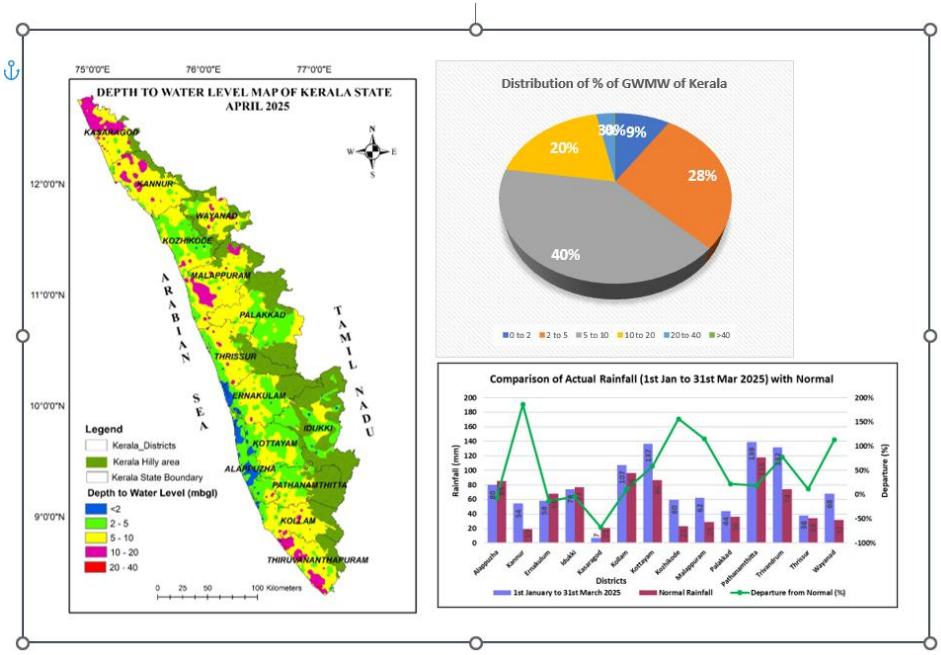

GROUND WATER LEVEL BULLETIN

APRIL 2025/KERALA STATE

ABSTRACT

The behavior of ground water table during the Pre-monsoon period (April-2025) in Kerala State has been studied by monitoring Board's groundwater monitoring dug wells and purpose-built piezometers. As of April 2025, Central Ground Water Board, Kerala Region, monitors 1379 dug wells and 271 piezometers to study the ground water scenario of Kerala State.

The State has received normal rainfall from January 2025 to March 2025, with a departure of +33% from the normal, however, with spatial variation especially in southern and northern districts of the State. During the period of study, the depth to water levels of phreatic aquifers of the State varies within 10 m bgl in most of the parts in the State (86% of the GWMS), while remaining 15 % of wells show depth to water level more than 10 m bgl.

Annual depth to water level of phreatic aquifer during April 2024 and 2025 indicates that, 74% of analyzed wells shows rise in water level and 26 % fall in water levels. The comparison between April decadal mean with respect to April 2024 shows that 73% of wells in rising and 27 % of wells in falling trend.

In confined/semi-confined aquifers, annual fluctuation of piezometric head shows rising trend in 81% of the analyzed wells and the rest shows falling trend. Similarly, the long-term fluctuation in piezometric head of confined/semi-confined aquifers indicates that 69% of the wells show rise in head, while the remaining wells show a rise in head.

CGWB, KERALA REGION, THIRUVANANTHAPURAM

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 meteorological parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include extraction 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 Ground Water Board. A network of 25437 observation wells called **National Hydrograph Network Stations (NHNS)**, as on 30.04.2025, located all over the country is being monitored.

2.0 STUDY AREA

Kerala State is a narrow stretch of land lies between North latitudes $08^0 18'$ and $12^0 48'$ and East longitudes $74^0 52'$ and $77^0 22'$ covering an area of 38863 sq.km, which is bordered by the Lakshadweep Sea on the western side and Tamil Nadu and Karnataka States on the eastern side. The length of the State from north to south is 560 km and the average width is 70 km, with a maximum of 125 km.

Due to urbanization and industrialization, the stress on groundwater has increased over the past few years, which resulted in declining water levels and contamination of groundwater at many places. Changes in rainfall pattern in recent years and the increased utilization of ground water have raised concern among the public on water being a scarce commodity in future.

