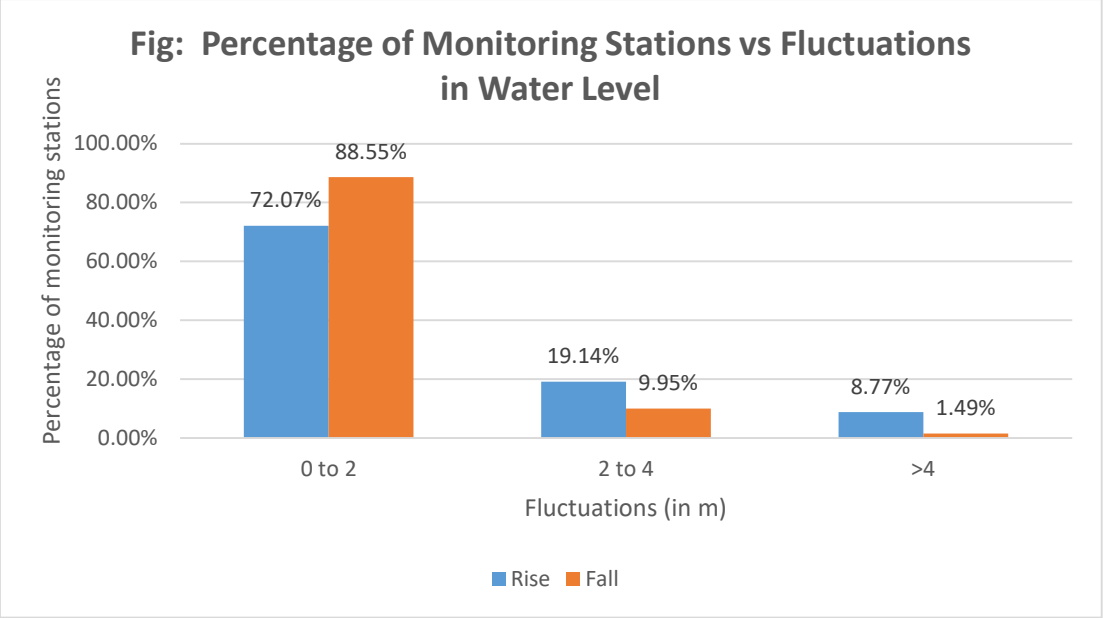


Fig: 8 Percentage of Monitoring Stations vs Ranges of rise and Fall of Water Level

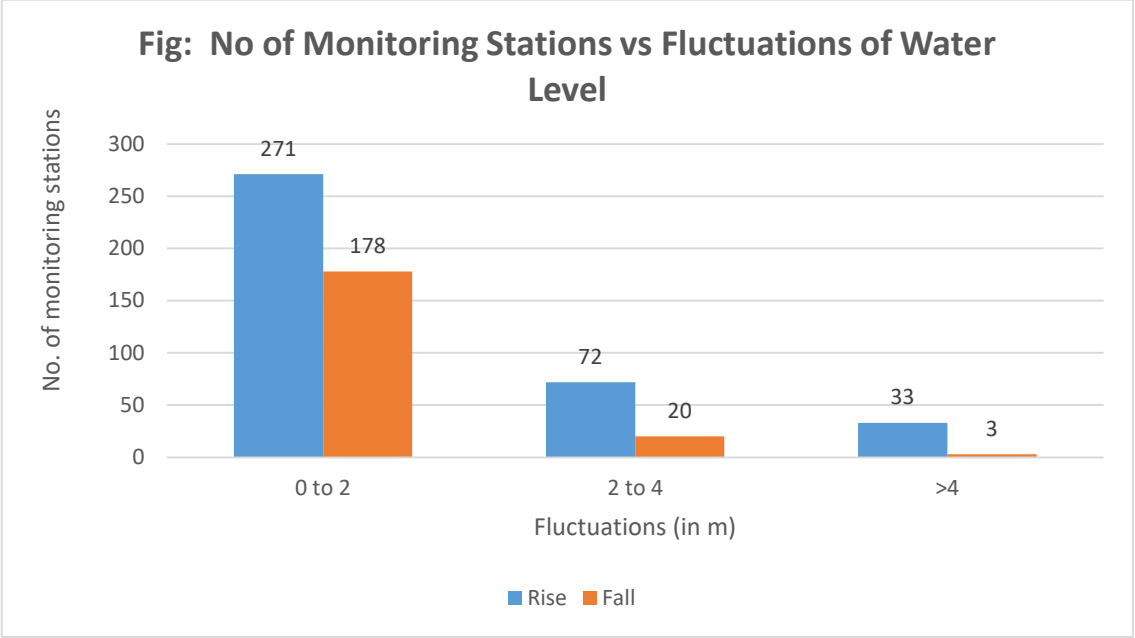


Fig: 9 Nos of Monitoring Stations vs Ranges of rise and Fall of Water Level

Rise in Water Level

Out of 376 wells, water level rise of less than 2 m is recorded in 72.07%(376)wells, 2 to 4 m in 19.14% (72) wells and more than 4 m in 8.77%(33) of the wells. Water level rise of less than 2 m is seen in all the districts, significantly in Bilaspur, Durg, Janjgir – Champa, Jashpur, Koriya, Raigarh and Sarguja. Water level rise of 2 to 4 m is observed mainly in districts such asBilaspur, Durg, Jashpur, Kawardha, Korba, Koriya, Mahasamund, Raigarh, Rajnandgaon, Raipur and Sarguja. Rise of more than 4 m is significantly observed in very few wells Bastar, Bilaspur, Dhamtari, Durg, Jashpur, Korba, Koriya, Raigarh, Rajnandgaon, Raipur and Sarguja.

Fall in Water Level

Out of 201 wells that have registered fall in water levels, 88.55% (178) have recorded less than 2 m while 9.95% (20) in the range of 2 to 4 m and remaining 1.49% (3) wells registered water level fall of more than 4 m. Fall of less than 2 m is mainly observed in Bastar, Bilaspur, Dhamtari, Durg, Janjgir Champa, Jashpur, Kanker,

Kawardha, Korba, Koriya, Mahasamund, Raigarh, Raipur, Rajnandgaon and Surgujadistricts. Fall of 2 to 4 m is observed mainly Bastar, Bilaspur, Durg, Kanker, Kawardha,Raigarh, Raipur, Rajnandgaon and Surguja districts. Fall of more than 4 m is significantly observed in very few wells Bilaspur, Durg and Raipur districts.

