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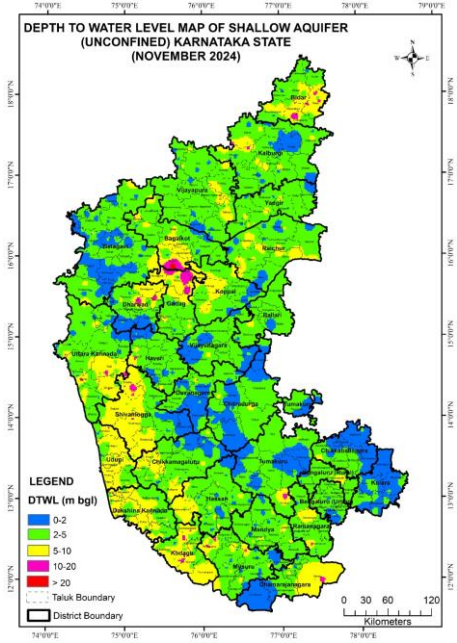
GROUND WATER LEVEL BULLETIN NOVEMBER 2024 - KARNATAKA STATE



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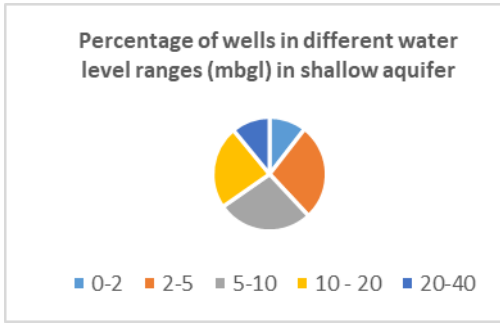
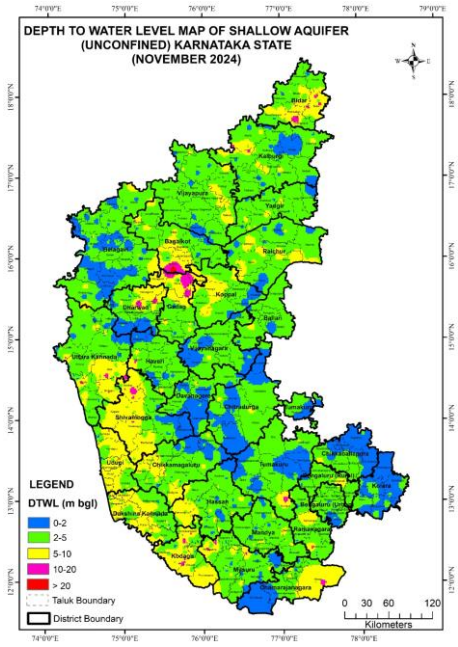
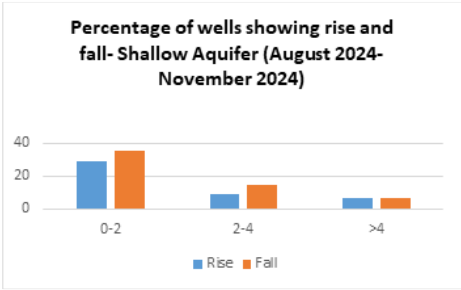
January 2025







GROUND WATER LEVEL BULLETIN NOVEMBER 2024 - KARNATAKA STATE

Abstract

This Bulletin gives the overall rainfall scenario of the post monsoon season and the 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.

In November 2024, shallow aquifer depths in Karnataka ranged from 0.02 m bgl (Belgaum & Bangalore Urban) to 27.99 m bgl (Bagalkot), with 95.84% of wells within 10 m bgl. About 31.92% of wells were under 2 m bgl, while 37.02% and 26.90% ranged from 2-5 m and 5-10 m bgl, respectively. Deeper aquifers depth to water level varied from 0.02 m bgl (Raichur) to 129.22 m bgl (Bangalore Urban), with 62.3% of wells within 10 m bgl. Depths beyond 10 m bgl were observed in 37.7% of wells, with 4.63% exceeding 40 m bgl, mostly in isolated districts. Shallow aquifers predominantly had lower depths, while deeper aquifers showed more variability.

From August to November 2024, deeper aquifers showed a water level rise in 81% of wells, with 33.75% rising over 4 m, while 19% saw declines, 3.13% exceeding 4 m. Shallow aquifers rose in 44.14% of wells, 6.43% exceeding 4 m, while 55.82% recorded falls, 6.18% over 4 m. From May to November 2024, Shallow aquifer showed rise in 79.36% of wells & deeper aquifer showed rise in 92.47 % of wells.

The decadal water level fluctuation (Nov 2014– Nov 2024) in Karnataka shows significant variations across shallow and deeper aquifers. For shallow aquifers, water levels rose in 71.08% of wells, with 53.69% experiencing a rise of 0-2 m, 12.52% seeing a 2-4 m rise, and 4.86% recording a rise of more than 4 m, except in certain districts like Bagalkot, Kolar, and Shimoga. However, 28.92% of wells showed a decline, with 22.25% experiencing a 0-2 m fall and smaller proportions registering larger drops. In deeper aquifers, 66.87% of wells reported a rise, with 28.22% showing a 0-2 m increase, 16.56% a 2-4 m rise, and 22.09% a rise exceeding 4 m, except for districts like Bidar, Mysore, and Udupi. Meanwhile, 33.13% of wells exhibited falling water levels, with most declines in the 0-2 m range. These fluctuations highlight regional variations in groundwater dynamics across the state.

South Western Region, Bengaluru

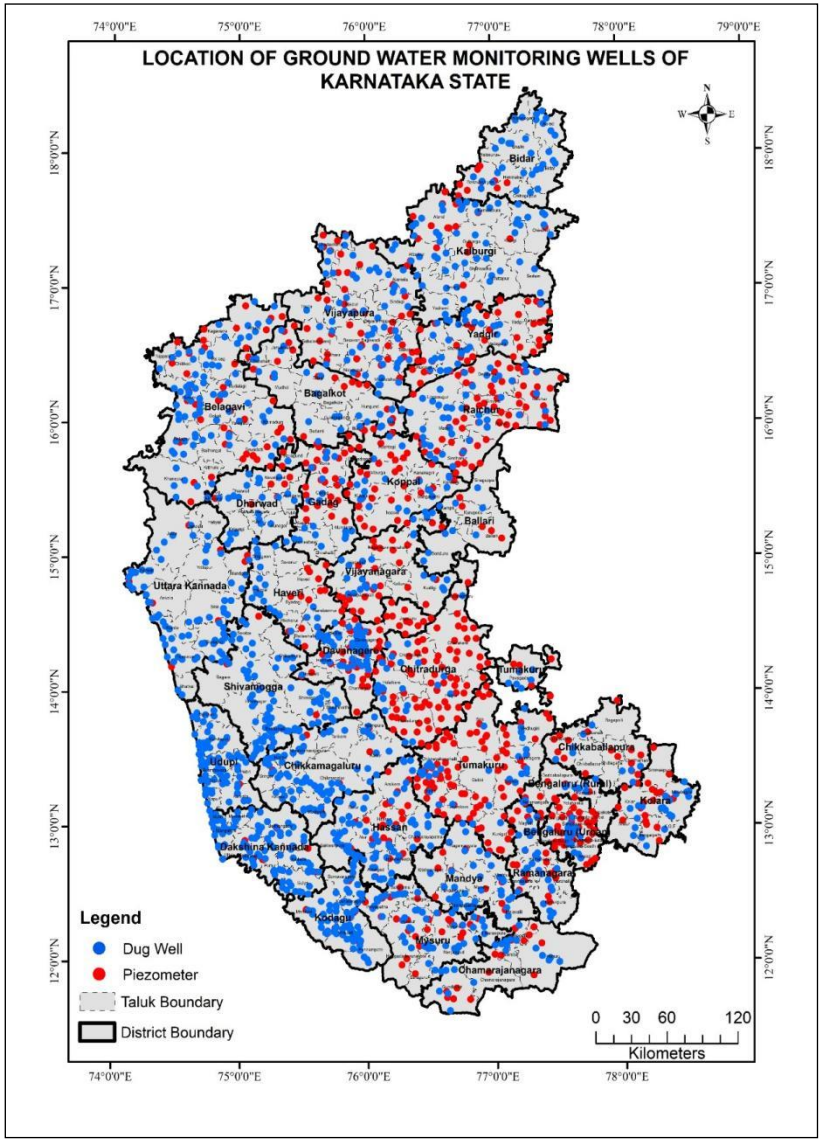
GROUND WATER LEVEL BULLETIN NOVEMBER 2024 – KARNATAKA STATE

