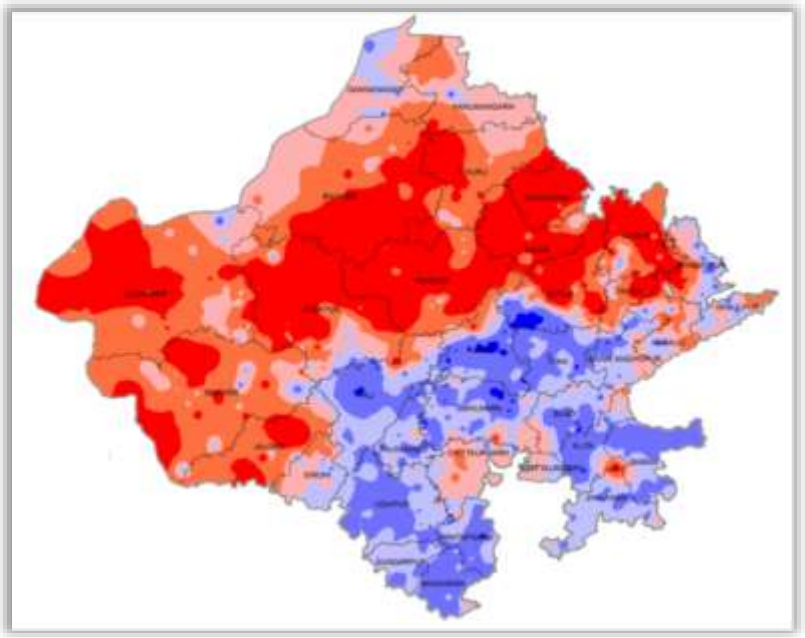


GROUND WATER LEVEL BULLETIN

JANUARY 2025

RAJASTHAN

ABSTRACT

Ground water level Scenario during January 2025 highlighting the findings, status of ground water level and its seasonal, annual and decadal comparison.

CGWB,WESTERN REGION, JAIPUR

1.0 INTRODUCTION

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

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

Groundwater levels are being measured by Central Ground Water Board four times a year during January, March/April/May, August and November. The regime monitoring started in the year 1969 by Central Groundwater Board. A network of 25437 observation wells called **National Hydrograph Network Stations (NHNS)**, as on 30.04.2024, located all over the country is being monitored.

2.0 STUDY AREA

The State of Rajasthan comprising of 33 districts has a geographical area of 3,42,239 square kilometers (sq km) and is the largest State in the country. Administrative division map of Rajasthan is shown in Figure-1. It is situated between north latitudes 23°03' and 30°12' and east longitudes 69°30' and 78°17'. The ground water monitoring is being carried out through a network of observation wells- the National Hydrograph Network Stations (NHS).

Physiographically the state is divided into four major units, i.e., Aravalli hill ranges, Eastern plains, Western Sandy Plain and Sand Dunes & Vindhyan Scarpland and Deccan Lava Plateau.The Aravalli Hill Ranges from the main water divide in Rajasthan.

Figure-1: Map showing administrative divisions of Rajasthan

Luni is the only river west of Aravallis. In the remaining area of western Rajasthan comprising about 60% of the geographical area of the state, the drainage is internal, and the streams are lost in the desert sands after flowing for a short distance from the point of origin. In the east of Aravalli ranges, the main rivers are Chambal, Banganga, Banas, Sahibi, Kantli, Banas and Mahi.Diverse rock types ranging from the oldest Archaean Metamorphics to Sub-Recent to Recent alluvium and wind-blown sand are exposed in Rajasthan. However, in a major portion of the area, particularly in Western Rajasthan, the older rocks lie concealed below a cover of alluvium and blown sand and underlain by hard rock (nearly 40%) consisting of the Archaeans

crystalline (Bhilwara Super Group), Proterozoic rocks comprising Aravalli and Delhi Super Groups, Erinpura Granite, Malani volcanics and plutonic suite of rocks and their equivalents, Marwars, Vindhyans and Deccan Traps. The soft rocks include the alluvium and the blown sand, which occupy the major portion in the remaining part of the State.

3.0 GROUND WATER LEVEL MONITORING

The National Hydrograph Network Stations set-up is a system of spatially distributed observation points at which periodic monitoring of ground water and regime behavior viz. recording of water levels and temperature and collection of ground water samples for water (chemical) quality analysis are done. The main objectives of monitoring of water levels and water quality are to observe the rise and fall of ground water levels and to study changes in quality of water in space and time consequent to changes in the inputs and outputs. Database on ground water levels and quality created through this effort forms an important tool in the evaluation of optimum development and decision making on the various aspects of water resources management. Presently 1489 NHS comprises of 647 dug well and 842 piezometers in the state are being monitored.

