GROUND WATER LEVEL BULLETIN

NOVEMBER – 2024

JAMMU & KASHMIR

CENTRAL GROUND WATER BOARD

NORTH WESTERN HIMALAYAN REGION

Jammu

ABSTRACT

The present report discusses the regional behaviour of groundwater water levels in the phreatic aquifers of the Kashmir valley and outer plains of the Jammu region, In this area, the water supply is mainly dependent on groundwater either from the springs or shallow/ or deep aquifer systems. The groundwater also forms the main source of the surface water bodies through base flow. The groundwater level maps showed that the water levels in the Kandi formation are deeper than areas in the Sirowal formation and are significantly controlled by the monsoons. In general, the groundwater levels in Jammu Region are shallow in August. However, in the Kashmir region, August has having deepest water levels as compared to May and November due to non-monsoon rainfall, glacier melt and paddy cultivation. In certain places, particularly in urban and industrial areas, the groundwater levels are showing a declining trend in response to over-exploitation.

In Kashmir Region, the depth to water level varied from 0.28 m bgl to 15.29 m bgl. In Jammu's outer plains, the depth to water level varied from 0.49 m bgl to 35.23 m bgl. The annual fluctuation of water levels of November 2024 in the Jammu Region shows a rise in 87 wells and a fall in 43 wells with no cjange in 5 wells. A minimum rise of 0.04 m to a maximum rise of 4.995 m whereas, a minimum decline of 0.03 m to a maximum of 8.1 m is recorded. The decadal fluctuation of water levels of November 2024 in the Jammu region shows a rise in 65 wells and a fall in 116 wells (especially in the Kandi areas of Outer plains), with no change in 2 wells. The minimum rise of 0.01 m to a maximum rise of 2.96m, whereas, a minimum decline of 0.01 m to a maximum of 8.95 m is observed.

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 attribute 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.

The Central Groundwater Board, North Western Himalayan Region is monitoring water levels in observation wells in Jammu and Kashmir State four times a year viz. May (between 20th and 31st), August (between 20th and 31st), November (1st and 10th), and January (1st and 10th). The total number of active groundwater monitoring wells is 425 (Dug Wells 338 and Piezometers 91) as of January 2024 which are located in alluvial areas of Jammu, Kathua, Samba, Rajouri, Reasi, Udhampur, Srinagar, Baramulla, Anantnag, Kupwara and Pulwama Districts. Most monitoring stations fall in valley areas of these districts. For a better understanding of the spatiotemporal behaviour of groundwater, the groundwater level contour maps were generated using IDW Interpolation methods in the GIS platform. Furthermore, the groundwater level categorization and data analysis were done using using Microsoft Excel. The present report discusses the regional behaviour of water levels in phreatic aquifers for the period November 2024 which will enable user agencies to plan development strategies.

2. STUDY AREA

Jammu and Kashmir is the northernmost Union Territory of India after Ladakh. It lies within latitudes of 32°17’ and 36°08’ N and longitudes of 73°23’ and 76°47' E. The UT has a total geographical area of 42,241 sq. km and has an international border with Pakistan in the west. The States of Punjab and Himachal Pradesh form its southern border and the UT of Ladakh forms the northern and northeastern border. Jammu & Kashmir is divided into two administrative divisions’ viz. Kashmir Division and Jammu Division. There is a total of 20 districts in J&K UT. The administrative map of the state is shown in Figure 1.

Major parts of the J&K represent high and rugged mountainous terrain. The geography of the J&K is highly varied with the highest mountain ranges in the world, extensive plateau, enormous valleys, deep gorges, and large canyons in the Middle and Higher Himalayan Regions. The UT can be divided into six distinct physiographic units Sirowal, Kandi, Shiwaliks, Kashmir Valley, Hilly Mountains, and Trans-Himalayan zone. Geological formations ranging in age from pre-Cambrian to Recent. These formations can broadly be classified into three categories viz – Hard or consolidated- rocks comprising granites, slates, quartzite, Panjal traps, limestone, etc. Semi-consolidated rocks comprising claystone, siltstone, sandstone, etc. Unconsolidated formations from Quaternary to Recent age are comprised of Clay, Silt, Sand, Gravel, pebbles, boulders, etc.