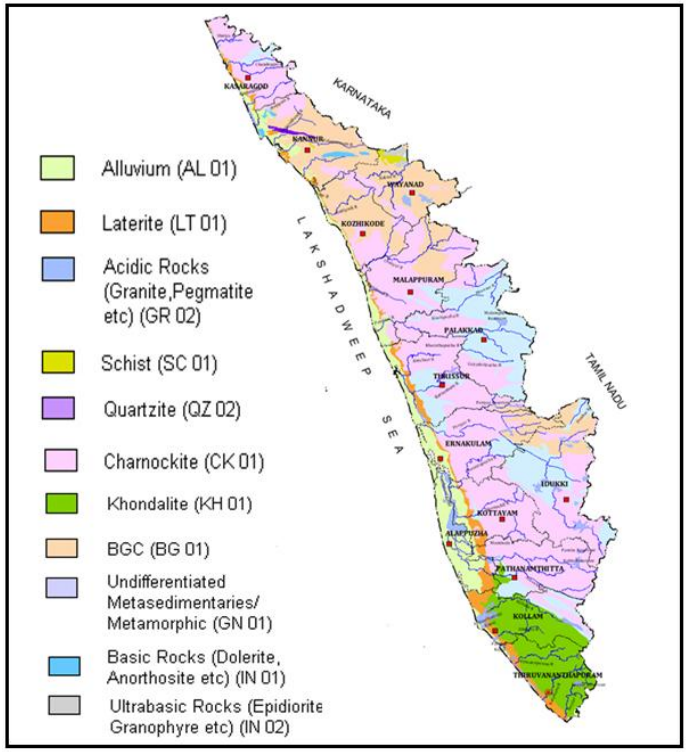

Figure-1: Map showing major aquifers and administrative divisions of Kerala

Physiographically, the State of Kerala is divided into three major units viz. the lowland, the midland and the high land. The lowlands are those areas where the elevation is less than 7 m above mean sea level (amsl) whereas the elevation of the midland ranges from 7 to 76 m amsl and that of the highland is more than 76 m amsl. Along the highlands there are two distinct plateau regions - Wayanad plateau and the Munnar plateau.

Geologically 88% of the State is underlined by crystalline rocks of Archaean age, which is a part of the peninsular shield. The crystalline complex of Kerala is composed of charnockites, gneisses, schists, migmatites and rocks of the Wayanad supracrustals.

Along the western part of the State, the crystalline rocks are topped by the sedimentary formations of Palaeogene, Neogene Periods and alluvial formations of Quaternary to Recent periods. The Palaeogene and Neogene sequence has been divided into four beds viz. Alleppey, Vaikom, Quilon and Warkali, with age ranging from Eocene to Lower Miocene. Laterites of Sub-Recent age derived from the crystalline as well as sedimentary formations, are seen all along the midlands. Along the coastal plains, the sedimentary formations and laterites are overlined by the Recent Alluvium deposits.

3.0 GROUND WATER LEVEL MONITORING

In order to assess the real situation of ground water conditions, it is very essential to monitor the groundwater level and water quality over time and space. Central Ground Water Board has established 1650 Ground Water Monitoring Wells (GWMW) throughout Kerala State for monitoring seasonal ground water level. Water level is being monitored four times a year during January, April, August and November months and water quality is being monitored from the water samples collected from optimized GWMW during April. The total number of GWMW as on 31.03.2025 is 1650. Out of these, 1379 are dug wells representing phreatic aquifers and 271 are bore wells/tube wells representing deeper aquifers of confined / semi-confined nature. These GWMW are spread over all the physiographic divisions of the State. The district-wise breakup of the water level monitoring stations is given in **Table-1**.