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

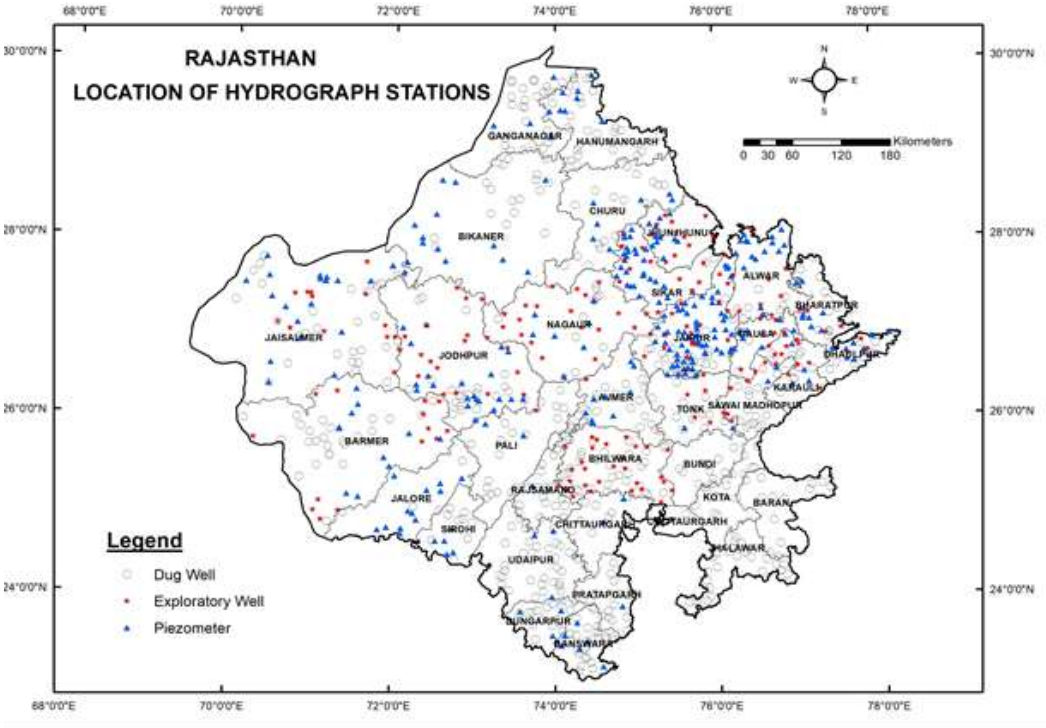


Figure- 2: Map showing locations of monitoring wells (NHNS) in Rajasthan State

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

Sl. No.	District	Geographical area (sq km)	Total Number of NHS			Number of NHS monitored		
			Dug well	Piezometer	Total	Dug well	Piezo meter	Total
1	Ajmer	8481	27	20	47	22	10	32
2	Alwar	8380	11	39	50	9	34	43
3	Banswara	4536	28	20	48	24	6	30
4	Baran	6955	18	1	19	13	0	13
5	Barmer	28387	31	56	87	27	24	51
6	Bharatpur	5100	17	22	39	14	15	29
7	Bhilwara	10455	36	33	69	34	28	62
8	Bikaner	27244	20	36	56	14	23	37
9	Bundi	5550	13	9	22	10	7	17
10	Chittaurgarh	7880	16	2	18	11	2	13
11	Churu	16830	19	11	30	18	9	27
12	Dausa	3470	6	28	34	5	23	28
13	Dhaulpur	3000	9	14	23	9	12	21
14	Dungarpur	3770	16	14	30	16	11	27
15	Ganganagar	10978	31	6	37	26	6	32
16	Hanumangarh	9656	29	24	53	20	20	40
17	Jaipur	11066	30	125	155	28	94	122
18	Jaisalmer	38401	35	49	84	30	38	68
19	Jalore	10640	7	17	24	4	15	19
20	Jhalawar	6219	27	2	29	22	1	23
21	Jhunjhunu	5928	0	30	30	0	25	25
22	Jodhpur	22850	26	98	124	20	78	98
23	Karauli	5016	14	26	40	13	17	30
24	Kota	5481	16	5	21	14	3	17
25	Nagaur	17718	13	39	52	8	30	38
26	Pali	12387	22	13	35	21	10	31
27	Pratapgarh	4360	20	2	22	16	1	17
28	Rajsamand	4768	26	4	30	22	4	26
29	Sawai Madhopur	5043	17	11	28	17	9	26
30	Sikar	7732	2	53	55	2	43	45
31	Sirohi	5136	11	7	18	10	4	14
32	Tonk	7194	16	22	38	16	17	33
33	Udaipur	11761	38	4	42	30	1	31
	Total	342,239	647	842	1489	545	620	1165

4.0 RAIN FALL

Rajasthan receives much lower rainfall compared to the other parts of the country. Out of the total rainfall, a sizable portion is in the beginning of the rainy season which is mainly used for building the soil moisture and is also lost to evaporation because of the arid conditions. The amount infiltrating through the soil mass to contribute to ground water storage is of the order of 5% to 7% in areas underlain by hard rocks and 10% to 15% in alluvial areas.

The normal annual rainfall of Rajasthan is 549 mm. However, during the period from 2014-23, highest average annual rainfall of the State occurred in the year 2019 and lowest inthe year 2017. The average annual rainfall (2023) is 20.9% more than the normal annual rainfall. The average annual rainfall of the State during the period 2023 works out to be 695.0 mm.

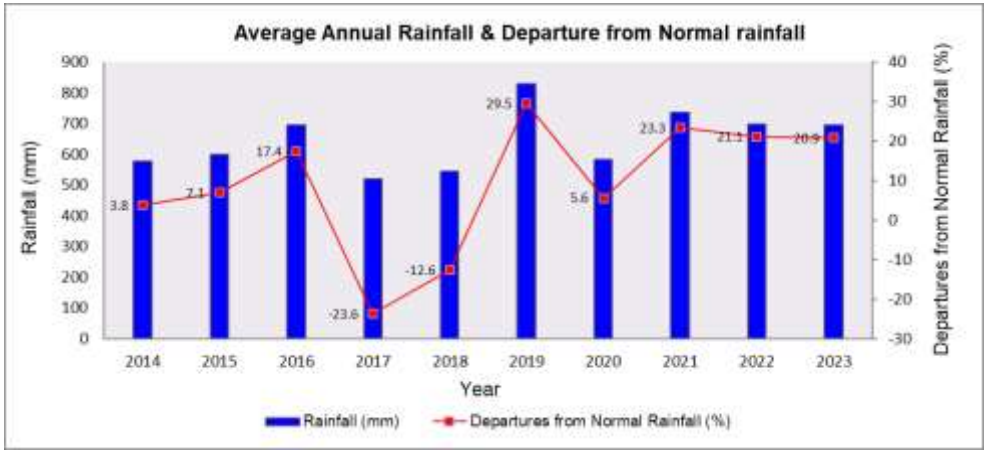


Figure-3: Average annual rainfall and departure from normal rainfall

5.0 GROUND WATER LEVEL SCENARIO (January 2025)

5.1.1 Depth To Water Level (January 2025) in Unconfined Aquifer

A total of 1,165 monitoring stations were analyzed across Rajasthan in January 2025.Depth to water level varies from 0.15 mbgl (Nayagaon,Tonk district) to 139.1 mbgl (Phalodi, Jodhpur district).