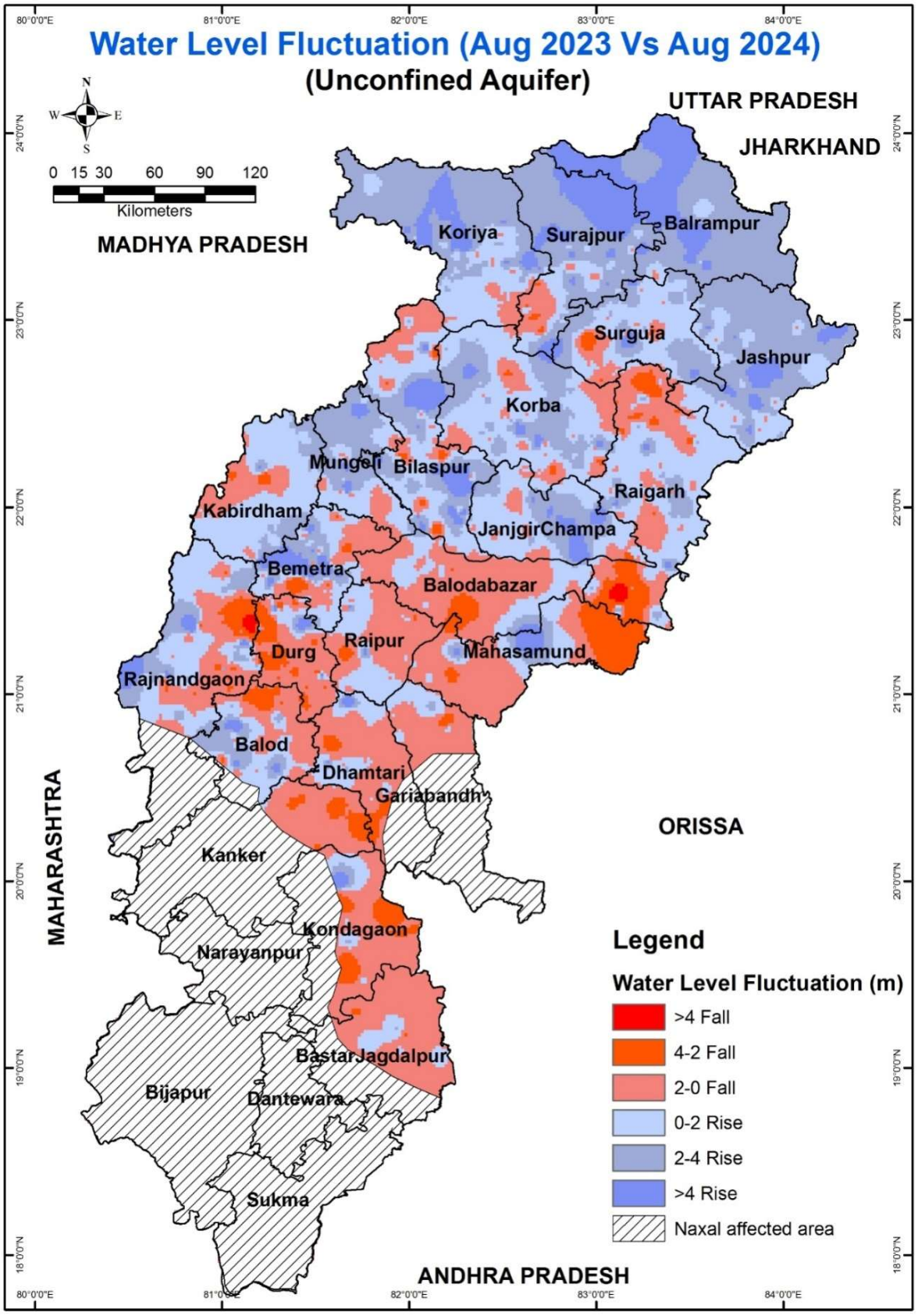


Fig 10 Annual Fluctuation in water Level in unconfined Aquifer (August 2023 vsAugust2024)

Table-4: District Wise –Annual Fluctuation of WL and Frequency Distribution of wells in Unconfined Aquifer

District	No. of Wells	Range of Fluctuation (m)				No. of Wells/Percentage Showing Fluctuation						Total No. of Wells	
Name		Rise		Fall		Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0 to 2	2 to 4	>4	0 to 2	2 to 4	>4		
BASTAR	25	0.01	7.54	0.02	3.11	12 48.00%	0	1 4.00%	8 32.00%	4 16.00%	0	13	12
BILASPUR	82	0.02	14.95	0.01	4.42	39 47,56%	13 15.85 %	6 7326	21 25.61%	2 2.44%	I 1.236	58	24
DHAMTARI	4	0.02	6.63	0.08	0.08	2 50.00%	0	1 25.004	1 25.00%	0	0	3	1
DURG	87	0.01	1021	0.02	7.52	20 22.99%	6 6.90 96	9 10346	49 56.32%	2 2.30%	1 1.15%	35	52
JANJGIR. CHAMPA	1	0.78	0.78	-	-	1. 100.00%	0	0	0	0	0	1	0
JASHPUR	26	0.35	715	0.50	0.50	14 53.89%	9 34.62 %	2 7.696	1 3.85%	0	0	25 U	1
KANKER	6	0.27	0.27	0.67	3.03	1 16.67%	0	0	3 50.00%	2 33.33%	0	1	5
KAWARDHA	10	0.09	2.88	0.20	2.70	5 50.00%	2 20.00 %	0	2 20.00%	1 10.00%	0	7	3
KORBA	11	0.04	4.29	+	-	6 54.59%	4 36.36 %	1 9.096	0	0	0	11	0
KORIYA	42	0.22	8.78	0.05	0.81	24 57.14%	9 21.43 %	4 9.524	4 9.52%	0	0	37	4
MAHASAMUND	18	0.24	1.25	0.06	1.50	6 33.33%	0	0	12 66.67%	0	0	6	12
RAIGARH	83	0.02	3.50	0.02	2.22	58 69.88%	4 4.82 %	0	17 20.48%	I 1.20%	0	62	18
RAIFUR	74	0.01	3.64	0.02	4.82	37 50.00%	3 4.05 %	0	28 37.84%	4 5.41%	1 1.35%	40	33
RAINANDOAON	54	0.03	7.67	0.07	2.62	14 25.93%	s 9.26 %	5 9.26%	28 51.85%	2 3.70%	0	24	30
SURGUJA	59	0.05	5.30			32	17 28.81		4	2			
Total	582	0.78	0.27	0.10	3.70	54.2496	%	4 6.736	6.7896	3.39%	0	53	6
				0.00	7.52	271	72	33	178	20	3	376	201