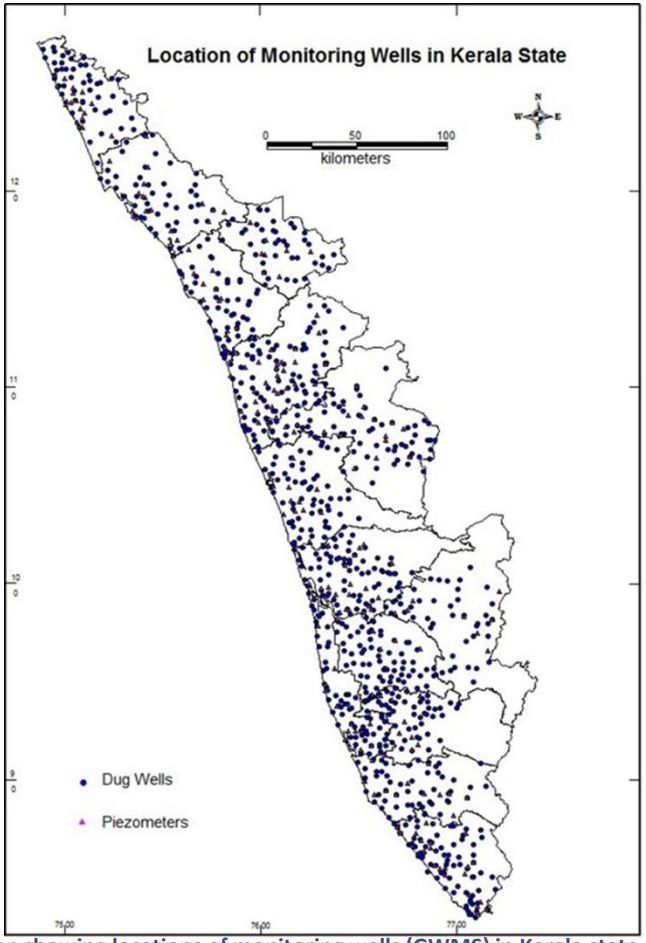

Figure- 2: Map showing locations of monitoring wells (GWMS) in Kerala state

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

SR. No.	District	Number of Water Level Monitoring Stations				
		2023	2024	2025		
		Total	Total	DW	PZ	Total
1	Alappuzha	93	93	79	15	94
2	Ernakulam	143	143	122	23	145
3	Idukki	76	80	71	9	80
4	Kannur	112	116	105	32	137
5	Kasaragod	127	139	98	17	115
6	Kollam	120	127	97	8	105
7	Kottayam	102	105	114	11	125
8	Kozhikode	103	110	81	23	104
9	Malappuram	146	146	116	31	147
10	Palakkad	157	163	118	41	159
11	Pathanamthitta	92	95	85	11	96
12	Thiruvananthapuram	125	128	106	23	129
13	Thrissur	131	129	111	18	129
15	Wayanad	83	85	76	**9**	85
14	**Total**	**1610**	**1659**	**1379**	**271**	**1650**

4.0 RAIN FALL

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 January – March 2025. Table-2 gives the district-wise rainfall data for the period January – March 2024 & 2025, normal and the departure of January – March 2025 rainfall with other periods.

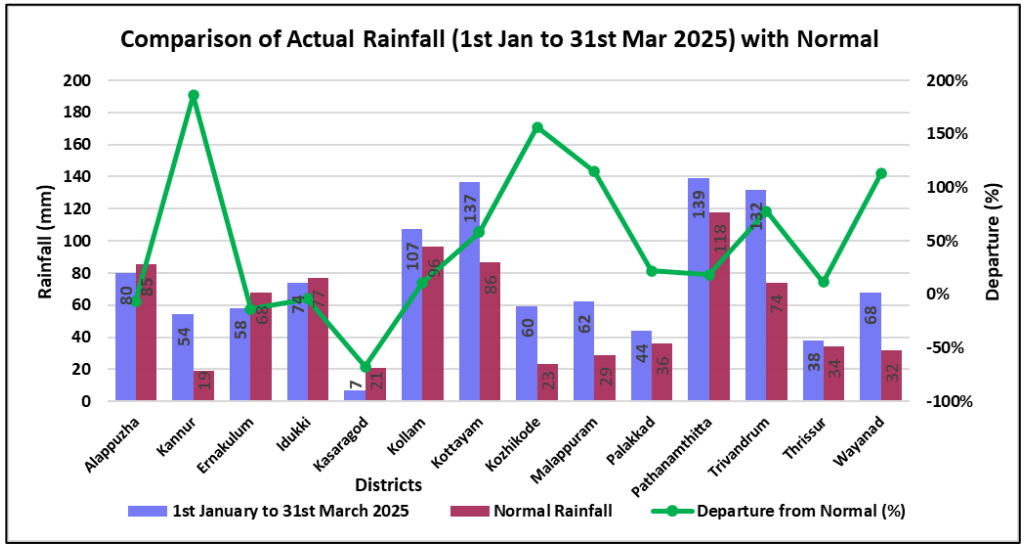

Figure-3: Rainfall deviation (January 2024-March 2024) from normal rainfall

Table-2: District wise variability of rainfall in Kerala (2024-2025)