Water level more than 40 mbgl was monitored at 24% stations and spread from north west to western and upper central parts covering mostly covering Jodhpur Jaipur ,Sikar ,Nagaur , Jhunjhunu , Barmer ,Alwar ,Jaisalmer ,Bikaner ,and Churu districts.Depth to water level between 20 to 40 mbgl was recorded in 16 % monitoring stations, stretching from north east to western part and upper central part of the spanning Jaisalmer ,Hanumangarh , Jodhpur, Jaipur , Barmer , Alwar , Bikaner , Churu , Nagaur , Sikar ,Jalore , Dhaulpur , Bharatpur , and Ganganagar. Depth to water level between 10 & 20 mbgl was recorded in 16% stations falling mostly in Jodhpur, Jaisalmer, Hanumangarh, Gangangar, Barmer, Bikaner, Bilwara, Jaipur, Alwar, Churu, Nagaur, Karauli , Jalawar, Rajsamand, Sirohi and at isolated locations.Depth to water level ranging from 5 to 10 mbgl was recorded at 15% stations in falling predominantly in southern/southeastern districts: Bhilwara , Dungarpur , Ganganagar , Jaipur , Karauli ,Udaipur , Jhalawar , Tonk , Pali ,Rajsamand ,Ajmer , and Sawai Madhopur .Water level ranging between 2 & 5 mbgl was observed at 21 % stations spread over south, south east part of State falling in Bhilwara , Jaipur ,Banswara , Pali , Udaipur , Rajsamand , Baran ,Ajmer , Dungarpur , Tonk , and Sawai Madhopur .Shallow water level i.e. less than 2 mbgl have been observed at 8% stations and falling in Tonk, Bhilwara, Jaipur, Ajmer, Bundi, Pratapgarh , Karauli districts

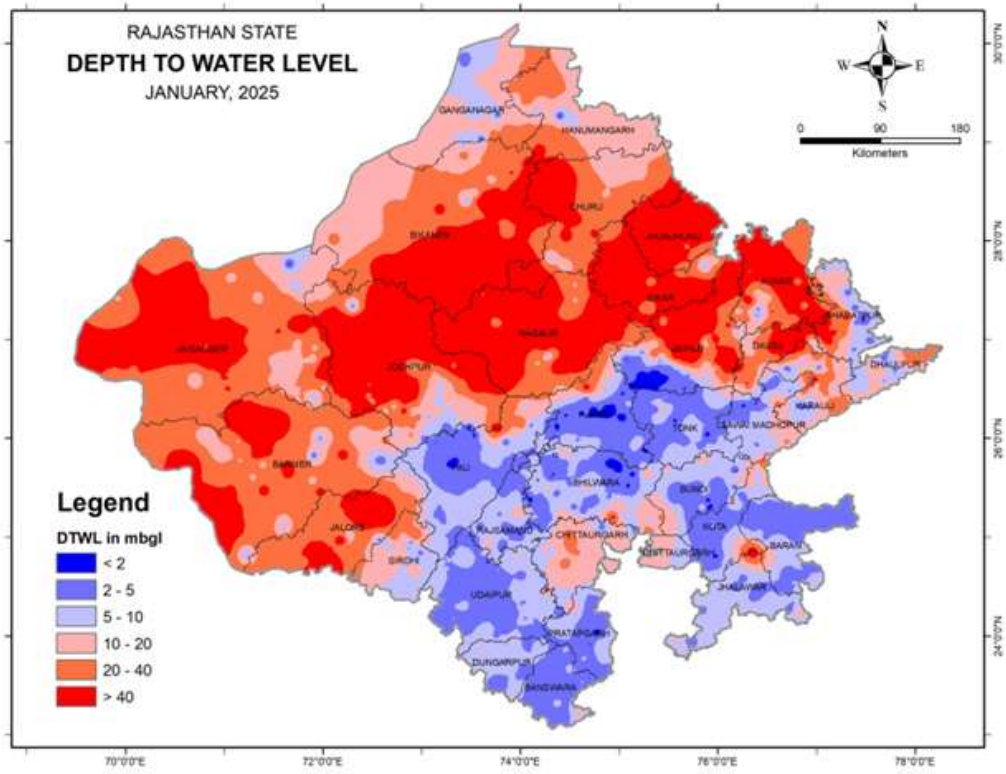
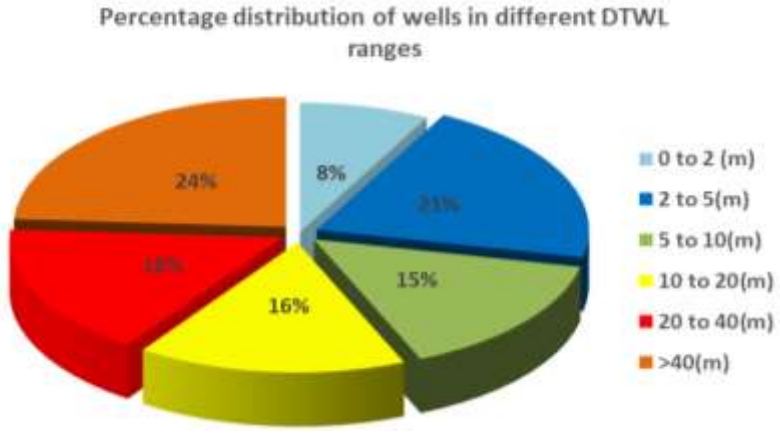


Fig4: Depth to Water level map of January 2025



5.1.2 Seasonal Fluctuation in Water Level in Unconfined Aquifer

Seasonal Fluctuation in Water Level in Unconfined Aquifer - (May/Pre-monsoon 2024 - January 2025)

Total number of wells analyzed are 956. A perusal of map (Fig-5) of seasonal water level fluctuation from May 2024 to January 2025 reveals that 78.7% stations shown rise, 21.0% decline & 0.3% stations shows no change in water level.