8.1.4 Decadal Fluctuation in water Level: -

Decadal Fluctuation in water Level in Unconfined AquiferAugust(2013-2023) vs August 2024

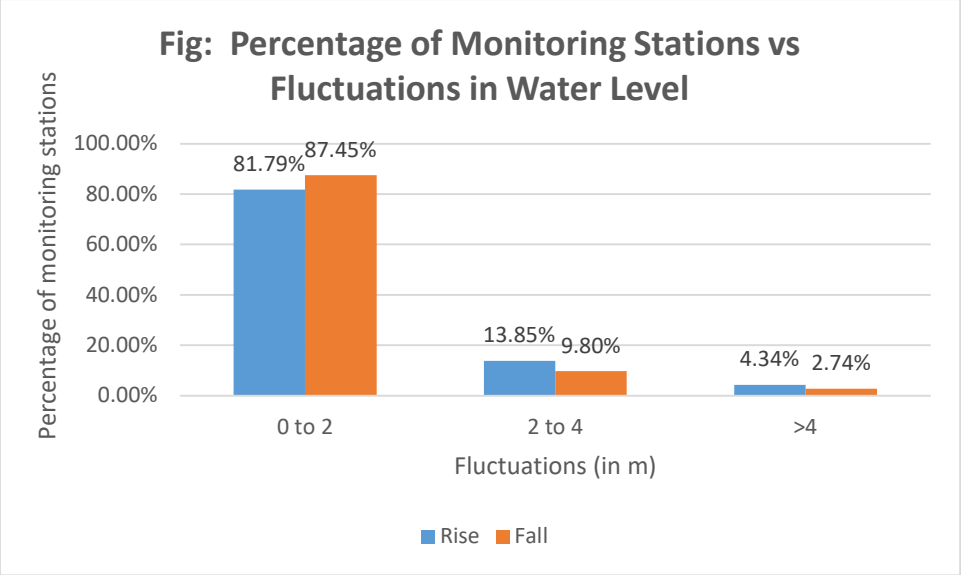


Fig: 11Percentage of Monitoring Stations vs Fluctuations of Water Level

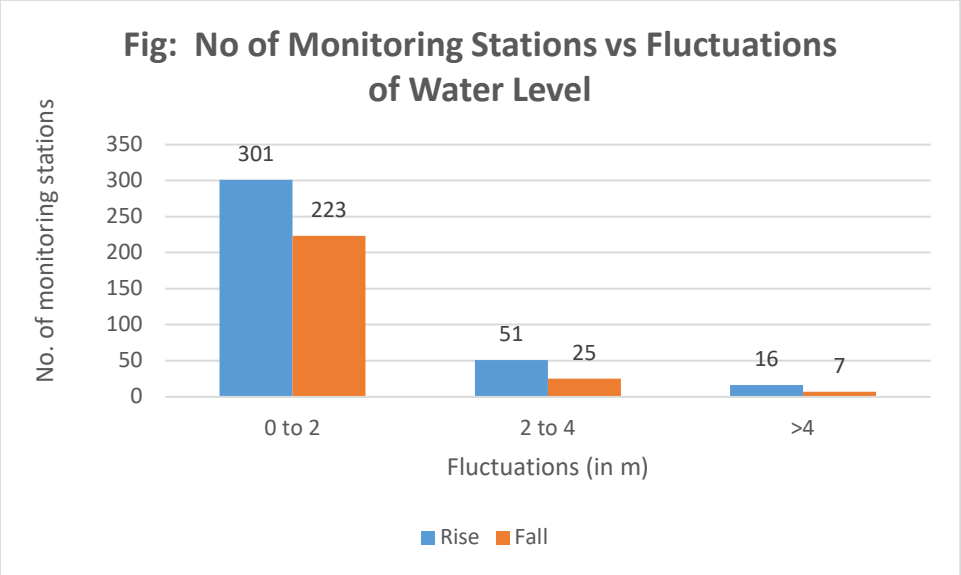


Fig: 12 Nos of Monitoring Stations vs Fluctuations of Water Level

Rise in Water Levels:

Out of 368 wells, water level rise ofless than 2 m is recorded in 81.79% wells, 2 to 4 m in 13.85% wells and more than 4 m in 4.34% of the wells. Water level rise of less than 2 m is seen in all the districts, except Janjgir-Champa.Water level rise of 2 to 4 m is observed in all districts except Bastar, Raipur, Dhamtari and Kankerand rise of more than 4 m is significantly observed in Bastar, Bilaspur, Durg, Jashpur, Korba, Koriya,Raigarh, Rajnandgaon&Surgujadistricts.

Fall in Water Levels:

Out of the 255 wells that have registered fall in water levels, 87.45% have recorded less than 2 m while 9.80% in the range of 2 to 4 m and remaining 2.74% wells registered water level fall of more than 4 m. Fall of less than 2 m is observed in all districts except Janjgir-Champa. Fall of 2 to 4 m, recorded in Bastar, Bilaspur, Durg,Koriya, Raigarh, Raipur, Rajnandgaonand Sargujadistricts. Fall beyond 4 m is recorded mainly in Durg, Mahasamund, Raigarh, Raipur and Sarguja districts.