	Rainfall (mm)		Normal Rainfall (mm)	Departure from 2024 (%)	Departure from Normal (%)	Category
	Jan to Mar 2025	Jan to Mar 2024				
Alappuzha	79.8	62.4	85.2	28%	-6%	Normal
Kannur	54.1	73.5	18.9	-26%	186%	Large Excess
Ernakulam	58.2	129.9	67.5	-55%	-14%	Normal
Idukki	74	97.7	77	-24%	-4%	Normal
Kasaragod	6.7	48.8	20.7	-86%	-68%	Large Deficient
Kollam	107.1	49.4	96.4	117%	11%	Normal
Kottayam	136.5	127.0	86.4	7%	58%	Excess
Kozhikode	59.5	75.6	23.2	-21%	156%	Large Excess
Malappuram	62.1	31.0	28.9	100%	115%	Large Excess
Palakkad	43.9	36.7	36	20%	22%	Excess
Pathanamthitta	139.3	79.0	117.8	76%	18%	Normal
Trivandrum	131.7	53.2	74.1	148%	78%	Large Excess
Thrissur	38.2	90.5	34.2	-58%	12%	Normal
Wayanad	67.5	43.1	31.7	57%	113%	Large Excess
State Mean	75.6	71.3	57.0	**6%**	**33%**	**Excess**

5.0 GROUND WATER LEVEL SCENARIO (APRIL 2025)

5.1 SHALLOW AQUIFER (UNCONFINED)

5.1.1 DEPTH TO WATER LEVEL

Depth to Water Level in Unconfined Aquifer (April 2025)

The depth to water level of 1329 wells is used for the analysis. 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 85.5 % of wells analyzed, whereas, 14.5 % of wells show depth to water level more than 10 m bgl. During the month of April 2025, the depth to water level of phreatic aquifer in the State varied from 0 to 16.81 mbgl with median of 5.74 m bgl. The outliers of 6 data points have values ranging from 22.91 to 43.39 respectively falling in the phreatic zones of Neogene sedimentary sequence along the western margin of Thiruvananthapuram district. Shallow water level in the range of 0 to 2 mbgl is observed mostly in parts of Alappuzha, Ernakulam and Thrissur districts and isolated patches of Idukki and Kottayam districts. 10 % of the analyzed wells are having depth to water level less than 2 mbgl. Water level in the range of 2 to 5 mbgl and 5 to 10 m bgl are observed for 32.5 % and 43% of the analyzed wells respectively in the State. It is to be noted that major part of the State shows depth to water level in the range of 2 to 10 m bgl, During April-2025. Water level in the range of 10 to 20 mbgl is recorded for about 14 % of the analyzed wells, and mostly belongs to Kasaragod, Malappuram, Kollam, Thiruvananthapuram districts and in isolated patches of Kannur, Wayanad, Kozhikode, Thrissur and Pathanamthitta districts. As mentioned earlier, deeper water levels more than 20 m bgl are observed in only 0.5% wells, most of them restricted to the western margin of Thiruvananthapuram district.