Rise in Water Levels:

Area of rise in water spreads from south east to south-central, north western, western and west central parts of the State. Minimum & maximum rise was recorded 0.01 m in Dhirawas,Churu district and 36.35 m Khali Dhai ,Sawai Madhopur district.Rise in water level < 2m in 28% stations mostly in western part of Rajasthan.Water level rise between 2 & 4m was shown by 16.4% stations more than 4m has been recorded at 34.2 % stations falling mostly districts falling in Eastern part of Rajasthan.

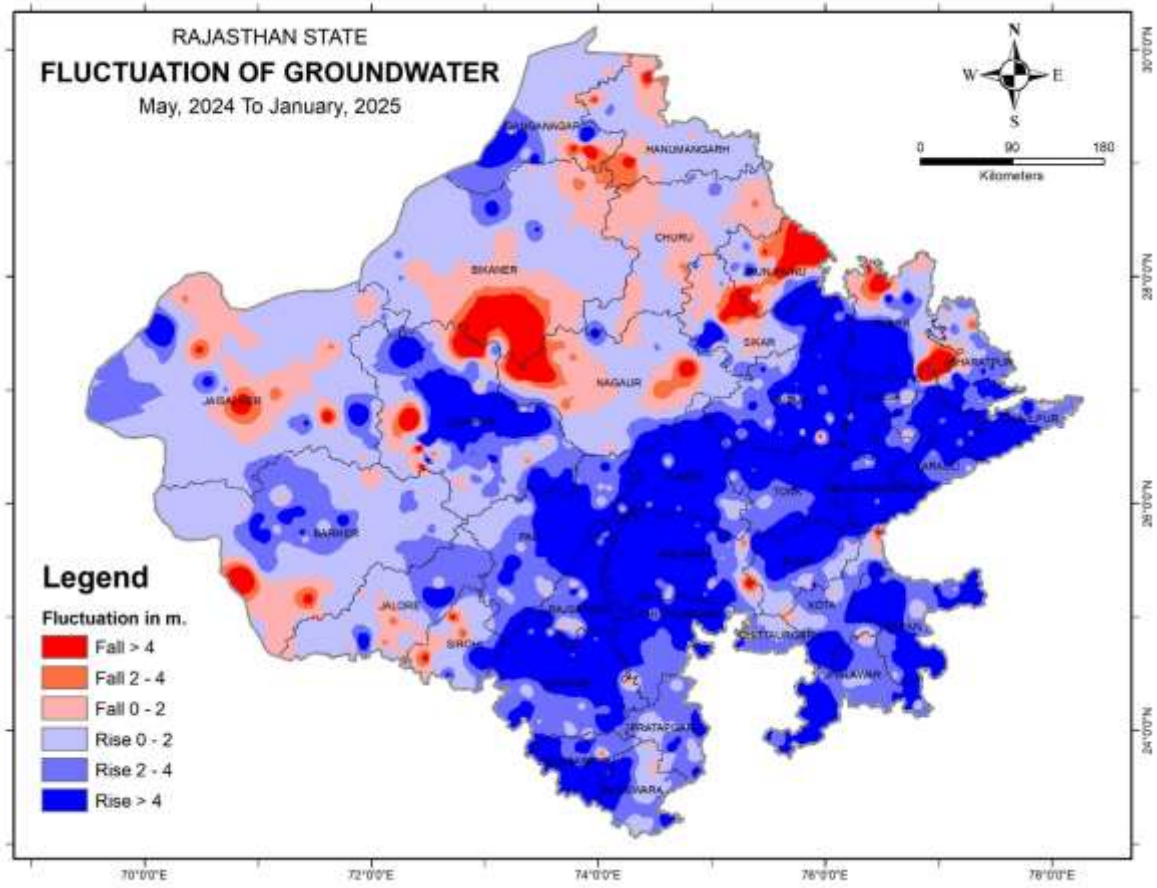


Fig5: Water level Fluctuation map May 2024 to January 2025

Decline in Water Levels:

About 21.0% stations scattered mostly in north-eastern, south, south western, north& north central parts, shows decline in water level during this period. Minimum & maximum decline was recorded at 0.01 m in Bhojasar, Churu District and 41.6 m Jhanjhar,Jhunjunu district. Decline in water level <2m was recorded in 13.6% stations. Decline in water level between 2 & 4m as recorded at 2.9% stations Water level decline >4m was exhibited by 4.5% stations .

Seasonal Fluctuation in Water Level in Unconfined Aquifer - (August 2024 - January 2025)

Total number of wells analyzed are 979. A perusal of map (Fig-6) of seasonal water level fluctuation from August 2024 to January 2025 reveals that 32.9% stations shown rise, 66.8% decline & 0.3% stations shows no change in water level.

Rise in Water Levels:

Area of rise in water spreads from central, north western, western and west central parts of the State. Minimum & maximum rise was recorded 0.01 m in Govindgarh.Jaipur district and 32.9 m Bhimal ,Jalore district. Rise in water level < 2m in 22.0% stations mostly in western part of Rajasthan. Water level rise between 2 & 4m was shown by 4.8% stations more than 4m has been recorded at 6.1 % stations .