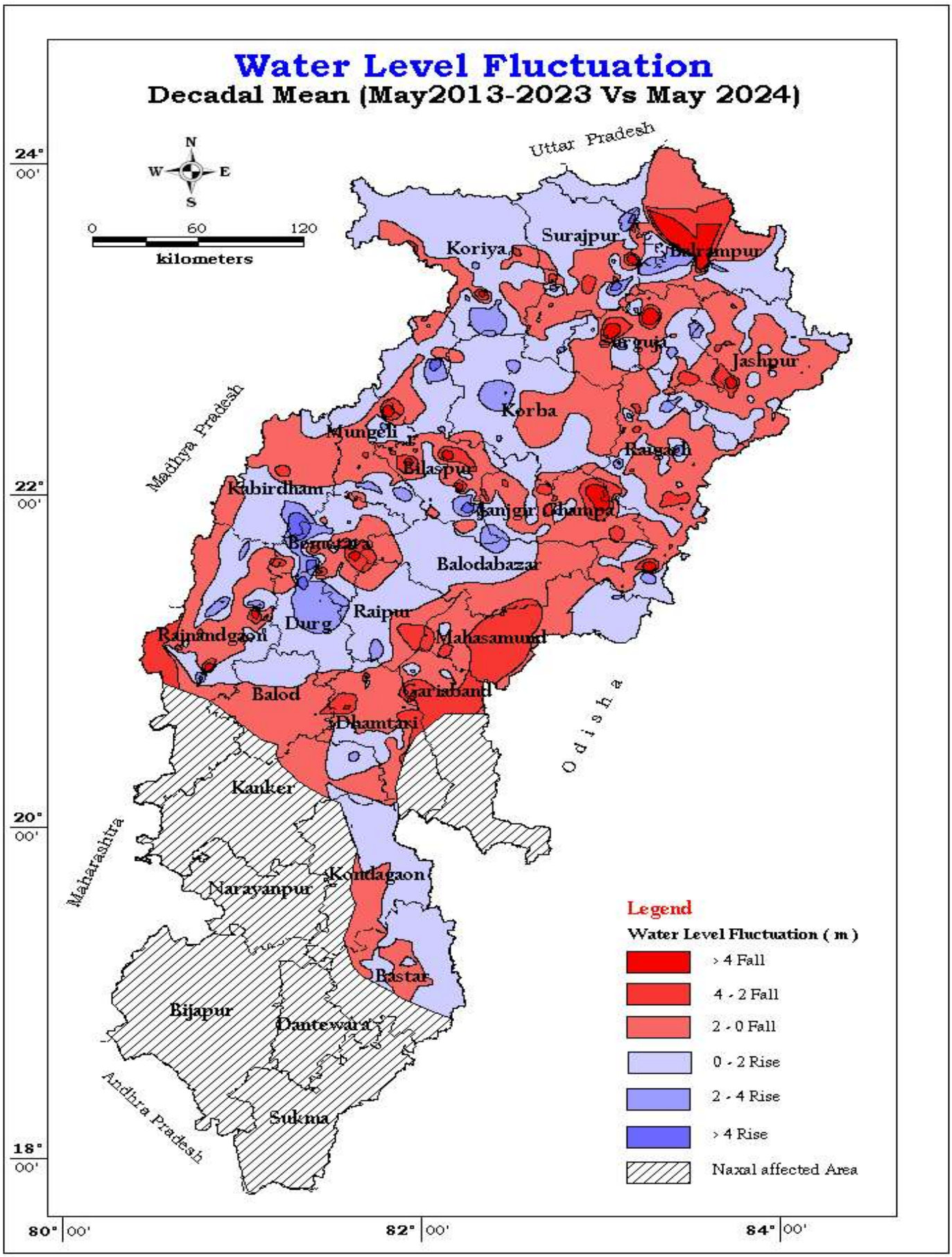


Fig 13 Decadal Fluctuation in water Level with Mean in unconfined Aquifer August ((2013- 2023) vs August 2024)

8.1.5 DEEPER AQUIFER

8.1.5.1DEPTH TO WATERLEVEL (August 2024 Fractured Aquifer)

The depth to water level of 160 wells is used for the analysis. Analysis of depth to water level data of 160 wells shows water levels vary between 0.60 m bgl (Korba) to 34.68 m bgl (Mungeli). Water level of less than 2 m bgl is recorded in 20 % of wells, between 2 to 5 m bgl in 32.5% of wells, between 5 to 10 m bgl in 21.88 % of wells, between 10 to 20 m bgl in 20.63 % ofwells, between 20-40 m bgl in 5% of wells and water level more than 40 mbgl is not registered in any of the well.Shallow water level of less than 2 m bgl as isolated patches occurs in parts of Korba, Jashpur, Durg, Sakti, Janjgir-Champa, Dhamtari, Baloda Bazar, Raipur, Raigarh, Kabirdham, Rajnandgaon. Water level of 2 to 5 m bgl is observed mainly 52 wells distributed in districts of Rajnandgaon, Raigarh, Kanker, Durg, Mahasamund, Jashpur, Raipur, Korba, Bilaspur, Janjgir-Champa, Balod, Sakti, Baloda Bazar, Bemetara, Kabirdham, Mungeli and Bastar. Water level of 5 to 10 m bgl is observed in 35 wells throughout the state within Raipur, Mahasamund, Balod, Korba, Bilaspur,Garaiyaband, Bastar, Kabirdham, Durg, Janjgir-Champa.Rajnandgaon and Saktidistricts. Water level of 10 to 20 m bgl is in 33 wells distributed in Mungeli, Rajnandgaon, Korba, Kabirdham, Mahasamund, Balod, Bastar, Dhamtari, Bemetara, Raigarh and Jashpurdistricts. Deeper water levels of 20-40 m occur in 8 wells in districts of Kabirdham, Mahasamund, Bastar, Bemetara and Raigarh districts. Deepest water levels of greater than 40 m don't occur in any of the well.