The entire UT of Jammu and Kashmir falls in the Indus River Basin Major sub-basins of the Indus System in J&K are the Jhelum Sub-basin, the Chenab Sub-basin, and the Ravi Sub-basin. The UT of J&K has great diversity in its temperature and

precipitation. Excepting the plain, south of the Siwaliks of the Jammu Division, the climate over the greater parts of the state resembles that of the mountainous and continental parts of the temperate latitudes.

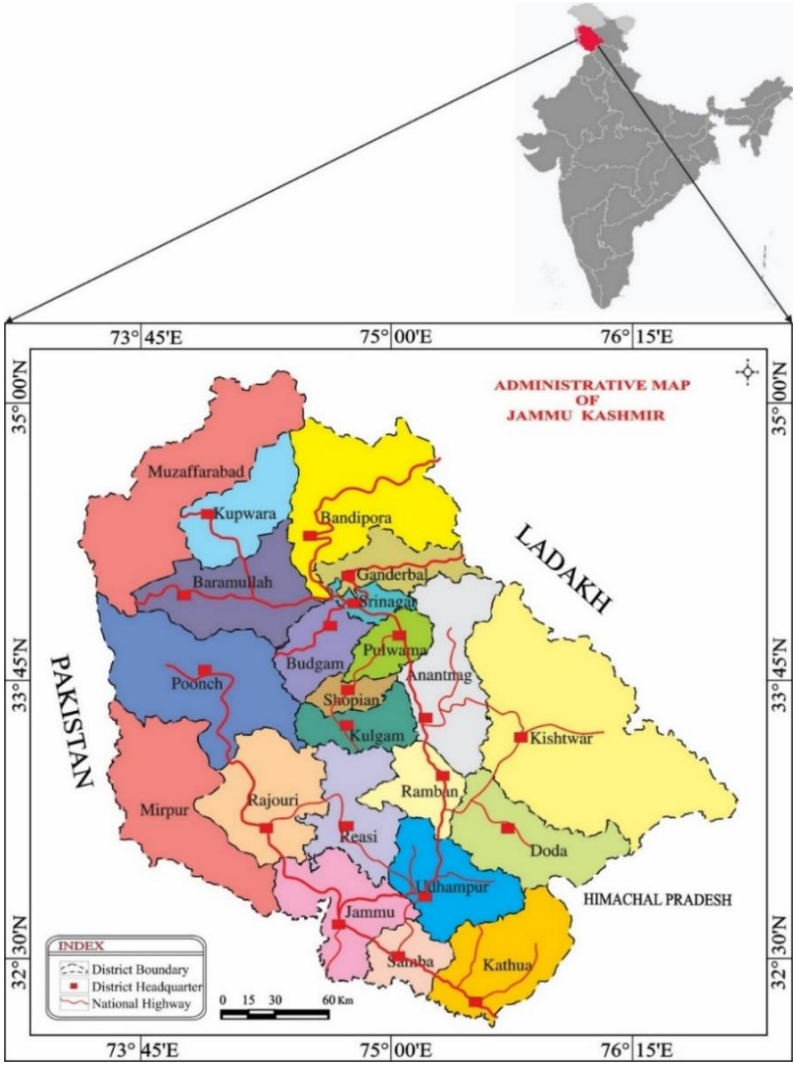

Figure. 1 Administrative Map of J&K

3. GROUND WATER LEVEL MONITORING

In Jammu & Kashmir, at present, 425 Hydrograph Network Stations are being monitored during pre-monsoon and post-monsoon periods. 241 NHS exist in the Jammu Region and 95 stations in the Kashmir Region. To date, no monitoring stations have been established in the Ladakh Region. District-wise number of hydrograph network stations as of November 2024 is shown in table 1 and their locations are shown in Figure 2.

Table 1A. District-wise break-up of active Ground Water Monitoring Wells (DUG WELLS) in J&K (November 2024)

Sl. No.	Region	District	Total No of Monitoring wells	Number of Active Ground Water Monitoring Wells
1	Kashmir Region	Anantnag	0	0
2		Baramulla	23	23
3		Kupwara	48	47
4		Pulwama	2	2
5		Srinagar	1	1
6		Bandipora	5	5
7		Budgam	0	0
8		Ganderbal	0	0
9		Kulgam	0	0
10		Shopian	0	0
	Total		**79**	**78**
11	Jammu Region	Jammu	88	82
12		Kathua	42	41
13		Rajauri	38	36
14		Reasi	8	8
15		Samba	38	36
16		Udhampur	22	22
17		Doda	0	0
18		Kishtwar	0	0
19		Ramban	0	0
20		Poonch	0	0
	Total		**236**	**225**
	TOTAL J&K		**315**	**303**