Decline in Water Levels:

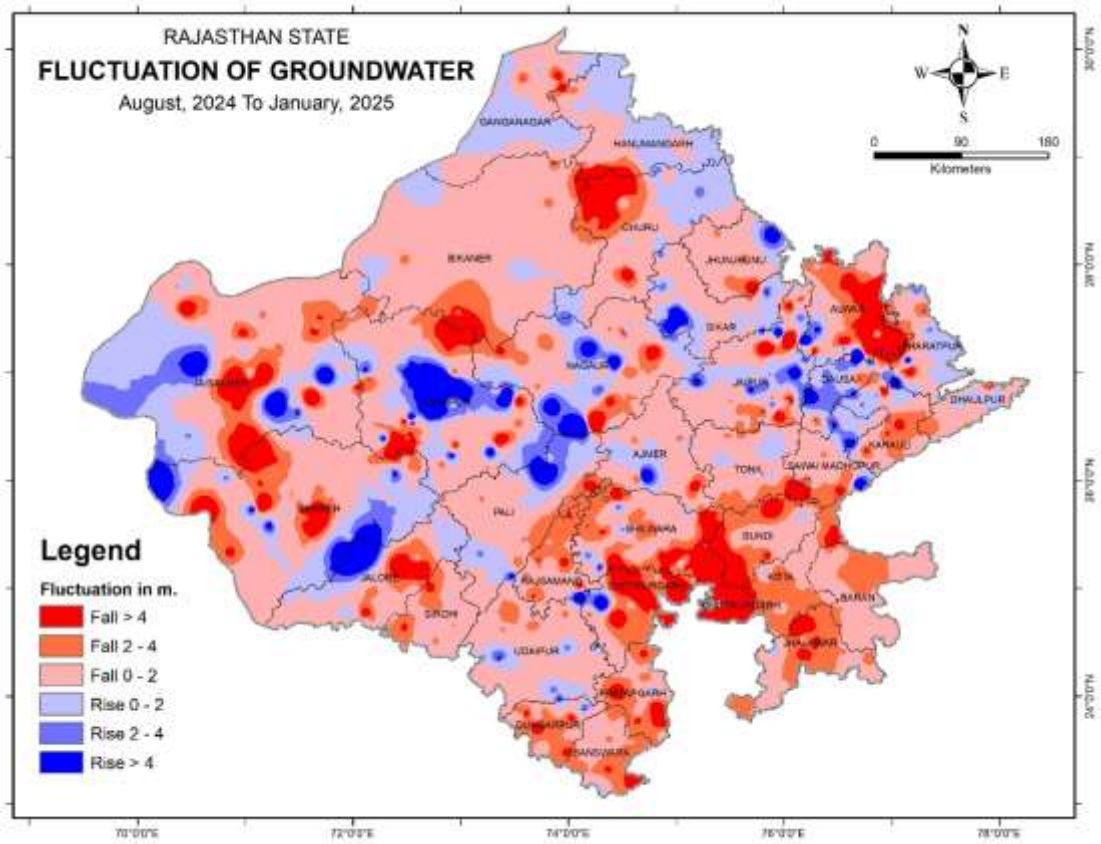


Fig6: Water level Fluctuation map August 2024 to January 2025

About 66.8% stations scattered in all the districts, mostly in north-eastern, south, south eastern, north& north central parts, shows decline in water level during this period. Minimum & maximum decline was recorded at 0.01 m in Phagi,Jaipur District and 49.67 m Shergarh.Jodhpur district. Decline in water level <2m was recorded in 40% stations. Decline in water level between 2 & 4m as recorded at 12.7% stations Water level decline >4m was exhibited by 14.1% stations .

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Seasonal Fluctuation in Water Level in Unconfined Aquifer - (November 2024 - January 2025)

Total number of wells analyzed are 1070. A perusal of map (Fig-7) of seasonal water level fluctuation from November 2024 to January 2025 reveals that 27.7% stations shown rise, 71.8% decline & 0.5% stations shows no change in water level.

Rise in Water Levels:

Area of rise in water spreads from western, north western and west central parts of the State. Minimum & maximum rise was recorded 0.01 m in Kirerea and Bhijawan of Bikaner district and 32. m Gadra road, Barmer district. Rise in water level < 2m in 22.3% stations mostly in western part of Rajasthan. Water level rise between 2 & 4m was shown by 2.7% stations more than 4m has been recorded at 2.7 % stations .

Decline in Water Levels:

About 71.8% stations scattered in all the districts, mostly in north-eastern, south, south eastern, north& north central parts, shows decline in water level during this period. Minimum & maximum decline was recorded at 0.01 m in Chokarwada,JBharatpur District and 18.93 m Dharwali,Jaipur district. Decline in water level <2m was recorded in 56.9% stations. Decline in water level between 2 & 4m as recorded at 9.1% stations Water level decline >4m was exhibited by 5.8% stations .