Contents

1. Introduction:

The state of Karnataka has a geographical area of 1, 91, 761 sq. km. and is situated between N. Latitudes 11°31'' and 18°45' and E. Longitudes 74°12' and 78°40'. For administrative purposes, the state is divided into 31 districts and 234 taluks. Physiographically the state is categorized into four units namely Northern plain, Southern Plain, Coastal area and Hilly region. Karnataka state is drained by the rivers Krishna, Cauvery, Godavari, West flowing minor rivers, Palar, Pennar and Ponnaiyar. The state of Karnataka is underlain by geological formations ranging in age from Archaean to Recent. Major portion of the State is covered by Peninsular Gneisses, Granites and Dharwarian Schists of Archaean age. Substantial area in the northern part of Karnataka is underlain by basalts, which form a continuation of the Deccan Traps occurring in Maharashtra. The sedimentaries comprising Bhima and Kaladgis occupy a small area in the northern districts. The recent alluvium is restricted to a narrow belt in the coastal area and along stream courses

Monitoring of ground water levels was carried out at 2352 ground water monitoring wells in the State of Karnataka during the month of November 2024. Among the wells monitored, **1329** are dug wells and **1023** are piezometers. The data indicated that the water level in the major part of the State is within the range of 0-10 m bgl .The deepest water level observed in dug wells is 27.99 m bgl. About 4.16% percentage of dugwells has recorded water levels deeper than 10 m bgl.



2. RAINFALL DISTRIBUTION IN KARNATAKA STATE, DURING THE MONTHS OF SEPTEMBER, OCTOBER & NOVEMBER 2024

In Karnataka State, the year is generally divided into four seasons. These are: dry season (Jan-Feb), premonsoon season (Mar-May), Monsoon season (Jun-Sep) and post monsoon season (Oct-Dec). The pre monsoon season is characterised by squally weather resulting in heavy rains often accompanied by hail. The Indian summer monsoon, the harbinger of hope for the farmers, normally sets in the state by the first week of June and covers the entire state in about two weeks time. It starts withdrawing by the end of September and totally goes out of the state by the middle of October. Bulk of the annual rainfall is contributed by the summer monsoon. It is replaced by the winter monsoon, which is relatively dry. Significant rainfall occurs due to passing depressions/cyclones. The rainfall in various districts/regions/taluks has been classified as Excess (E), Normal (N) and Deficit (D) as per following criteria.

Excess : 120% of normal or more
Normal : 81% to 119% of normal
Deficit : 80% of normal or less

Based on the above classification, districts falling under the above-mentioned three of Karnataka and as well as for the State as a whole for the months September, October and November during 2024 **has been presented below.**

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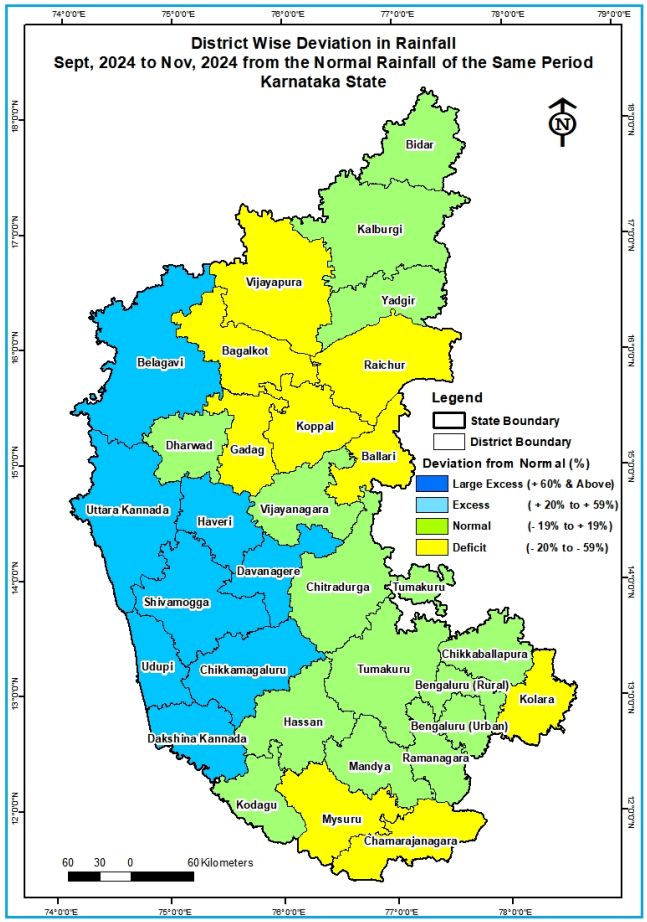
The rainfall data has been collected and compiled from Karnataka State Natural Disaster Management Cooperation (KSNDMC), GoK for the period September 2024 to November 2024. Table 4.1 gives the district-wise rainfall data for the period September to November 2023 & 2024, normal and the departure of September to November 2024 rainfall with other periods.

2.1. During the Months of September, October & November - 2024

In general the showers received during September to November are considered for the analysis. During the period (September to November 2024), the State had received an total rainfall of 348 mm, which is 0.4 percent more than the normal of 347 mm. Rainfall was deficit in 9 district, Excess in 8 district and normal in 15 districts (Table 4.1). Map showing the district-wise rainfall distribution in Karnataka State for the period of September to November 2024 period is given as Fig.4.1

Fig1.1: Rainfall Deviation (Sept 2024 to Nov 2024) from Normal Rainfall of the same period



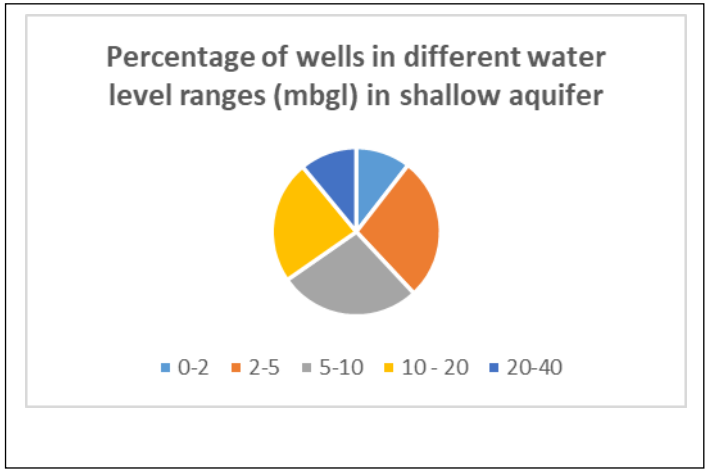
Sl.No.	District	SEPT - NOV 2024 Actual (mm)	SEPT - NOV 2023 Actual (mm)	SEPT - NOV 2024 Normal (mm)	%DEP From 2023	%DEP From Normal	Category
1	Bagalkote	184	121	271	52	-32	Deficit
2	Ballari	222	84	286	164	-22	Deficit
3	Belagavi	303	172	251	76	21	Excess
4	Bengaluru Rural	344	331	373	4	-8	Normal
5	Bengaluru Urban	348	308	388	13	-10	Normal
6	Bidar	319	240	281	33	14	Normal
7	Chamarajanagara	253	229	362	10	-30	Deficit
8	Chikkaballapura	292	294	357	-1	-18	Normal
9	Chikkamagaluru	469	328	379	43	24	Excess
10	Chitradurga	252	132	255	91	-1	Normal
11	Dakshina Kannada	892	1057	696	-16	28	Excess
12	Davanagere	337	162	262	108	29	Excess
13	Dharwad	308	122	263	152	17	Normal
14	Gadag	183	138	273	33	-33	Deficit
15	Hassan	365	283	348	29	5	Normal
16	Haveri	320	96	261	233	23	Excess
17	Kalaburagi	270	233	298	16	-9	Normal
18	Kodagu	520	501	494	4	5	Normal
19	Kolar	266	294	360	-10	-26	Deficit
20	Koppala	165	126	285	31	-42	Deficit
21	Mandya	300	274	333	9	-10	Normal
22	Mysuru	220	276	310	-20	-29	Deficit
23	Raichur	162	133	290	22	-44	Deficit
24	Ramanagara	332	297	388	12	-14	Normal
25	Shivamogga	516	296	394	74	31	Excess
26	Tumakuru	380	229	324	66	17	Normal
27	Udupi	992	820	701	21	42	Excess
28	Uttara Kannada	607	423	434	43	40	Excess
29	Vijayanagar	260	99	257	163	1	Normal
30	Vijayapura	183	124	290	48	-37	Deficit
31	Yadgir	238	169	290	41	-18	Normal
	State	348	252	347	38	0.4	Normal