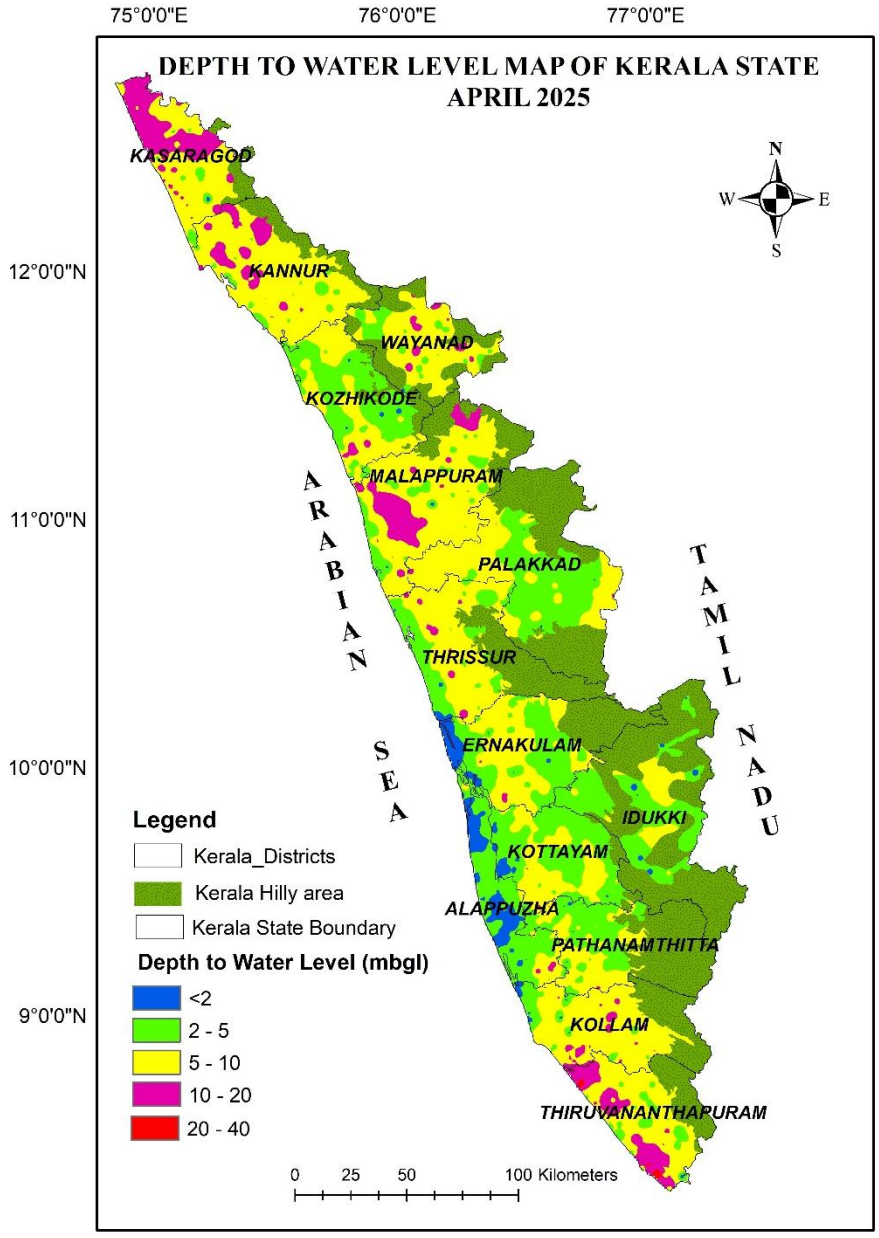

Figure-4: Depth to water Level in phreatic aquifer in Kerala during April 2025

5.1.2 ANNUAL FLUCTUATION IN WATER LEVEL

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

Out of a total of 1112 wells analyzed, 65% of wells (728 wells) show rise in water level and 35% of wells (384 wells) show fall in water level**.**

Rise in Water Levels:

Out of 728 wells that have registered rise in water level, water level rise of less than 2 m is recorded in 93% wells,2 to 4 m in 6% wells and >4m is observed in 1% wells. Water level rise of less than 2 m is seen in all the districts. Water level rise of 2 to 4 m is observed in almost all districts except Kottayam and Idukki districts. Rise of more than 4 m is observed in a very few wells located in Malappuram and Thiruvananthapuram districts.

Fall in Water Levels:

Out of 264 wells that have registered fall in water levels, 94% have recorded less than 2 m, 5% in the range of 2 to 4 and 1% has recorded fall >4 m. Fall of less than 2 m observed in parts of Thiruvananthapuram, Kollam, Alappuzha, Kottayam, Ernakulam, Malappuram, Wayanad, Kannur and Kasaragod districts and observed in Palakkad, Thrissur, and Pathanamthitta districts. Fall of 2 to 4 m is observed mainly in Thiruvananthapuram, Kottayam, Ernakulam, Malappuram, Kannur and Kasaragod districts. Fall of beyond 4 m is observed in isolated patches in Kannur, Wayanad, Malappuram, and Thiruvananthapuram districts

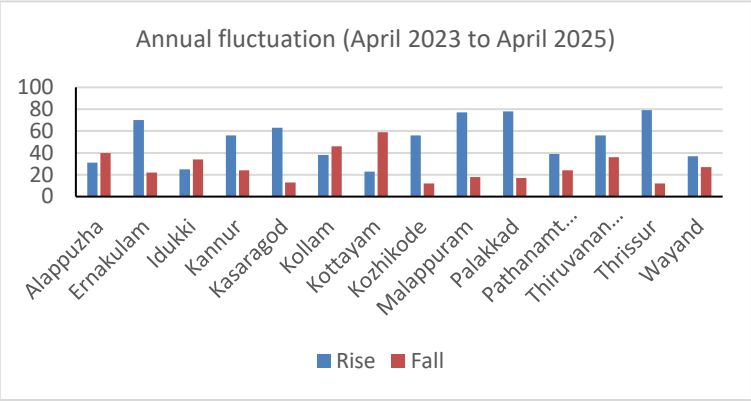

Figure-5: Percentage of wells showing rise and fall in WL in unconfined aquifer(April 2023 to April 2025)