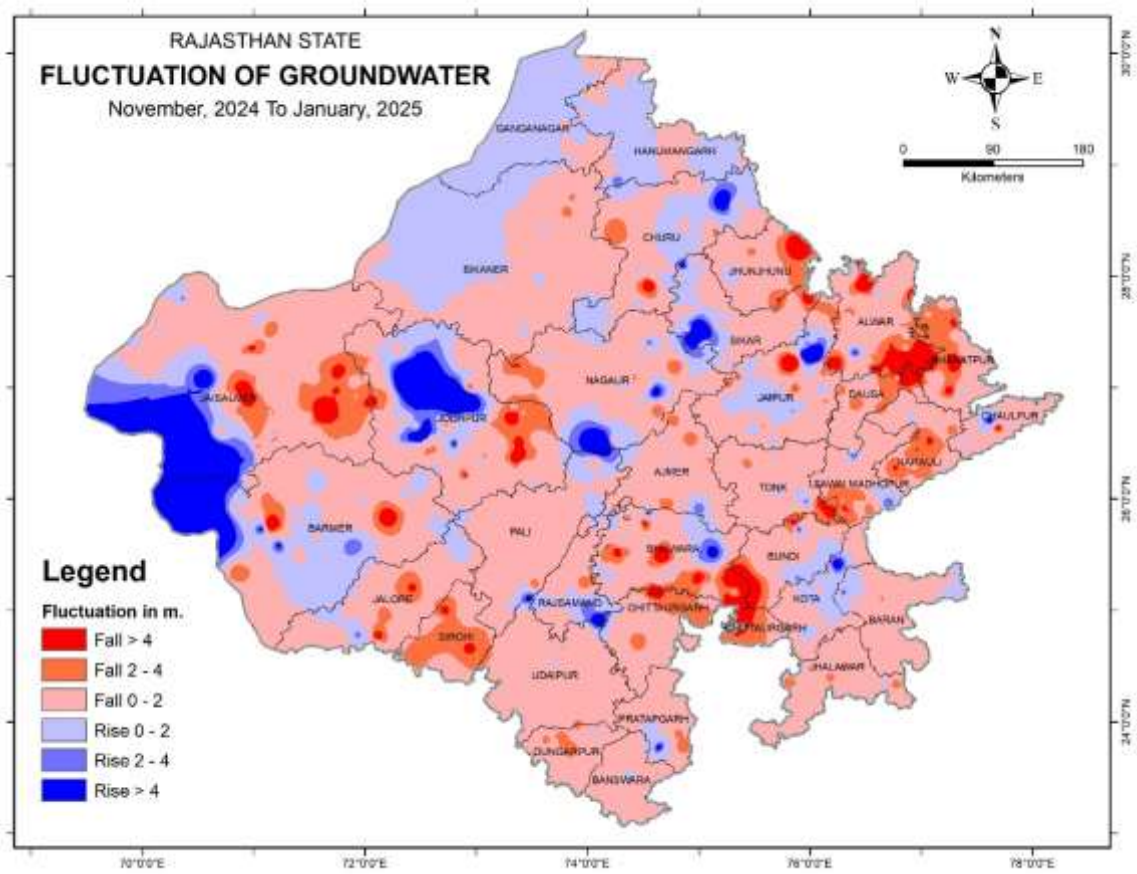

Fig7: Water level Fluctuation map November 2024 to January 2025

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5.1.3 Annual Fluctuation in Water Level

Annual Fluctuation in Water Level in Unconfined Aquifer (January 2024 to January 2025)

Total number of wells analyzed are 952. A perusal of map (Fig-8) of annual water level fluctuation from January 2024 to January 2025 reveals that 74.9% stations shown rise, 25.1% decline .

Rise in Water Levels:

Area of rise in water spreads from eastern, western, north western, southern and west central parts of the State. Minimum & maximum rise was recorded 0.01 m in Posana, Jhunjhunu district and 46.87 m Jaisingpur Khor,Jaipur district. Rise in water level < 2m in 34.1% stations mostly in western ,northern and central part of Rajasthan. Water level rise between 2 & 4m was shown by 20.4% stations mainly around western and central part of the State and more than 4m has been recorded at 20.4 % stations .

Decline in Water Levels:

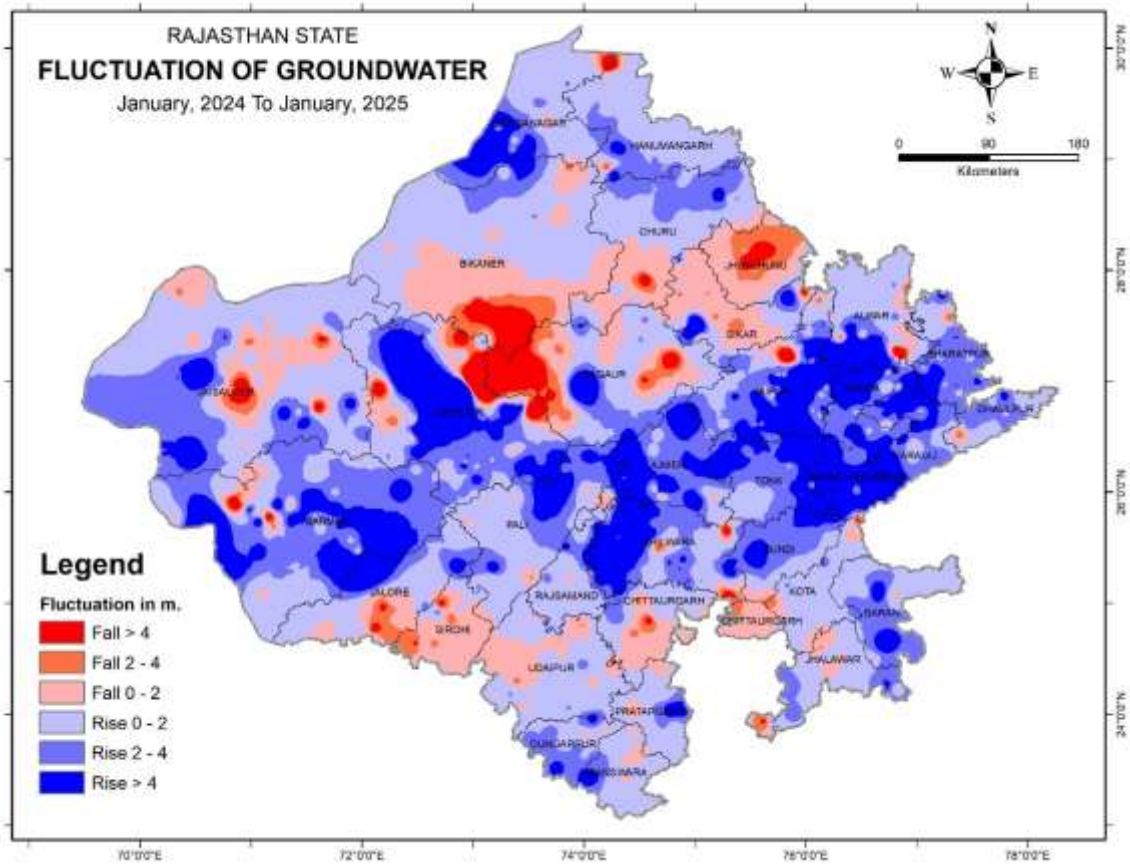

Fig8: Annual Fluctuation map January 2024 to January 2025

About 25.1 % stations shows decline in water level fluctuations and scattered in all the districts.Minimum & maximum decline was recorded at 0.01 m in Sadri,Pali District and 46.87 m Jaisinghpur Khor,Jaipur district. Decline in water level <2m was recorded in 16.9% stations. Decline in water level between 2 & 4m as recorded at 4.3% stations Water level decline >4m was exhibited by 3.9% stations .