Table. 2.1: District-Wise Cumulative Rainfall and Percentage Departure, During the Months of September, October & November *2024*

3. Depth to water level of shallow aquifer (unconfined) of November-2024:

During November 2024 the depth to water level of shallow aquifer vary widely from 0.02 to 27.99. in major part of the state the water level of the shallow aquifer is within 5m bgl. Salient features of the depth to water level of Shallow aquifer (Unconfined) during **November 2024** are given below.

1. A perusal of the water level data reveals that the depth to water level ranged from 0.02m bgl (Belgaum & Bangalore urban district) to 27.99 bgl (Bagalkot district).
2. The salient feature of the analysis is that the depth to water level over major part of the State lies within 10 m bgl in 95.84 % of wells analysed, while 4.16 % of wells show depth to water level more than 10 m bgl.
3. Depth to water level of less than 2 m bgl has been recorded in around 31.92% of wells analysed and noted all over the districts in Karnataka state.
4. Depth to water level in the range of 2 to 5 m bgl has been recorded in 37.02 % of wells analysed and noted in all the districts.
5. Depth to water level in the range of 5 to 10 m bgl has been recorded in 26.90% of wells analysed and noted in almost all districts except Kolar district. Water level in this range is more concentrated along the western ghat region of the state.
6. Depth to water level in the range of 10 to 20 m bgl has been recorded in 3.92% of wells analysed and observed in all districts except Bangalore Urban, Bagalkot, Bellary, Chikballapura, Chitradurga, Kolar, Koppal, Raichur and Yadgir Districts.
7. Depth to water level in the range of 20 to 40 m bgl has been recorded in 0.24 % of wells analysed and observed in Gadag & Mysore district.



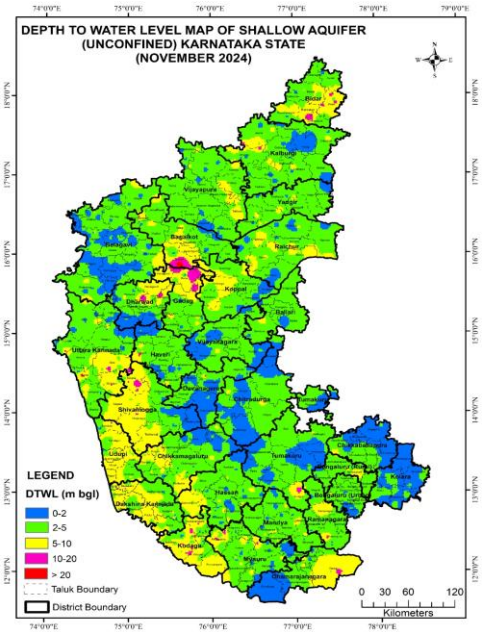
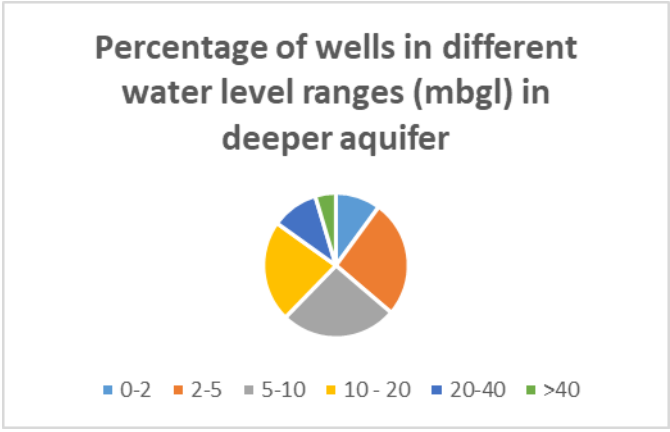


Plate- I: Depth to Water Level Map of Shallow Aquifer (Unconfined) of Karnataka State - November-2024

4. Depth to water level of deeper aquifer (semi-confined/confined) of November-2024:

Depth to Water level of Deeper aquifer (Semi-confined/Confined) has been recorded from piezometers spread all over the State in hard rock areas. Salient features of the depth to water level of Deeper aquifer (Semi-confined/Confined) during November 2024 are given below;

1. The depth to Water level of Deeper aquifer (Semi-confined/Confined) ranged from 0.02 m bgl (Raichur district) to 129.22 bgl (Bangalore Urban district) in Karnataka. 62.3% of wells have recorded depth to Water level of Deeper aquifer (Semi-confined/Confined) within 10 m bgl and 37.7% of wells show depth to Water level of Deeper aquifer (Semi-confined) in more than 10 m bgl Water level more than 10 mbgl is more concentrated in northern and southern districts of the state.
2. Depth to Water level of Deeper aquifer (Semi-confined/Confined) of less than 2 m bgl has been recorded in 10.03% of wells analysed and this has been noted in all the districts except Bangalore Rural, Bangalore Urban, Bidar, Bijapur, Chamrajnagar, Chikballapur, Dharwad, Hassan, Kodagu, Ramanagara, Udupi, Uttar kannada Districts and in the range of 2 to 5 m bgl has been recorded in 26.24% of wells analysed and noted in almost all districts except Kolar & Udupi districts.
3. Depth to Water level of Deeper aquifer (Semi-confined/Confined) in the range of 5 to 10 m bgl has been recorded in 26.02% of wells analysed and noted in almost all districts except Kodagu & in the range of 10 to 20 m bgl has been observed in 26.24% of wells analysed and reported in all districts except Shimoga & Chikmagaluru.
4. Depth to Water level of Deeper aquifer (Semi-confined/Confined) in the range of 20 to 40 m bgl has been noted in 10.47% of wells analysed and noted in almost all districts except Chikmagalur, Dakshin Kannada, Haveri, Kodagu, Mandya, Shimoga, Udupi, Uttar kannada, Yadgir districts.
5. Depth to Water level of Deeper aquifer (Semi-confined/Confined) in the range of more than 40 m bgl has been noted in 4.63% of wells analysed and is observed as isolated patch of Bangalore Rural, Bangalore Urban, Belgaum, Bidar, Bijapur, Chamrajnagar, Chikballapur, Chitradurga, Davanagere, Gulbarga, Kolar, Tumkur districts