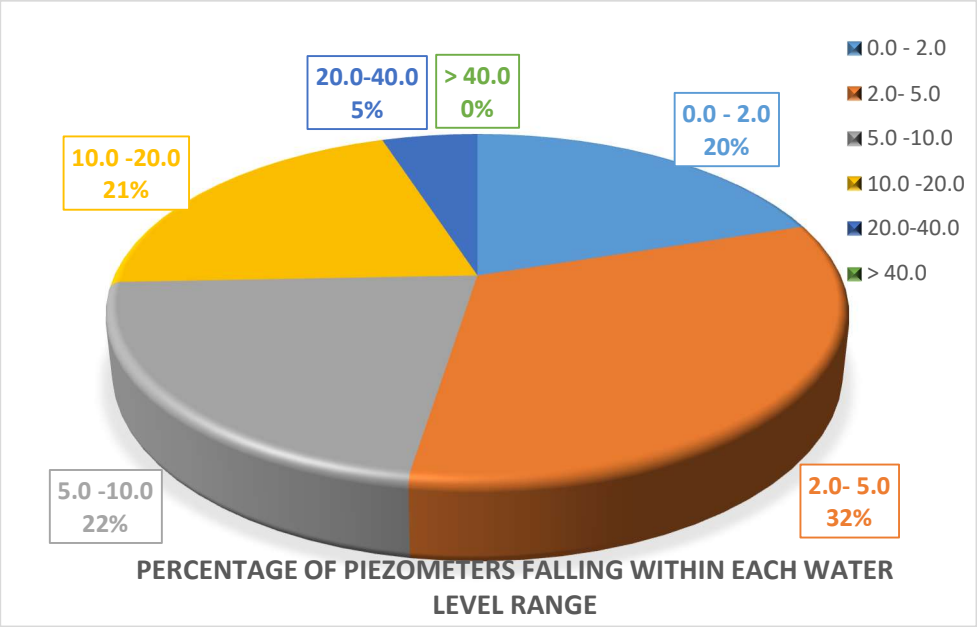


Fig: 14 Percentage of wells showing water level range in Deeper Aquifer in August 2024