Table 1B. District-wise break-up of active Ground Water Monitoring Wells (PIEZOMETERS) in J&K (November 2024)				
Sl. No.	**Region**	**District**	**Total No of Monitoring wells**	**Number of Active Ground Water Monitoring Wells**
1	Kashmir Region	Anantnag	0	0
2		Baramulla	0	0
3		Kupwara	0	0
4		Pulwama	0	0
5		Srinagar	2	2
6		Bandipora	0	0
7		Budgam	0	0
8		Ganderbal	1	1
9		Kulgam	0	0
10		Shopian	0	0
	Total		**3**	**3**
11	Jammu Region	Jammu	22	22
12		Kathua	22	18
13		Rajauri	6	6
14		Reasi	8	6
15		Samba	7	6
16		Udhampur	13	12
17		Doda	0	0
18		Kishtwar	0	0
19		Ramban	0	0
20		POONCH	5	5
	Total		**83**	**75**
	TOTAL J&K		**86**	**78**

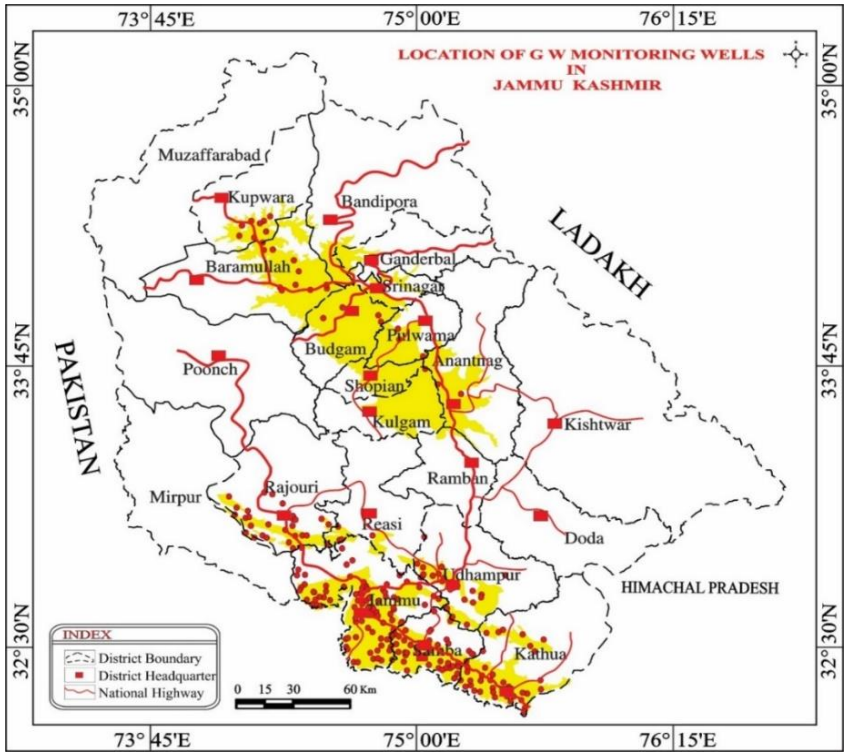

Figure 2. Location Map of Groundwater monitoring wells in Alluvial Aquifers in J&K

4. RAINFALL

The State of Jammu and Kashmir has great diversity in its temperature and precipitation. Excepting the plain, south of the Siwaliks of the Jammu Division, the climate over the greater parts of the state resembles that of the mountainous and continental parts of the temperate latitudes.

4.1. The climate of the Jammu Division

The climate of the Jammu division is sub-humid to sub-tropical. It is divisible into two parts namely (i) the plain region, lying to the south of the Siwaliks, and (ii) the mountainous region, stretching over the Middle and the Greater Himalayas in the districts of Doda, Rajouri, Poonch, and Udhampur. The climate of the plain region and Middle Himalayas including the Pir Panjal is characterized by a rhythm of seasons which is caused by the reversal of winds in the form of southwest and north-east monsoons. The reversal of pressure takes place regularly twice a year. This region has a sub-tropical climate with a hot and dry climate in summer and a cold climate in winter. It lies in the northern hemisphere above the tropic of Cancer. The Minimum and Maximum temperature of the district varies between 4°C to 47°C and the monsoon starts from the beginning of July to the first week of September. From October to June the precipitation and temperature patterns resemble closely the valley temperature zones. However, the summer rainfall and temperature resemble the precipitation pattern in the sub-tropical zone. The region receives an average annual precipitation of 1070 mm mainly in the form of rainfall. Snowfall occurs in high mountainous parts of the Jammu region due to the southwest monsoon from July to September and contributes about 80% of the total rainfall. The temperature in plain areas of the Jammu region goes up to 45ºC during summer and drops to as low as 3º C during the winter season.