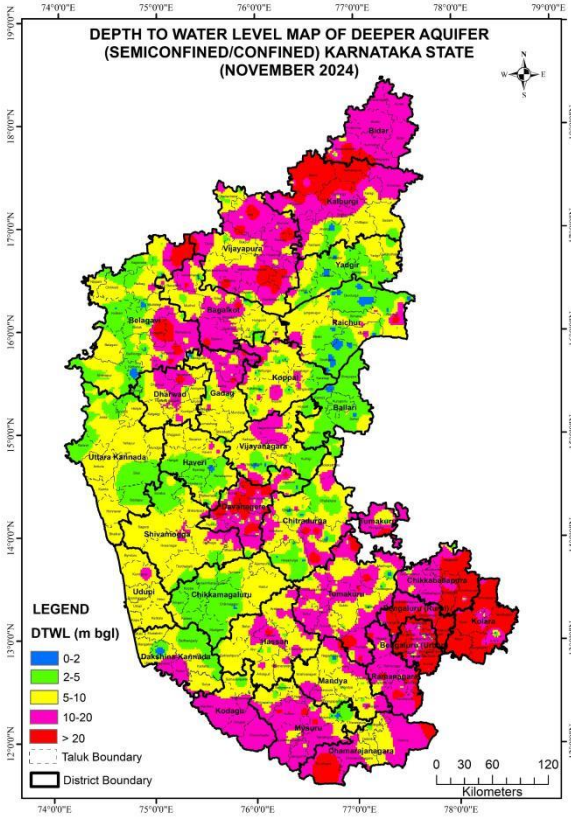
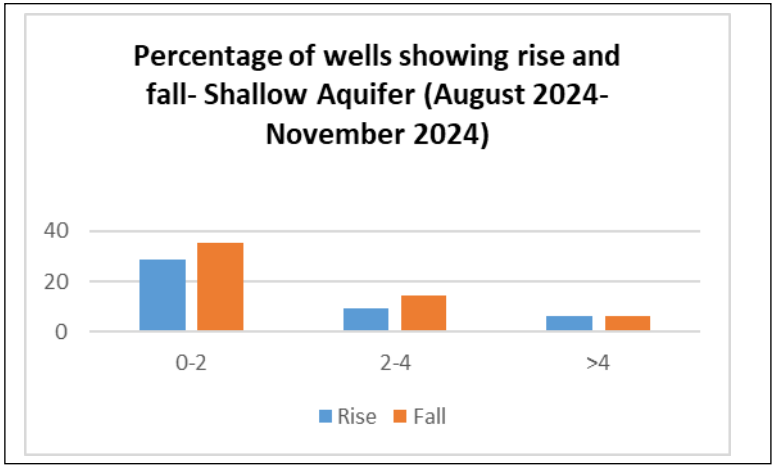


Plate II: Depth to Water Level Map of Deeper Aquifer (Semi-confined/ confined) of Karnataka State - November-2024

5. Change in seasonal water level of shallow aquifer (unconfined) - August 2024 to November 2024:

A comparison of water level shows that a rise in the water level is recorded in 44.14% of wells analyzed while 55.82% recorded fall. Fall in water level is more concentrated in the western districts surrounding the western ghats and in the eastern fringes of the north eastern districts of the state. Map showing fluctuation in water level of Shallow aquifer (Unconfined) of August 2024 with respect to November 2024 has been given in **Plate III**.

1. Rise in the water level in the range of 0-2 m has been observed in 28.67% of wells analysed and observed in all over the State.
2. Rise in the water level in the range of 2-4 m has been observed in 9.08 % of wells analysed and observed in all over the State except Bangalore Urban, Chikballapur, Udupi, Uttara Kannada Districts.
3. Rise in water level more than 4m has been observed in 6.43% of wells analysed in all over the State except Bagalkot, Bidar, Chamarajanagar, Gadag, Mandya, Raichur, Shimoga districts.
4. The fall in water level in the range of 0-2 m has been observed in 35.34% of wells analysed and noted in all the districts Chikballapur district.
5. The fall in water level in the range of 2-4 m is observed in 14.30% of wells analyzed and noted in all the districts except Bangalore Rural, Bangalore Urban, Bijapur, Chamarajanagar, Chikballapur, Chitradurga, Gadag & Kolar districts.
6. The fall in water level more than 4 m has been observed in 6.18% of wells analysed and reported in all the districts except Bangalore Rural, Bangalore Urban, Chikballapur, Chitradurga, Dharwad, Kolar districts.



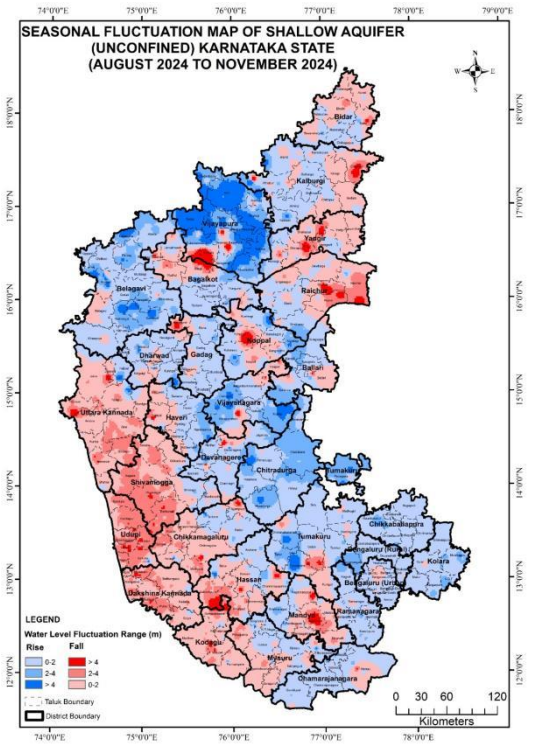
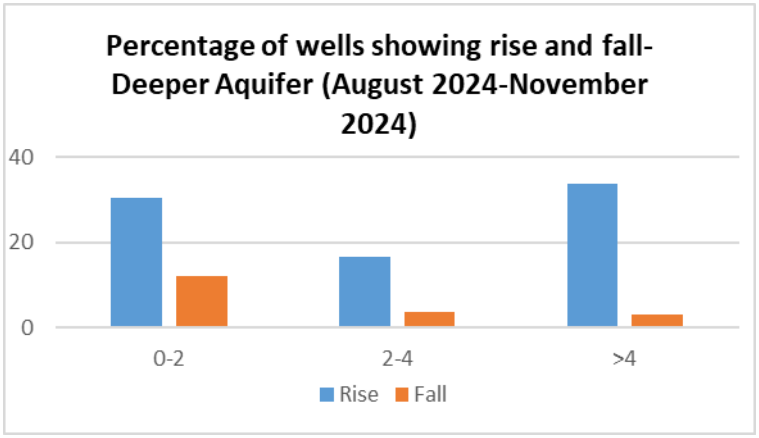


Plate III: Seasonal Fluctuation Map of Shallow Aquifer (Unconfined) of Karnataka State - August 2024 to November 2024

6. Change in seasonal water level of deeper aquifer (semi-confined/confined) - August 2024 to November 2024:

A comparison of water level of deeper aquifer shows that a rise in the water level is recorded in 81.00% of wells analysed, while 19% recorded fall. The Map showing fluctuation in water level of Deeper aquifer (Semi-confined/Confined) of November 2024 with respect to August 2024 has been plotted in **Plate IV**. A perusal of the plate shows that a general rise in the range of >4 m is noticed in major part of the area and fall in water level is found in southern districts more.