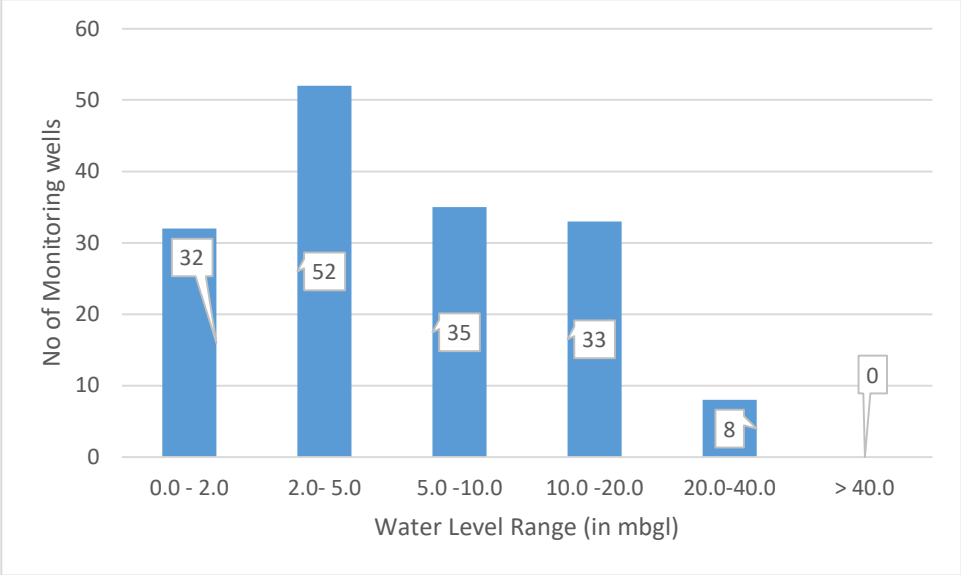


Fig: 15 Nos of wells showing water level range in Deeper Aquifer in August 2024

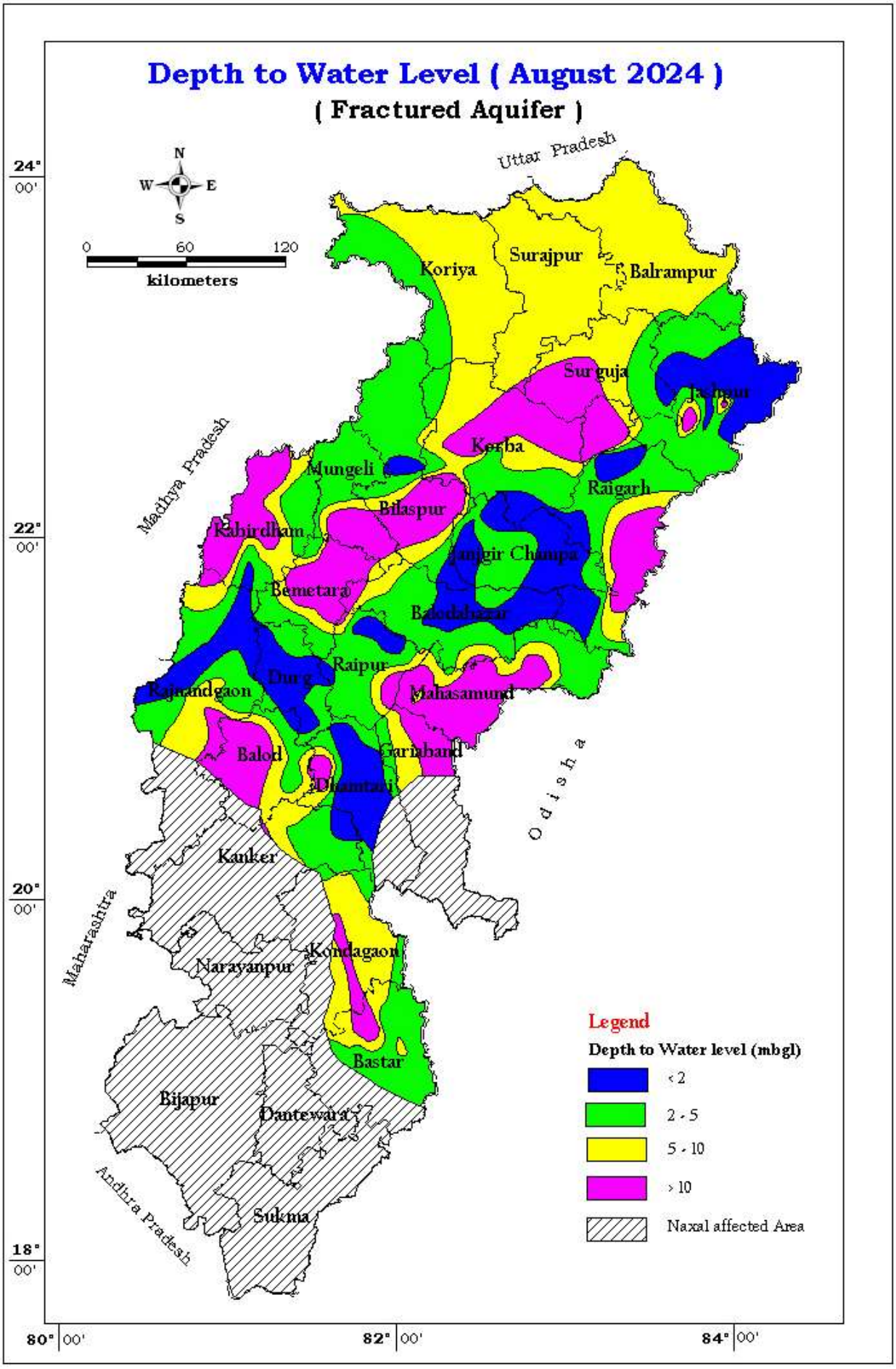


Fig: 16 Depth to Piezometric Level in Deeper Aquifers in August 2024

8.1.6 Annual Fluctuation in water Level: -

Annual Fluctuation in water Level in Fractured Aquifer (August 2023 vs August 2024): -

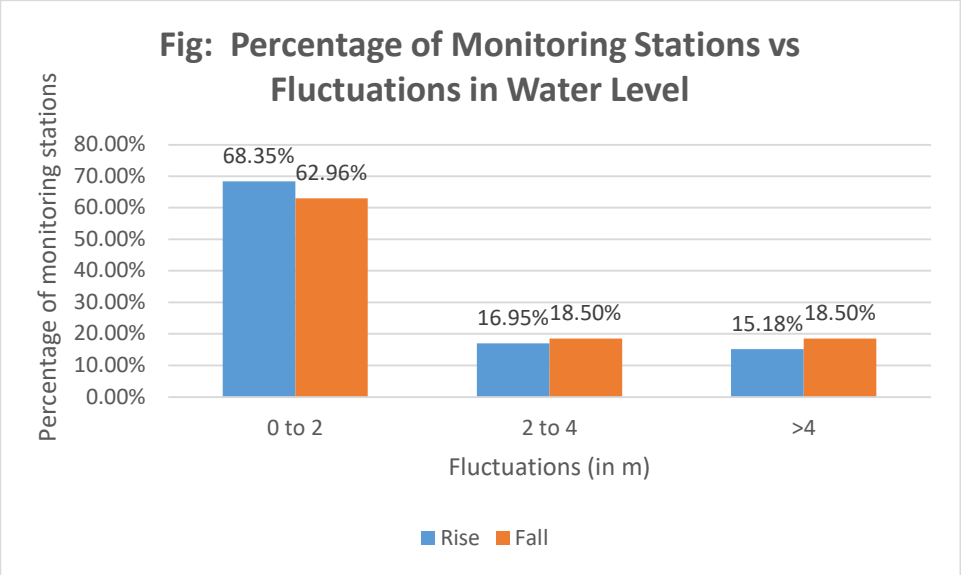


Fig: 17 No of Monitoring Stations vs Fluctuations in Water Level

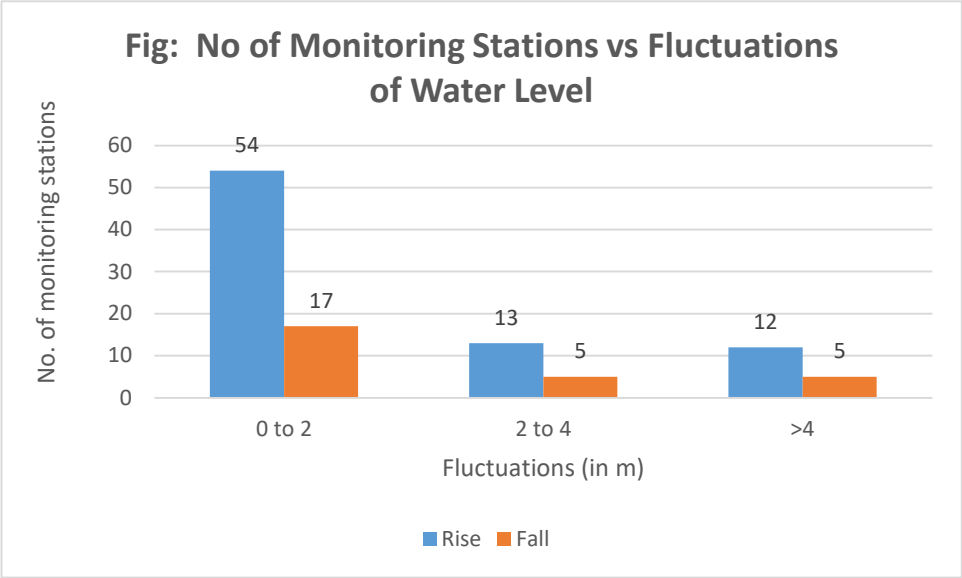


Fig: 18 No of Monitoring Stations vs Fluctuations in Water Level

Rise in Water Level

Out of 79 wells, water level rise of less than 2 m is recorded in 68.35% (54) wells, 2 to 4 m in 16.45% (13) wells and more than 4 m in 15.18%(12) of the wells. Water level rise of less than 2 m is seen significantly in Bilaspur, Korba, Raigarh, Durg, Jashpur, Kanker, BatarKawardha, Rajnandgaon, Raipur, Dhamtari and Janjgir-Champa districts. Water level rise of 2 to 4 m is observed mainly in districts such as, Korba, Jashpur, Raigarh, Janjgir-Champa, Durg, Raipur, Bastar and Kawardhadistricts. Rise of more than 4 m is significantly observed in Korba, Sarguja, Janjgir-Champa, Durg, Bastar and Bilaspur districts.

Fall in Water Level

Out of 27 wells that have registered fall in water levels, 62.96% (17) have recorded less than 2 m while 18.51% (5) in the range of 2 to 4 m and remaining 18.51% (5) wells registered water level fall of more than 4 m. Fall of less than 2 m is mainly observed in parts of Rajnandgaon, Kawardha, Korba, Raigarh, Dhamtari, Bilaspur, Durg and Raipur districts.Fall of 2 to 4 m is observed mainly in Raipur, Durg,Korba, Bilaspurdistricts. Fall of more than 4 m is observed in Kawardha, Rajnandgaon, Dhamtari and Durg districts.