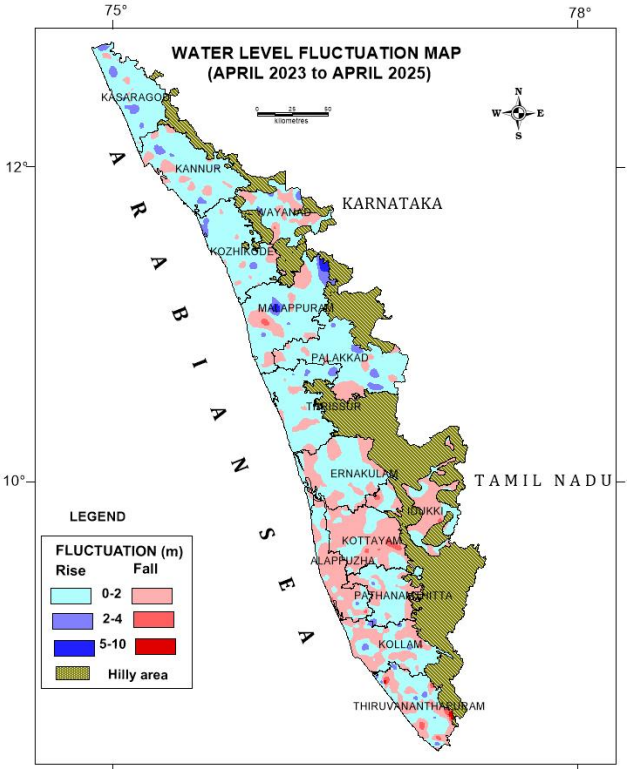

Figure-6: Annual water level fluctuation in unconfined aquifer (April 2023 to April 2025)

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

Out of a total of 996 wells analyzed, 74% of wells (732 wells) show rise in water level and 26% of wells (264 wells) show fall in water level**.**

Rise in Water Levels:

Out of 732 wells that have registered rise in water level, water level rise of less than 2 m is recorded in 88% wells, 2 to 4 m in 10% wells and >4m is observed in 2% wells. Water level rise of less than 2 m is seen in all the districts. Water level rise of 2 to 4 m is observed in Kannur and Idukki districts. Rise of more than 4 m is observed in a very few wells located in Kollam, Alappuzha, Thrissur and Kozhikode districts.

Fall in Water Levels:

Out of 264 wells that have registered fall in water levels, 88% have recorded less than 2 m, 10% in the range of 2 to 4 and 2% has recorded fall >4 m. Fall of less than 2 m observed in parts of Thiruvananthapuram, Kollam, Alappuzha, Kottayam, Ernakulam, Malappuram, Wayanad, Kannur and Kasaragod districts and observed in Palakkad, Thrissur, and Pathanamthitta districts. Fall of 2 to 4 m is observed mainly in Thiruvananthapuram, Kottayam, Ernakulam, Malappuram, Kannur and Kasaragod districts. Fall of beyond 4 m is observed in isolated patches in Kannur, Wayanad, Malappuram, and Thiruvananthapuram districts

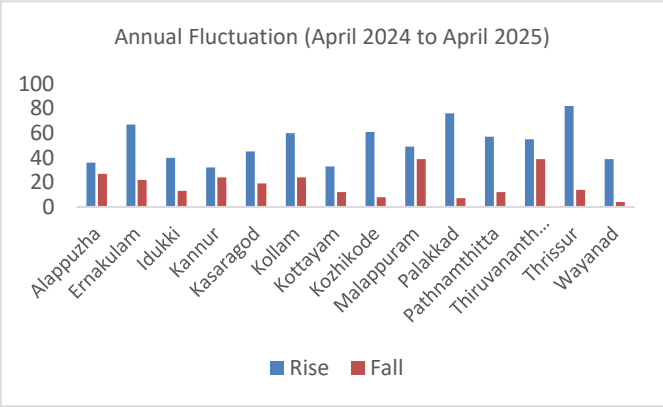

Figure-7: Percentage of wells showing rise and fall in WL in unconfined aquifer(April 2024 to April 2025)