1. Rise in the water level in the range of 0-2 m has been observed in 30.50% of wells analyzed and observed in all over the District except Chikmagalur, Ramanagara, Udupi, Uttara Kannada districts.
2. Rise in the water level in the range of 2-4 m has been observed in 16.75% of wells analyzed and noted in all the districts except C.R.Nagar, Dakshin Kannada, Dharwad, Hassan, Kodagu, Mysore, Ramanagara, Shimoga, Udupi, Uttara Kannada districts.
3. Rise in water level more than 4m has been observed in 33.75% of wells analysed and noted in all the Districts except Dakshin Kannada, Kodagu, Shimoga, Udupi, Uttara Kannada districts.
4. The fall in water level in the range of 0-2 m has been observed in 12.13% of wells analyzed and noted in all the districts except Bangalore Rural, C.R.Nagar, Chamarajanagar, Davanagere, Mandya Districts.
5. The fall in water level in the range of 2-4 m has been observed in 3.75% of wells analysed and noted in all districts except Bangalore Rural, Bangalore Urban, Bellary, Chamarajanagar, Chikballapura, Chitradurga, Gadag, Gulbarga, Kolar, Mandya, Ramanagara, Shimoga, Udupi Districts.
6. The fall in water level more than 4 m has been observed in 3.13 % of wells analysed and noted in Belgaum, Bijapur, Chikballapura, Gulbarga, Hassan, Kolar, Koppal, Mandya, Mysore, Raichur, Tumkur, Uttara Kannada, Yadgir districts.



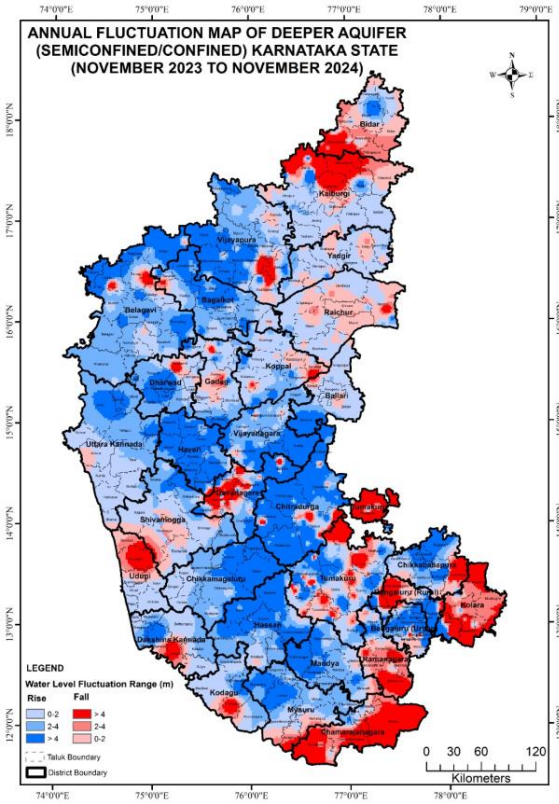
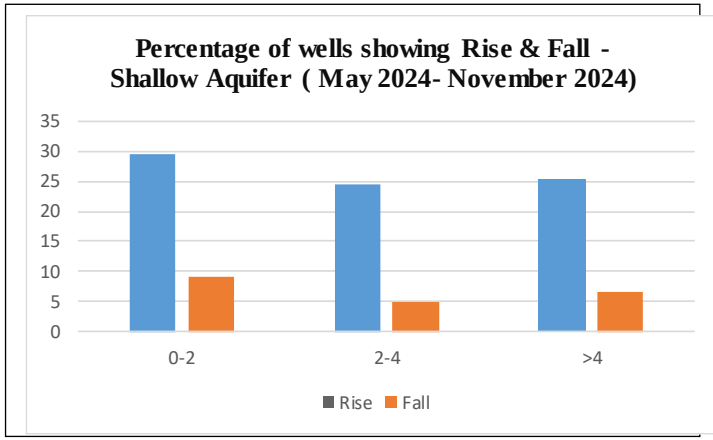


Plate IV: Seasonal Fluctuation Map of Deeper Aquifer (Semi-confined/ confined) of Karnataka State - August 2024 to November 2024

7. Change in seasonal water level of shallow aquifer (unconfined) - May 2024 to November 2024:

A comparison of water level shows that a rise in the water level is recorded in 79.36% of wells analyzed while 20.64% recorded fall. Fall in water level is more concentrated in the North -western & South Eastern districts the state. Map showing fluctuation in water level of Shallow aquifer (Unconfined) of May 2024 with respect to November 2024 has been given in **Plate V**.

1. Rise in the water level in the range of 0-2 m has been observed in 29.52% of wells analysed and observed in all over the State.
2. Rise in the water level in the range of 2-4 m has been observed in 24.48 % of wells analysed and observed in all over the State except Chikballapur District.
3. Rise in water level more than 4m has been observed in 25.36% of wells analysed in all over the State Chikballapur & Bangalore Rural districts.
4. The fall in water level in the range of 0-2 m has been observed in 9.20% of wells analysed and noted in all the districts except Chikballapur district.
5. The fall in water level in the range of 2-4 m is observed in 4.80% of wells analyzed and noted in all the districts except Bangalore Rural, Bangalore Urban, Bellary, Chamarajanagar, Chikballapur, Dharwad, Kolar, Raichur districts.
6. The fall in water level more than 4 m has been observed in 6.64% of wells analysed and reported in all the districts except Chikballapur, Chitradurga, Gadag, Kolar districts.



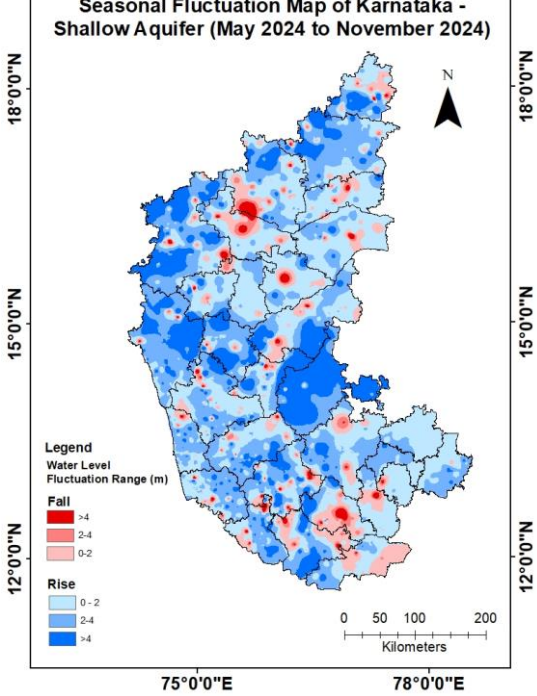
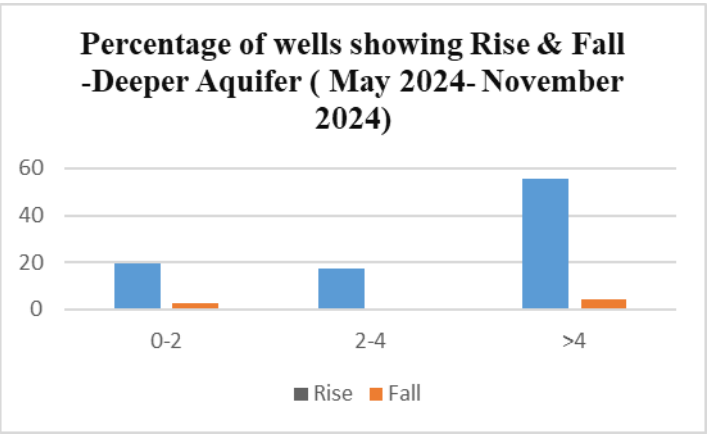


Plate V: Seasonal Fluctuation Map of Shallow Aquifer of Karnataka State - May 2024 to November 2024

8. Change in seasonal water level of deeper aquifer (semi-confined/confined) - May 2024 to November 2024:

A comparison of water level of deeper aquifer shows that a rise in the water level is recorded in 92.47.00% of wells analysed, while 7.53% recorded fall. The Map showing fluctuation in water level of Deeper aquifer (Semi-confined/Confined) of November 2024 with respect to May 2024 has been plotted in **Plate VI**. A perusal of the plate shows that a general rise in the range of >4 m is noticed in major part of the area and fall in water level is found in south-eastern districts more.