4.2. The climate of the Kashmir Division

The weather and climate of the Kashmir Division are intrinsically linked with the weather mechanism of the subcontinent in general. The location of the Kashmir Valley at a high altitude (about 1600m AMSL) in the north-western corner of the subcontinent, surrounded by high mountains on all sides, gives it a unique geographical character with distinctive climatic characteristics. It experiences Temperate-cum-Mediterranean type of climate. The average annual precipitation is 660 mm. In winter, rainfall occurs from the western disturbances (temperate cyclones). These disturbances have their origin in the Mediterranean Sea. The rainfall generated by these cyclones is fairly widespread locally known as *Alamgir*. About 65% of the precipitation occurs in the form of snow during the winter season, i.e. December to February. March and April are the months of rainfall. May to September are relatively dry months. The mercury drops between -8ºC and 12ºC during winter and attains a moderate temperature of around 35ºC during summer.

5. GROUND WATER LEVEL SCENARIO (NOVEMBER 2024)

5.1. SHALLOW AQUIFER (UNCONFINED)

5.1.1. DEPTH TO WATER LEVEL

Depth To Water Level in Unconfined Aquifer (November 2024)

The water level data in respect of 265 wells for November 2024 were analysed in J&K out of which 190 fall in Jammu region and 75 in Kashmir valley. In Kashmir Region, the depth to water level varied from 0.28 m bgl (Urwan in Pulwama District) to 15.29 m bgl (Tral in Pulwama district). In Jammu's outer plains, the depth to water level varied from 0.03 m bgl (Kothian in Kathua District) to 35.72 m bgl (Taryai in Jammu district).

DTWL in Kashmir Region: out of 75 wells, 18 wells (24%) have recorded a water level of less than 2.0 m bgl. About 45 (60%) of the total wells analyzed have shown depth to water level in the range of 2-5 m bgl. Whereas 11 wells (14.66%) have shown water levels in the range of 5-10 m bgl. 1 (1.3%) wells have registered deeper water levels, in the range of 10-20 m bgl. None of the wells has shown water levels below 20 mbgl.

DTWL in Jammu Region: Out of 180 wells, 37 wells (20.55%) have recorded a water level of less than 2.0 m bgl. About 102 (56.6%) of the total wells analyzed have shown depth to water level in the range of 2-5 m bgl. Whereas 27 wells (15%) have shown water levels in the range of 5-10 m bgl. 10 (5.55%) wells have registered deeper water levels, in the range of 10-20 m bgl. 6 wells (3.3%) have shown water levels below 20 mbgl.

Valley areas of Jammu, Samba and Kathua districts below the contact of Kandi Sirowal show water levels between 2-5 m bgl except few patches that show water levels between 0-2m bgl. In the Sirowal area of Outer Plains, most of the water levels have been recorded between 2 - 5 m bgl except a few small patches that show water levels from 0 to 2 m bgl. In the Kandi Belt, the water levels are deeper ranging between 5-20 m bgl and a few patches of northern and northwestern Jammu, having water levels more than 10 m bgl. The northwestern and northern parts of the Jammu district show water levels > 20 mbgl (Figure 3).