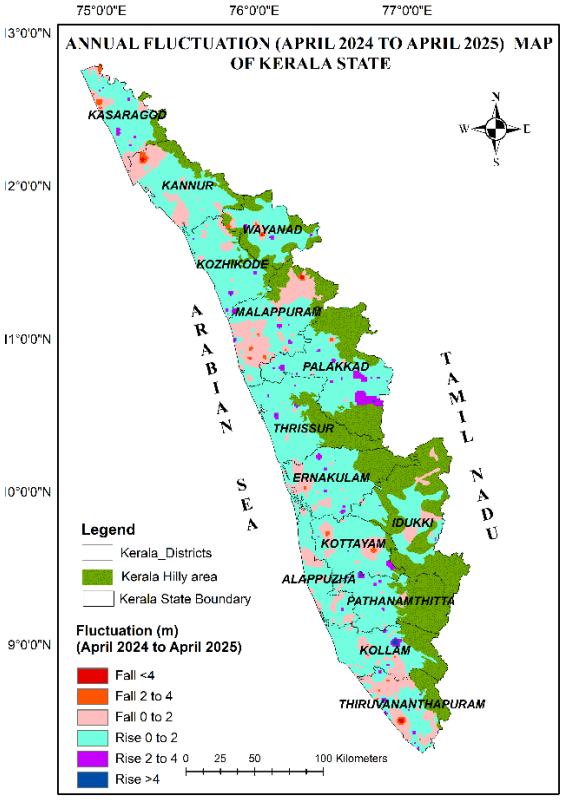

Figure-8: Annual water level fluctuation in unconfined aquifer (April 2024 to April 2025)

5.1.3 DECADAL FLUCTUATION IN WATER LEVEL

Decadal Fluctuation of Water Level in Unconfined Aquifer(Decadal Mean April (2015-2024) to April 2025)

Out of a total of 1061 wells analyzed, 73% of wells (774 wells) show rise in water level and 27% of wells (287 wells) show fall in water level**.**

Rise in Water Levels:

Out of 774 wells, water level rise of less than 2 m is recorded in 91% of wells,2 to 4 m in remaining 7% wells and >4 m in 2% of wells. Water level rise of less than 2 m is seen in all the districts. Water level rise of 2 to 4 m is observed in some wells located in Kasaragod, Kozhikode, Kannur, Wayanad, Palakkad, Thrissur, Ernakulam districts.

Fall in Water Levels:

Out of the 287 wells that have registered fall in water levels,91% wells have recorded less than 2 m fall while 7% in the range of 2 to 4 m and only 2% wells show fall more than 4 m. Fall of less than 2 m is observed prominently in parts of all Kannur, Wayanad, Malappuram, Ernakulam, Idukki, Alappuzha, Kollam district and in isolated patches in all districts. Fall of 2 to 4 m, recorded in Kannur, Ernakulam, Kozhikode, Malappuram, Thiruvananthapuram districts. Fall beyond 4 m is recorded in wells located in Ernakulam, Palakkad, Malappuram, Wayanad and Kasaragod districts Thiruvananthapuram district.

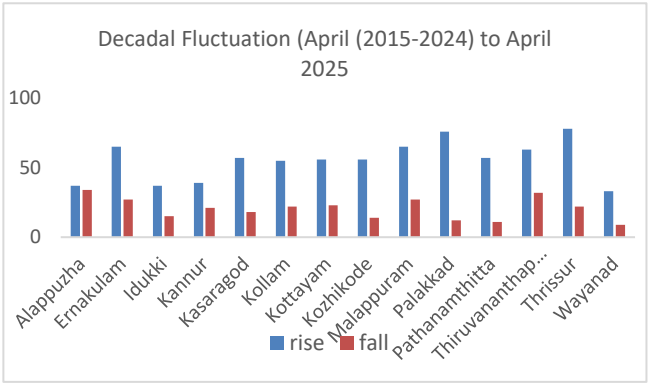

Figure-9: Percentage of wells showing rise and fall in WL in unconfined Aquifer(Decadal Mean April (2015-2024) to April 2025)