1. Rise in the water level in the range of 0-2 m has been observed in 19.59% of wells analyzed and observed in all over the District except Chamarajanagar, Dakshin Kannada, Mandya, Shimoga, Udupi districts.
2. Rise in the water level in the range of 2-4 m has been observed in 17.56% of wells analyzed and noted in all the districts except Chikmagalur district.
3. Rise in water level more than 4m has been observed in 55.32% of wells analysed and noted in all the districts of Karnataka.
4. The fall in water level in the range of 0-2 m has been observed in 2.63% of wells analyzed and noted in Bangalore Urban, Bellary, Bidar, Chitradurga, Gadag, Hassan, Haveri, Tumkur, Yadgir Districts.
5. The fall in water level in the range of 2-4 m has been observed in 0.6% of wells analysed and noted in Bijapur, Chitradurga, Yadgir districts.
6. The fall in water level more than 4 m has been observed in 4.30 % of wells analysed and noted in Bangalore Rural, Bangalore Urban, Belgaum, Bidar, Bijapur, Davanagere, Kolar, Koppal, Raichur, Ramanagara, Tumkur districts.



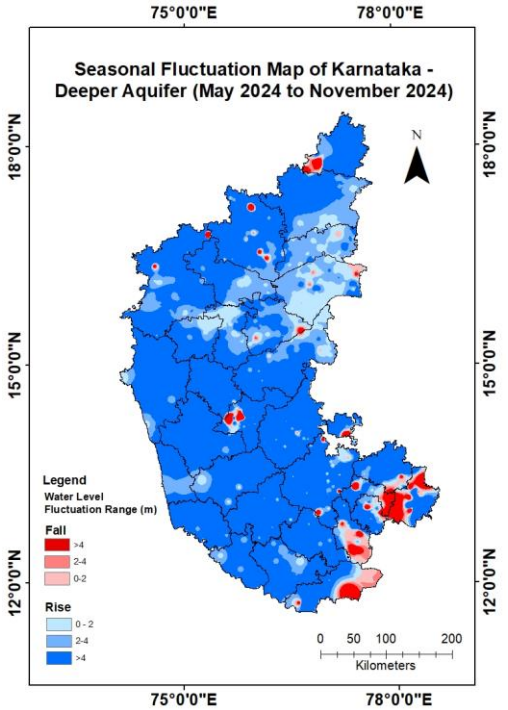
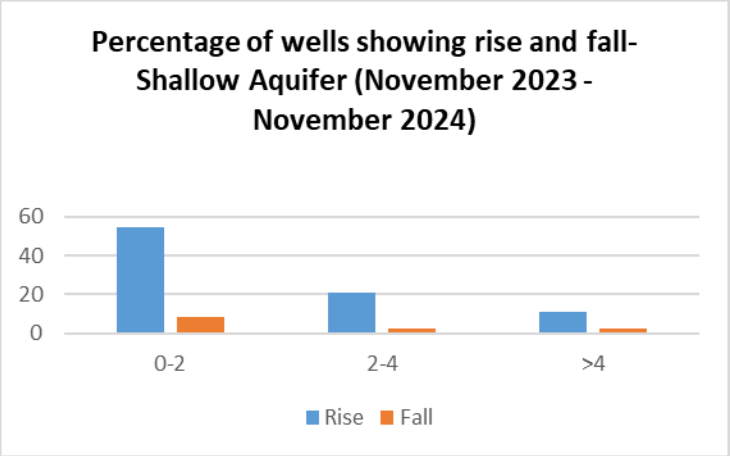


Plate VI: Seasonal Fluctuation Map of Deeper Aquifer of Karnataka State - May 2024 to November 2024

9. Change in annual water level of shallow aquifer (unconfined) - November 2023 - November 2024:

Comparison of water level of Nov 2024 with Nov 2023 shows that a rise in the water level is recorded in 86.91% of wells analysed, while 13.09% recorded fall. The Map showing fluctuation in water level of current monitoring period with November 2023 has been given in **Plate VII**. A perusal of the plate shows that a general rise in the range of 0 – 2 m is noticed in major part of the area.

1. Rise in the water level in the range of 0-2 m has been observed in 54.55% of wells analysed and observed in all over the state.
2. Rise in the water level in the range of 2-4 m has been observed in 21.10% of wells analysed and noted in all districts except Chamrajnagar district.
3. Rise in water level more than 4m has been observed in 11.26% of wells analysed and noted in all districts except Bangalore Rural, Kolar, Koppal and Gadag districts.
4. The fall in water level in the range of 0-2 m has been observed in 8.42% of wells analysed and noted in all the districts except Bellary, Chitradurga & Gadag districts.
5. The fall in water level in the range of 2-4 m has been observed in 2.59% of wells analysed and noted in all the districts except Bagalkot, Bangalore Urban, Bellary, Chikballapura, Haveri, kolar, Raichur, Ramanagara, Uttara Kannada Districts.
6. The fall in water level more than 4 m has been observed in 2.09% of wells analysed and noted in all Districts except Chikballapura, Mandya, Raichur, Shimoga districts.



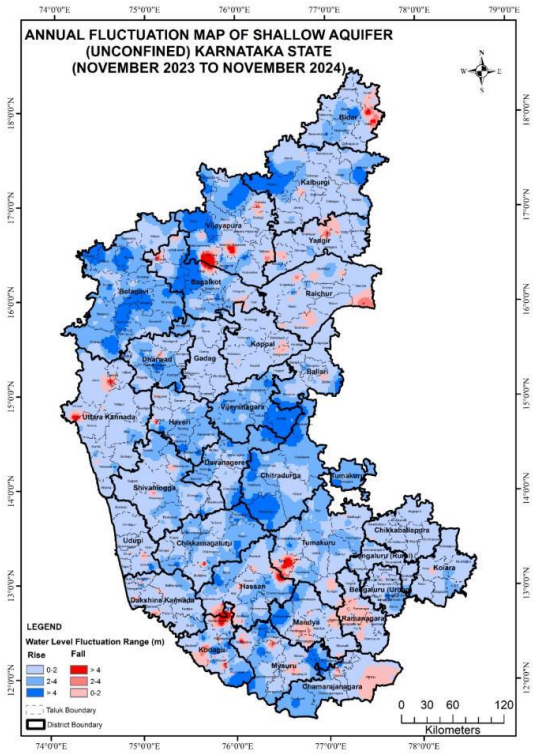
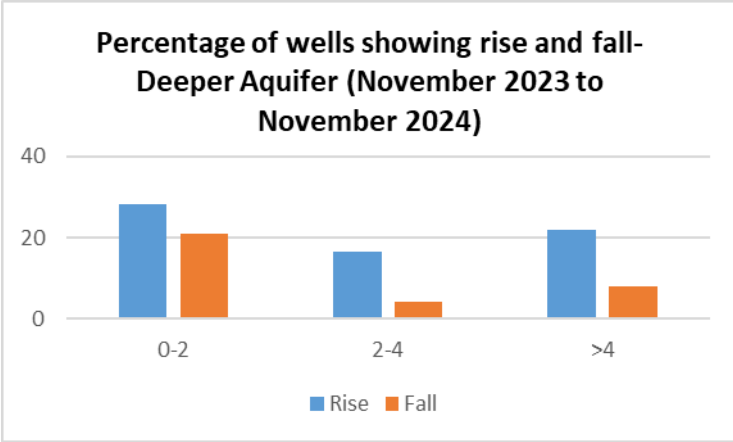


Plate VII: Annual Fluctuation Map of Shallow Aquifer (Unconfined) of Karnataka State November-2023 to November-2024

10. Change in annual water level of deeper aquifer (semi-confined/ confined) – November 2023 - November 2024:

A comparison of water level shows that a rise in the water level is recorded in 71.41% of wells analyzed, while 28.59% recorded fall. The fluctuation map of November 2024 with respect to November 2023 has been plotted in **Plate VIII**. A perusal of the plate shows that a general rise in the range of more than 0-2 m is noticed in major part of the area.