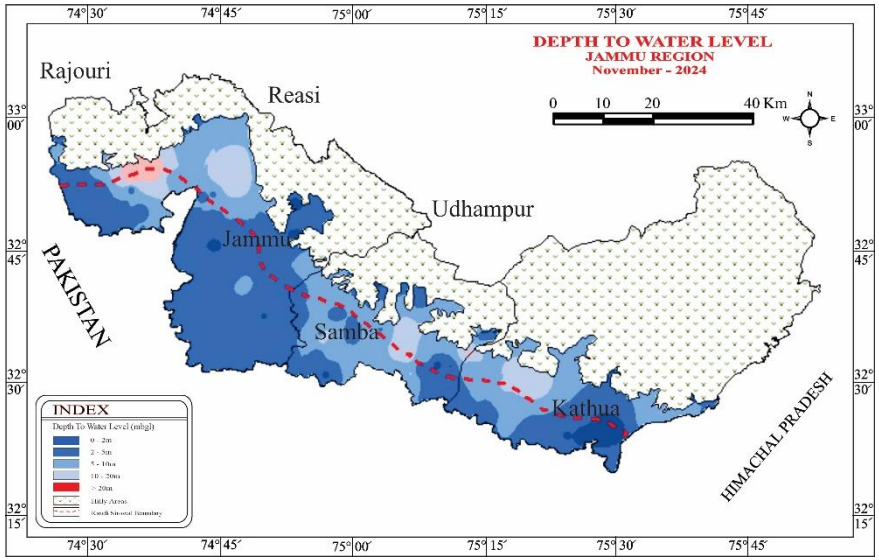

Figure 3 DTWL November 2024 Jammu Region

5.1.2. SEASONAL FLUCTUATION OF WATER LEVELS

November 2024 with respect to May 2024

The water level data with respect to 190 National Hydrograph Stations for November 2024 was analyzed in the Jammu Region. Majority of the wells have shown a rise. A total of 163 wells have shown a rise and 26 wells have shown a fall in water levels in the range of 0-2 m, 2-4 m, and >4 m, and no change in fluctuation is shown by 1 well. The minimum rise of 0.01 m at Reasi in Reasi District to a maximum rise of 13.98 m is shown at Bhagwal in Kathua district. Whereas a minimum decline of 0.07 m is recorded at Lower Kharak in Rajouri district to a maximum of 5.83 m at Nilcha in Samba district

Rise in water Levels:

Rise is shown by 122 wells (64.21%) in the range of 0-2 m. 30 wells (15.78%) have registered a rise from 2-4 m bgl and 11 wells (5.78%) are showing a rise of >4 m.

Fall in Water Levels:

21 wells (11.05%) have shown a fall in the range of 0-2 m, 2 wells (1.05%) have shown a fall between 2-4 m, and 3 wells (1.57%) have shown fall of >4 m.

In the Jammu Region, a decline in the range of 0–2 m has been observed in North and northwestern areas of Jammu district, western Samba, and southeastern parts of Samba district show a decline of >2 m, Rise is shown in major areas of all districts, (Figure 4).

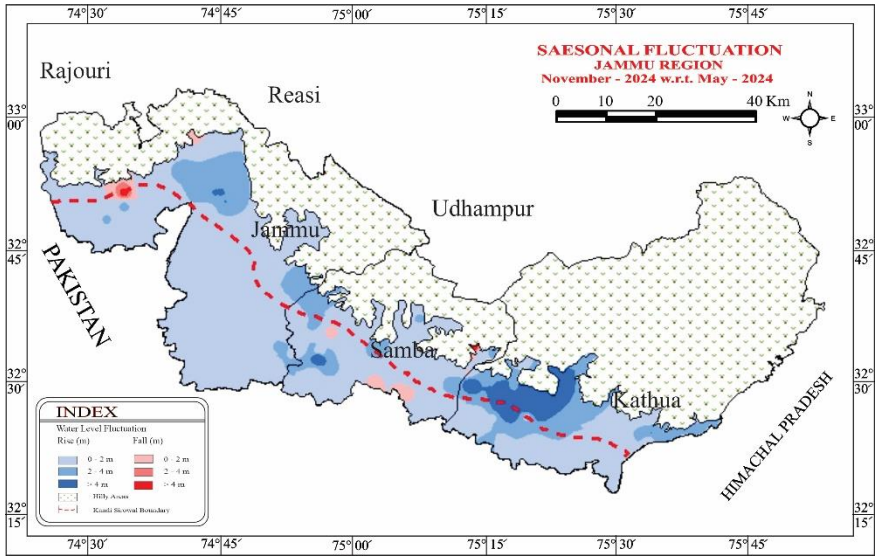

Figure 4. Seasonal Fluctuation November 2024

5.1.3. ANNUAL FLUCTUATION OF WATER LEVEL

November 2024 with respect to November 2023

The water level data with respect to 181 National Hydrograph Stations for November 2024 was analyzed in the Jammu Region. Majority of the wells have shown a fall. A total of 133 wells have shown a decline and 43 wells have shown a rise in water levels in the range of 0-2 m, 2-4 m, and >4 m, whereas, 5 wells have shown no change. The minimum rise of 0.04 m at Reasi in Reasi District to a maximum rise of 4.99 m is shown at Miran Sahib in Jammu district. Whereas a minimum decline of 0.03 m is recorded at Jagti in Jammu district to a maximum decline of 8.1 m at Bhagwanachak in Jammu district