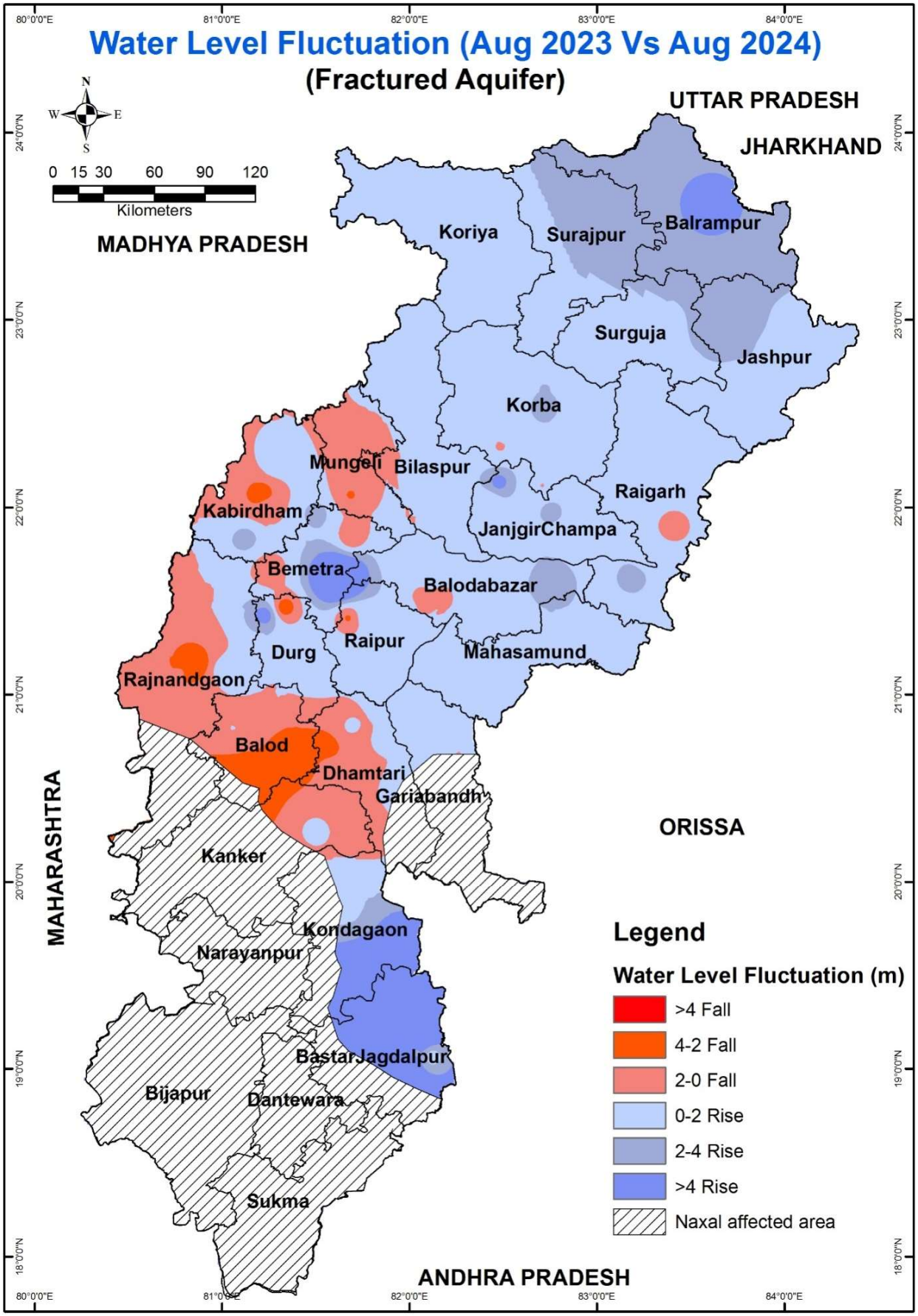


Fig: 19 Water Level Fluctuation Map (August 2023 vs. August 2024) in Fractured Aquifer

8.1.7 Decadal Fluctuation in water Level: -

Decadal Fluctuation in water Level in Semi Confined/Fracture Aquifer August (2013-2023) vs August 2024