1. Rise in the water level in the range of 0-2 m has been observed in 28.33% of wells analyzed and observed in all over the District except Kolar and Chamrajnagar districts.
2. Rise in the water level in the range of 2-4 m has been observed in 16.21% of wells analyzed and noted in all districts except Bidar, Chikballapura, Udupi and Ramanagara Districts.
3. Rise in water level more than 4m has been observed in 26.88% of wells analysed and noted in all districts except Chikballapura, Raichur, Ramanagara, Shivamogga and Udupi districts.
4. The fall in water level in the range of 0-2 m has been observed in 10.8% of wells analysed and reported in all the districts except Chamrajnagar, Chikballapur, Chikmagalur, Dakshin Kannada, Mysore, Raichur, Shimoga & Udupi districts.
5. The fall in water level in the range of 2-4 m has been observed in 5.01% of wells analysed and and noted in Bangalore Rural, Belgaum, Bidar, C.R.Nagar, Chikballapur, Chitradurga, Dakshin Kannada, Davanagere, Gadag, Gulbarga, Kolar, Koppal, Raichur, Tumkur & Yadgir Districts.
6. The fall in water level more than 4 m has been observed in 12.78% of wells analysed and noted in all districts except Chikballapur, Chikmagalur, Hassan, Haveri, Mandya, Mysore, Shimoga& Uttara Kannada districts.



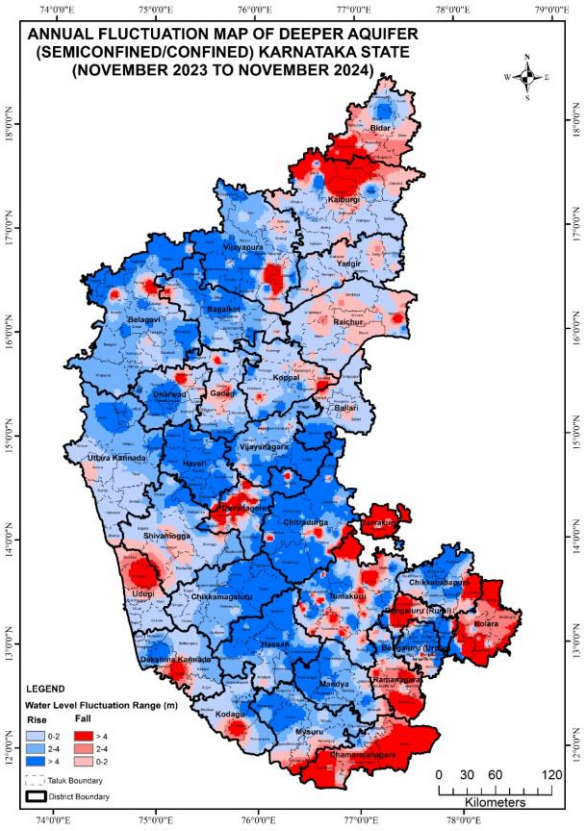
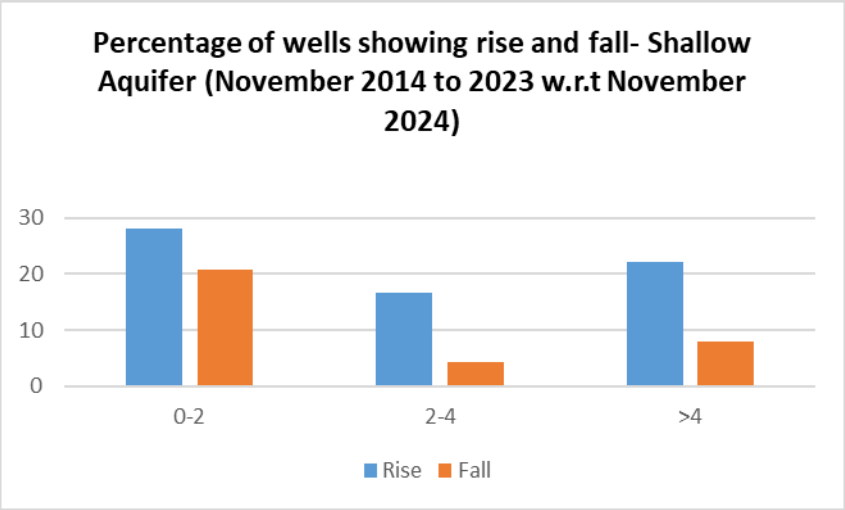


Plate VIII: Annual Fluctuation Map of Deeper Aquifer (Semi-confined/confined) of Karnataka State - November-2023 to November 2024

11. Decadal water level fluctuation of Shallow Aquifer (Unconfined) - Decadal mean November 2014-2023 & November 2024 of Karnataka State:

The fluctuation in water level has been plotted in **Plate IX**. A comparison of water level shows that a rise in the water level is recorded in 71.08% of wells analysed, while 28.92% recorded fall. Salient features of the comparison of water levels are given below.

1. Rise in the water level in the range of 0-2 m has been observed in 53.69% of wells analysed, noted all over the State.
2. Rise in the water level more than 2-4 m has been observed in 12.52% of wells analysed, noted all over the State.
3. Rise in the water level more than 4 m has been observed in 4.86% of wells analysed and noted in all over the State except Bagalkot, Bangalore Rural, Bellary, Chikballapur, Chikmagalur, Kolar, Koppal, Shimoga, Uttar Kannada, Yadgir district.
4. The fall in water level in the range of 0-2 m has been observed in 22.25% of wells analysed and noted in all over the state except Chikballpur & Dharwad districts.
5. The fall in water level in the range of 2-4 m has been observed in 3.96% of wells analysed and noted in Bagalkot, Bangalore Rural, Bijapur, Chamarajanagar, Chikmagalur, Dakshin Kannada, Davanagere, Dharwad, Hassan, Kodagu, Koppal, Mandya, Mysore, Raichur Shimoga, Udupi, Uttara Kannada Yadgir districts.
6. The fall in water level more than 4 m has been observed in 2.70% of wells analysed and noted in Bagalkot, Belgaum, Bidar, Bijapur, Chikballapur, Dakshin Kannada, Gulbarga, Hassan, Haveri, Kodagu, Mandya, Mysore, Raichur, Tumkur, Udupi, Uttara Kannada, Yadgir districts.



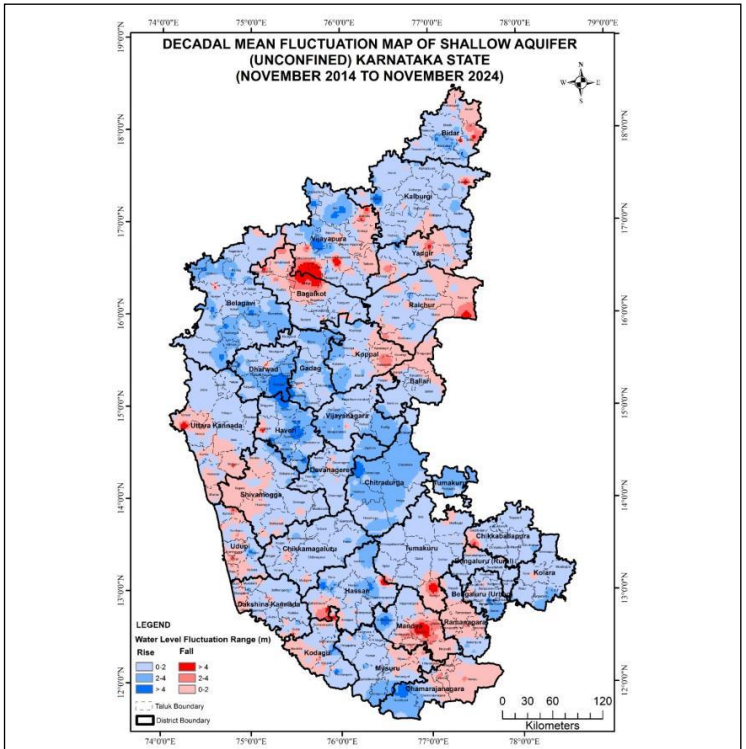


Plate IX: Decadal Mean Fluctuation Map of Shallow Aquifer (Unconfined) of Karnataka State - Nov-2014-23 to Nov 2024

12. Decadal mean water levels of deeper aquifer (semi-confined/confined) for the period – November 2014-2023 & November 2024:

The fluctuation in water level has been plotted in **Plate X**. A comparison of water level shows that a rise in the water level is recorded in 66.87% of wells analysed, while 33.13% recorded fall.