Annual Fluctuation in Water Level in Unconfined Aquifer (January 2023 to January 2025)

Total number of wells analyzed are 815. A perusal of map (Fig-9) of annual water level fluctuation from January 2023 to January 2025 reveals that 59.3% stations shown rise, 40.5% decline and 0.2 % stations shows no change .

Rise in Water Levels:

Area of rise in water spreads from eastern, western, north western, southern and west central parts of the State. Minimum & maximum rise was recorded 0.01 m in Sirsala,Churu district and 36.29 m Parasla,Jodhpur district. Rise in water level < 2m in 29.2% stations mostly in western ,eastern,northern and central part of Rajasthan. Water level rise between 2 & 4m was shown by 12.1% stations mainly around western and central part of the State and more than 4m has been recorded at 17.9 % stations .

Decline in Water Levels:

About 40.5 % stations shows decline in water level fluctuations and scattered in all the districts. Minimum & maximum decline was recorded at 0.01 m in Hamirpur,Tonk District and 21.7 m Kumara,Jodhpur district. Decline in water level <2m was recorded in 24.4% stations. Decline in water level between 2 & 4m as recorded at 8.6 % stations Water level decline >4m was exhibited by 7.5% stations .

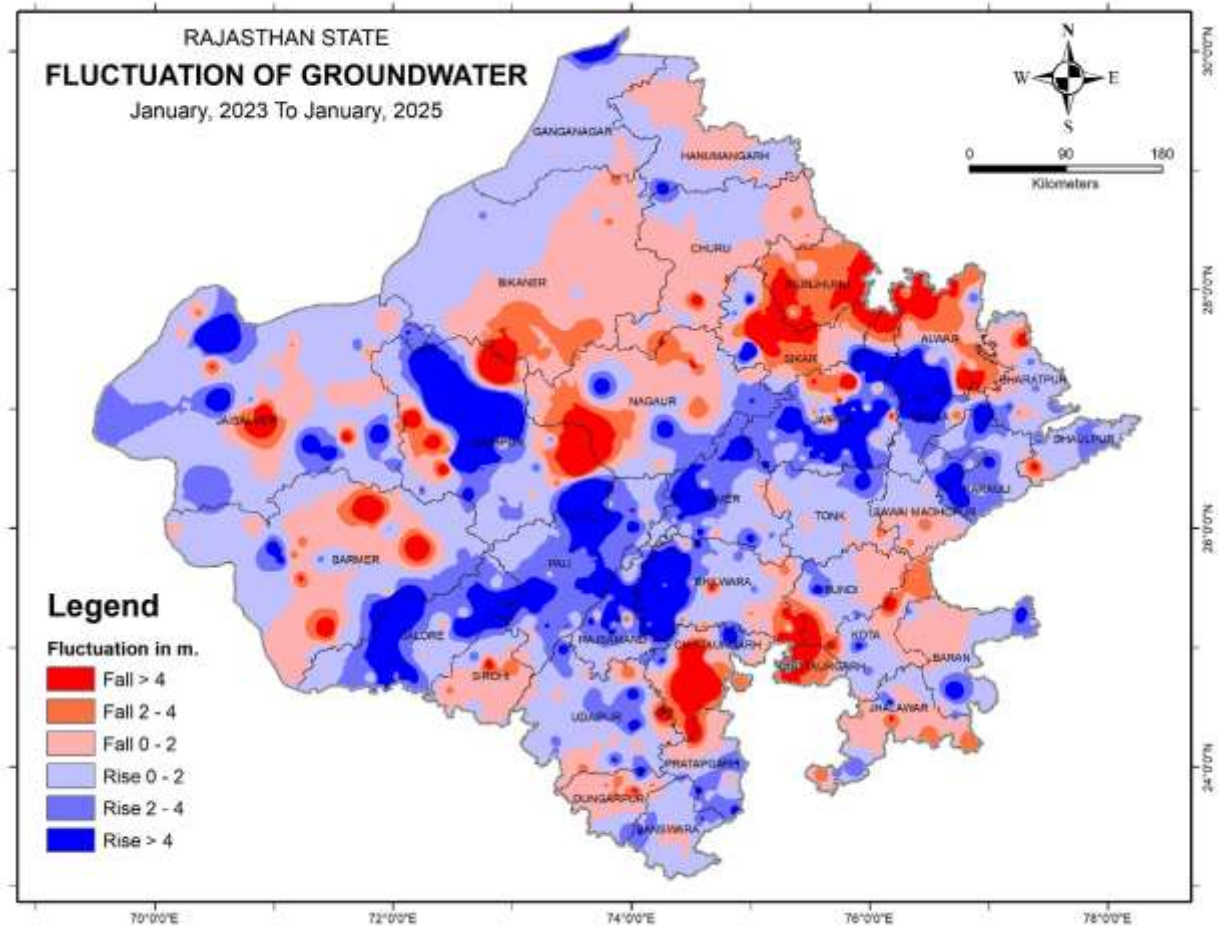

Fig9: Annual Fluctuation map January 2023 to January 2025

5.1.4 Decadal Fluctuation in Water Level

Decadal Variation - Decadal average Fluctuation of January, (2015-2024) to January 2025

Total number of wells analyzed are 1009. A perusal of map (Fig-10) of annual water level fluctuation from January (2015-2024) to January 2025 reveals that 37.1% stations shown rise, 62.9% decline .

Rise in Water Levels:

Area of rise in water spreads from western, north western, southern and west central parts of the State. Minimum & maximum rise was recorded 0.01 m in Jaitsar,Ganganagar district and 31.75m Jasai,Mandawar district. Rise in water level < 2m in 19.7% stations mostly in western , northern part of Rajasthan. Water level rise between 2 & 4m was shown by 6.5% stations mainly around western and central part of the State and more than 4m has been recorded at 10.8 % stations .

Decline in Water Levels:

About 62.9 % stations shows decline in water level fluctuations and scattered in all the districts. Minimum & maximum decline was recorded at 0.01 m in Phulia ,Jaisalmer District and 36.24 m Jirawal,Sirohi district. Decline in water level <2m was recorded in 28.1 % stations. Decline in water level between 2 & 4m as recorded at 16.1 % stations Water level decline >4m was exhibited by 18.7 % stations .