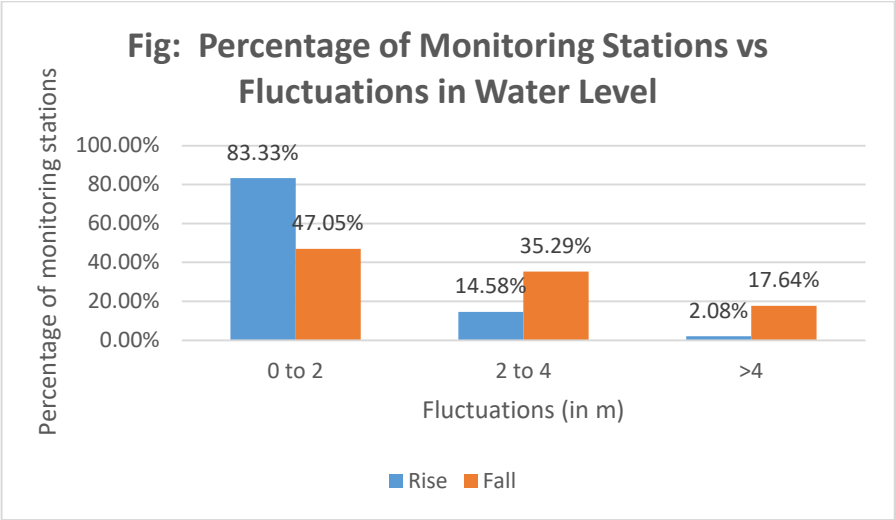


Fig: 20 Percentage of Monitoring Stations vs Fluctuations of Water Level

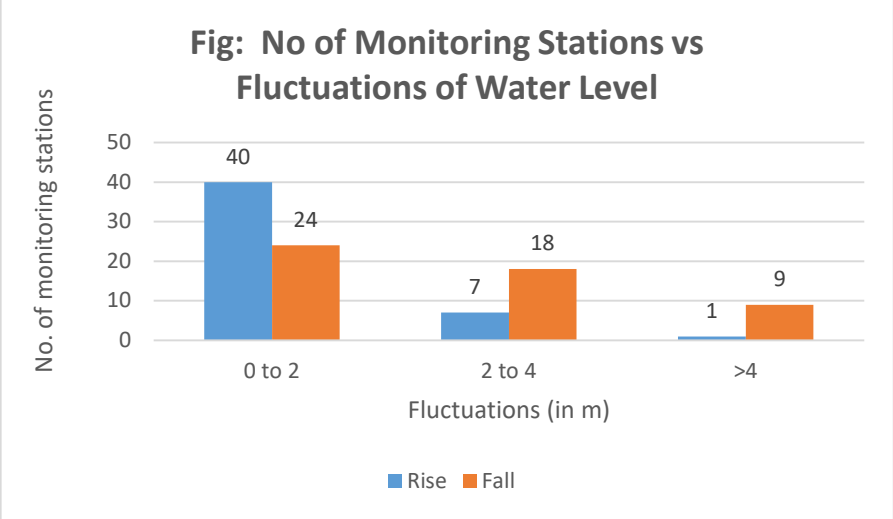


Fig: 21 Nos of Monitoring Stations vs Fluctuations of Water Level

Rise in Water Levels:
Out of 48 wells, water level rise of less than 2 m is recorded in 83.33%% wells, 2 to 4 m in 14.58% wells and more than 4 m in 2.08% of the wells. Water level rise of less than 2 m is seen in all the districts Sakti, Janjgir-Champa, Rajnandgaon, Balod, Korba, Balod Bazar, Narayanpur, Rajim, Dongargarh, Kawardha, Water level rise of 2-4 m is observed in Durg, Bastar, Raipur, Bastar districts. And rise of more than 4 m is observed in Raigarh district.

Fall in Water Levels:
Out of the 51 wells that have registered fall in water levels, 47.05% have recorded less than 2 m while 35.29% in the range of 2 to 4 m and remaining 17.64% wells registered water level fall of more than 4 m. Fall of less than 2 m is observed in Raipur, Bilaspur, Durg, Janjgir-Champa, Jashpur, Mahasamund, Kawardha. Fall of 2 to 4 m, recorded in Durg, Kawardha, Dhamtari, Mahasamund, Bilaspur, Korba, Raigarh, Bilaspur, Jashpur. Fall beyond 4 m is recorded mainly in Bilaspur, Mahasamund, Durg and Jashpur districts.

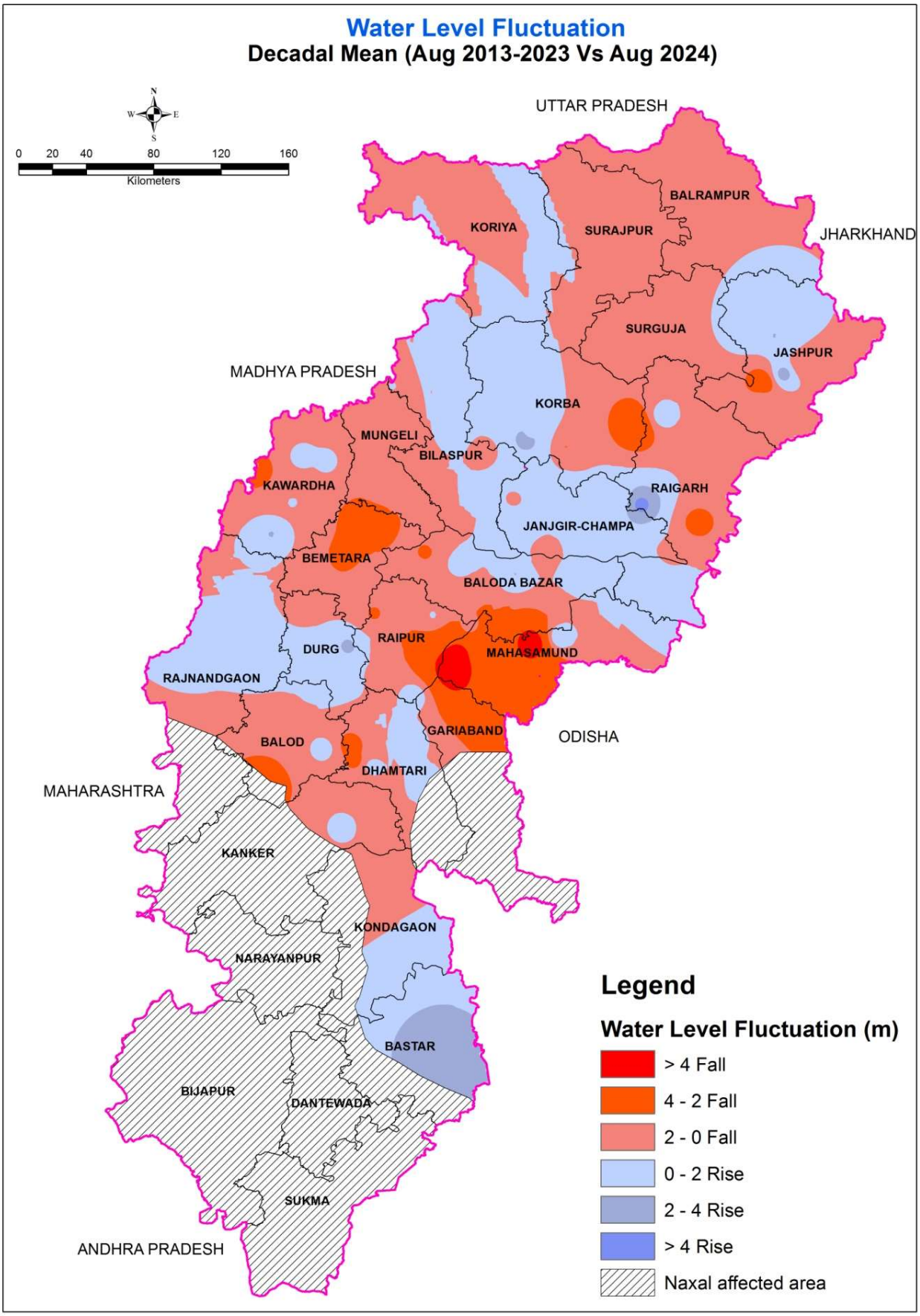


Fig 22 Decadal Fluctuation in water Level with Mean in Semi Confined Aquifer August ((2013-2023) Vs August 2024