1. Rise in the water level in the range of 0-2 m has been observed in 28.22% of wells analysed, noted all over the State except Bidar, Dharwad, Haveri & Udupi districts.

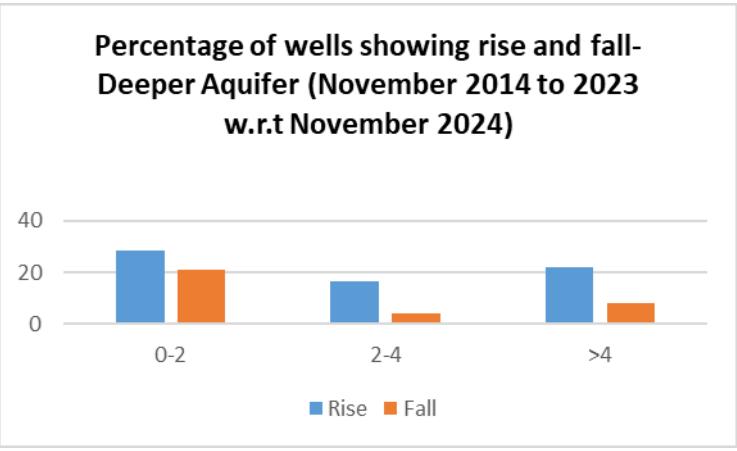
2. Rise in the water level more than 2-4 m has been observed in 16.56% of wells analysed, noted in Bangalore Rural, Belgaum, Chamrajnagar, Chikballapur, Chikmagalur,Dakshin Kannada, Davanagere, Hassan, Kodagu, Kolar, Mysore, Shimoga & Tumkur districts.

3. Rise in the water level more than 4 m has been observed in 22.09% of wells analysed and noted in all over the state except Bidar, Chikmagalur, Chitradurga, Dharwad, Gadag, Gulbarga, Kodagu, Mysore, Raichur, Shimoga, Udupi & Uttarkannada districts.

4. The fall in water level in the range of 0-2 m has been observed in 20.86% of wells analysed and noted in all over the state except Bellary, Chamrajnagara, Chikballapur, Chitradurga, Davanagere,Gadag, Haveri, Kolar, Koppal, Shimoga, Tumkur, Udupi districts.

5. The fall in water level in the range of 2-4 m has been observed in 4.29% of wells analysed and noted in Bangalore Urban, Bidar, Gadag, Gulbarga, Haveri districts.

6. The fall in water level more than 4 m has been observed in 7.98% of wells analysed and noted in Bagalkot, Bangalore Urban, Bangalore Rural, Bijapur, Kolar, Tumkur, Udupi districts.



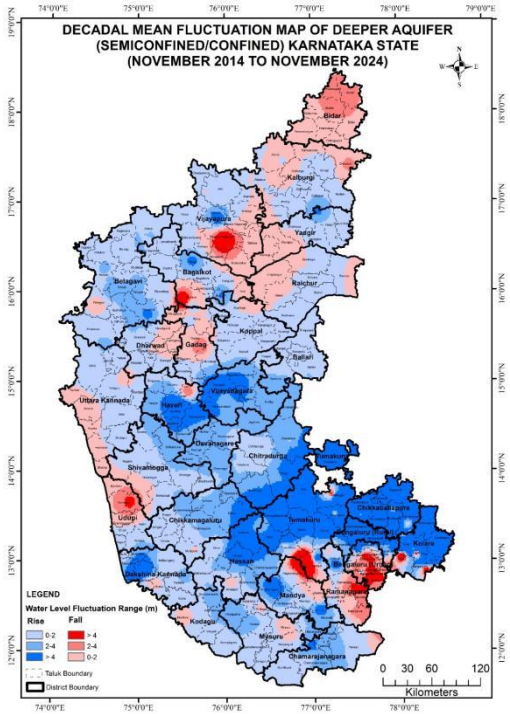


Plate X: Decadal Mean Fluctuation Map of Deeper Aquifer (Unconfined) of Karnataka State - Nov-2014-23 to Nov 2024

13. Conclusions:

The behavior of ground water table during November 2024 in Karnataka State has been studied by analyzing the water level of the dug wells and bore/tube wells. The data on water levels was analyzed in detail and salient features are as under.

1. The depth to water level of shallow aquifer over major part of the State lies within 10 m bgl in 95.84 % of wells analysed, while 4.16 % of wells show depth to water level more than 10 m bgl.
2. In case of deeper aquifer (Semi-confined/Confined) 62.3% of wells have recorded depth to Water level within 10 m bgl and 37.7% of wells show depth to Water level of Deeper aquifer (Semi-confined) in more than 10 m bgl.
3. Comparison of November 2024 shallow aquifer water level with August 2024 indicates rise in 44.14 % of the analyzed wells and fall in 55.82% of wells.
4. Comparison of water level of deeper aquifer (Semi-confined/Confined) of November 2024 with August 2024 indicated rise in 81% of wells analyzed and fall in 19% of wells analyzed.
5. 86.91% of wells have recorded rise in annual fluctuation (Nov 2023- Nov 2024) and 13.09% of wells have recorded fall in water levels of Shallow aquifer (Unconfined).
6. 71.41 of wells have recorded rise in annual fluctuation in water levels of Deeper aquifer (Semi-confined/Confined) and 28.59% of wells have recorded fall in annual fluctuation in water levels during Nov 2023- Nov 2024.
7. 71.08% of wells have recorded rise in water levels and 28.92% of wells recorded fall in water levels of Shallow aquifer (Unconfined) during August 2024 in comparison to decadal mean Nov 2014-23 to Nov 2024
8. 66.87% of wells have recorded rise in water levels and 33.13% of wells recorded fall in water levels of Deeper aquifer (Semi-confined/Confined) during Nov 2024 in comparison to decadal mean Nov 2014-23 to Nov 2024.

14. SUMMARY

During the period (September to November 2024), the State. had received an total rainfall of 348 mm, which is 0.4 percent more than the normal of 347 mm. Rainfall was deficit in 9 district, Excess in 8 district and normal in 15 districts. In Karnataka state 86.91% of wells have recorded rise in annual fluctuation (Nov 2023- Nov 2024) and 13.09% of wells have recorded fall in water levels of Shallow aquifer (Unconfined).71.41 of wells have recorded rise in annual fluctuation in water levels of Deeper aquifer (Semi-confined/Confined) and 28.59% of wells have recorded fall in annual fluctuation in water levels during Nov 2023- Nov 2024. From May to November 2024, Shallow aquifer showed rise in 79.36% of wells & deeper aquifer showed rise in 92.47 % of wells.

15. RECOMMENDATIONS

- In order to enhance the groundwater scenario of Karnataka state utmost effort should be made to harvest the rainwater received during monsoon days and use it for artificial recharge. Periodic maintenance of the structures is also recommended to maintain the efficiency of the structure. Abandoned bore wells/dug well can be used to recharge the aquifer utilizing the surplus surface runoff available during rainy days. Master plan for artificial recharge of Karnataka as well as NAQUIM reports of CGWB help in selecting sites for artificial recharge structures.

- Point recharge structures are recommended to recharge deeper aquifers.

- Efficient micro irrigation practices can save upto 40% of water.

- Use of Grey water after treatment, opting for water efficient fixtures and low flow plumbing fixtures reduce the stress on groundwater. Low flow technology is normally used in faucets, aerator, shower heads and toilets.