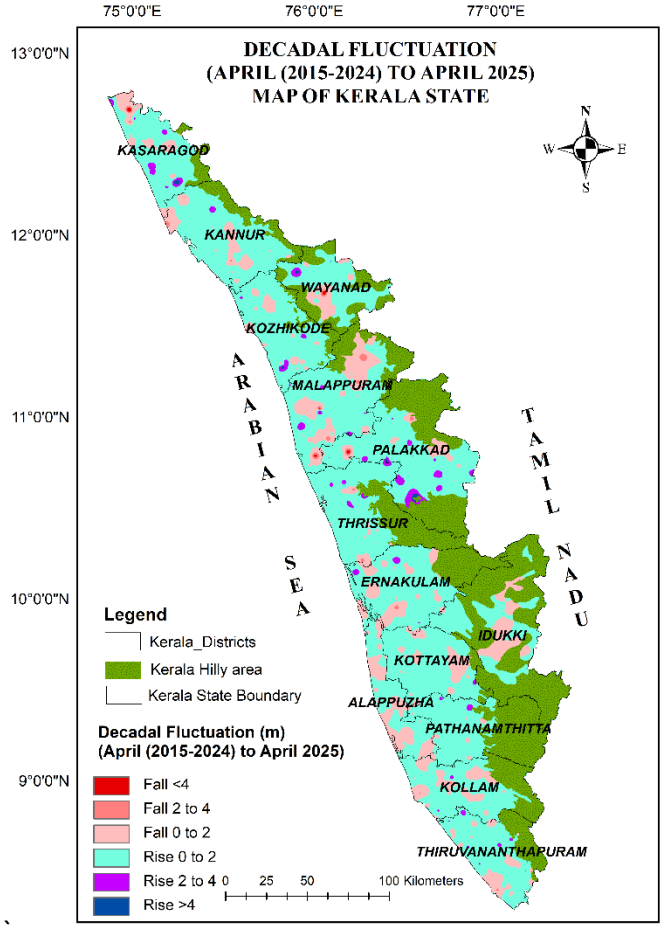

Figure-10: Water level fluctuation with respect to decadal mean (April (2015-2024) to April 2025)

6.0 SUMMARY

As a vertical of the National Ground Water Monitoring Programme, the CGWB, Kerala Region, Thiruvananthapuram carries out monitoring of the ground water conditions of the State four times in a year: viz January, April, August, and November. Additionally, yearly assessment ofground water quality is performed in April month. As of April, 2025, the Region monitors 1379 dug wells and 271 piezometers. This comprehensive effort aims to portray the variations in the state's ground water conditions across different aquifers.

In April 2025, out of the 1329 dug wells monitored representing unconfined aquifer, depth to water level is within 10 m bgl in most of the parts in the State with 86%, while remaining 15 % of wells show depth to water level more than 10 m bgl.

The State has received normal rainfall from January 2025 to March 2025. with a departure of +33% from the normal. However, the rainfall pattern varies spatially such that Kasaragod district has received significantly less rainfall than the normal, whereas the Wayanad, Trivandrum, Kannur districts are classified as rainfall 'Large Excess' and Kottayam, Palakkad are classified as "Excess". This spatial variation in rainfall distribution is obviously reflected in groundwater scenario of the State.

Comparison of depth to water level between April 2023 and 2025 indicates that 65% of analyzed wells shows rise in water level and 35 % fall in water levels.

Comparison of depth to water level between April 2024 and 2025 indicates that 74 % of analyzed wells shows rise in water level and 26 % fall in water levels. The comparison between April decadal mean with respect to April 2025 shows a rising trend in 73% of wells and a falling trend in 27 % of wells.

7.0 RECOMMENDATIONS

Based on the findings, wherever declining trend in groundwater levels are observed the following recommendations are made to improve the groundwater conditions of Kerala:

1. **Promotion of Water Conservation/Recharge Techniques**: As the State is having variation in rainfall distribution water conservation techniques need to be adopted particularly in districts like Thiruvananthapuram, which has received deficient rainfall and have deeper water levels. Encouraging natural groundwater recharge techniques, such as improving vegetative cover and increasing the greenbelt areas, would help mitigate falling water levels. The urban areas are often facing shortage of water during the lean period. Care should be given to reduce the usage of ground water or have to increase the groundwater availability through artificial recharge methods or reducing the demand through water efficient techniques to bridge the gap between draft and availability. While constructing artificial recharge structures higher priority must be given to shallow valley fills, slightly dissected plateau and pediment area. The immediate measures that can be adopted to provide quality drinking water during water scarce summer months include identification and regular maintenance of perennial ponds or tanks, and augmentation of water resource in the phreatic aquifer.

2. **Dug well recharge through rain water harvesting:** Open dug wells are the major ground water abstraction structure in the region and the region receives sufficient rainfall in both south-west and North-east monsoon. Hence dug well recharge through Roof Top Rain water harvesting is the most economical way to tackle the water scarcity during summer. It is recommended to promote the use of the domestic wells in the water scarce area as recharge wells for the rainwater harvested from their roof tops and the filter medium must be cleaned yearly before the onset of the monsoon. This practice will improve the ground water availability as well as the sustainability of the wells

3. **Rainfall and Groundwater Correlation Studies**: The variation in rainfall

distribution significantly impacts groundwater levels. More studies should be undertaken to understand this correlation better and predict areas that might face water scarcity due to erratic rainfall patterns.

4. **Community Awareness Programs**: Public awareness campaigns focusing on the importance of maintaining groundwater levels should be conducted. Informed communities are more likely to adopt measures that protect and conserve water resources.