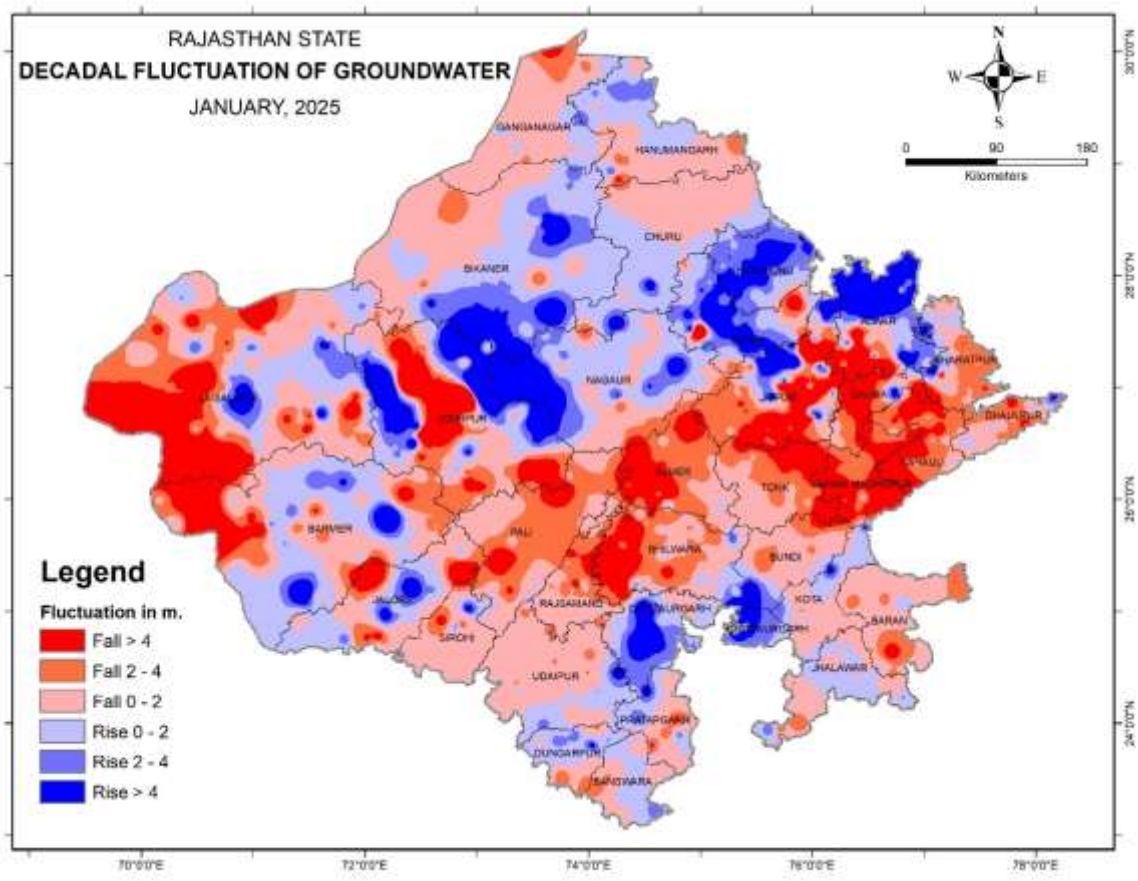

Fig10: Decadal average Fluctuation of January, (2015-2024) to January 2025

6.0 Summary:

The Central Ground Water Board (CGWB), Western Region (WR), Jaipur, conducts quarterly groundwater monitoring under the National Ground Water Monitoring Programme. Monitoring is carried out in January (post-monsoon), May (pre-monsoon), August (post-monsoon), and November. Currently, 1,489 National Hydrograph Stations (NHS)—consisting of 647 dug wells and 842 piezometers—are being monitored across Rajasthan.

In January 2025, 1,165 monitoring stations were analyzed, revealing that the depth to water level varied significantly across the state. The shallowest water level was recorded at 0.15 meters below ground level (mbgl) in Nayagaon (Tonk district), while the deepest was 139.1 mbgl in Phalodi (Jodhpur district).

Seasonal water level fluctuations were assessed across different periods. From May 2024 to January 2025, analysis of 956 wells showed that 78.7% of stations experienced a rise in water levels, 21.0% saw a decline, and 0.3% remained unchanged. For the period August 2024 to January 2025, 979 wells were analyzed, with 32.9% showing a rise, 66.8% a decline, and 0.3% no change. Similarly, from November 2024 to January 2025, 1,070 wells were examined, revealing a rise in 27.7% of stations, a decline in 71.8%, and no change in 0.5%.

The annual fluctuation (January 2024 to January 2025) indicated that 74.9% of stations recorded a rise in water levels, while 25.1% saw a decline. And for January 2023 to January 2025 showed slightly different figures, with 59.3% of stations experiencing a rise, 40.5% a decline, and 0.2% remaining no change.

A long-term comparison of January 2025 water levels with the mean of January (2015–2024) was conducted using 1,009 wells. The findings revealed that 37.1% of stations showed a rise in water levels, while 62.9% exhibited a decline, indicating a concerning trend of groundwater depletion in many areas over the past decade.

7.0 Recommendations:

1. **Enforce strict extraction limits** in high-depletion zones with regulated borewell permits and penalties for overuse.
2. **Boost conservation** Promotion of Water Conservation Practices, such as rainwater harvesting, watershed management, and micro-irrigation techniques
3. **Accelerate aquifer recharge** :Recharge Initiatives like constructing check dams, percolation tanks, and artificial recharge structures in depleted regions to enhance aquifer replenishment.
4. **Educate communities** :Public Awareness Campaigns to educate farmers and industries on efficient water use and the adoption of drought-resistant crops.
5. **Implement smart monitoring** :Monitoring & Data-Driven Policies through real-time groundwater tracking and periodic reassessment of extraction limits based on aquifer health.