Rise in water Levels: Rise is shown by 37 wells (20.44%) in the range of 0-2 m. 4 wells (2.20%) have registered a rise from 2-4 m bgl and 2 wells (1.10%) are showing a rise of >4 m.

Fall in Water Levels: Among 133 wells showing a fall, 125 wells (69.06%) have shown a fall in the range of 0-2 m, 5 wells (2.76%) have shown a fall between 2-4 m, and 3 wells (1.65%) have shown fall of >4 m.

In the Jammu Region, a decline in the range of 0–2 m has been observed in major portions of each district with few exceptions in all the districts. North and Central areas of Jammu district, Northeastern parts of Kathua and Samba district show a rise of >2 m (Figure 5).

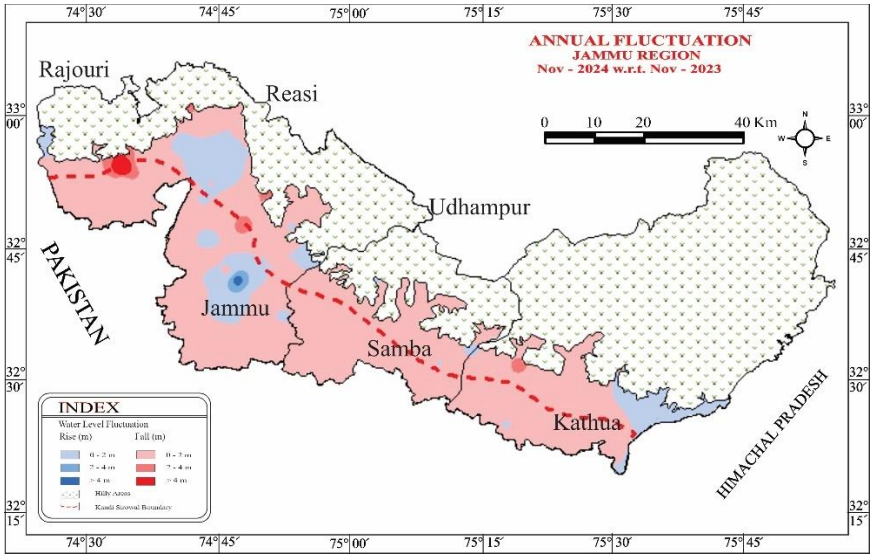

Figure 5. Annual Fluctuation November 2024

5.1.4. DECADAL FLUCTUATION OF WATER LEVEL

November 2024 with respect to the mean of November 2014 – November 2023

The water level fluctuation for November 2024 Vs. (Mean of November 2014 – November 2023 has been worked out in respect of 183 observation wells. It is observed that a total of 65 wells have shown a rise and 116 wells have shown a decline in water level (especially in Kandi areas of Outer plains) and 2 wells have shown no change. The minimum rise of 0.01 m at Gangu Chak Kahua district to a maximum rise of 2.96m in Mothian Kalan Samba district, whereas, a minimum decline of 0.01 m in Gudwal Samba district to a maximum of 8.95m at Bhagwanachak Jammu district is recorded.

Rise in water Levels:

Rise is shown by 61 wells (3.33%) in the range of 0-2 m. 4 wells (2.18%) have registered a rise from 2-4 m bgl and 0 wells (0%) are showing a rise of >4 m.

Fall in Water Levels:

Among 116 wells showing a fall, 103 wells (56.28%) have shown a fall in water level in the range of 0-2 m, 10 wells (5.46%) have shown a fall between 2-4 m, and 3 wells (1.63%) have shown fall of >4 m.

Jammu Region the decline in the range of 0–2 m has been observed in major portions of each district. Significant portions of all the districts have shown a a decline above 2m in water levels. Northern and central portions besides southeastern parts of Jammu, and south western Samba and southern areas in Kathua district shows water level rise. (Figure 6)

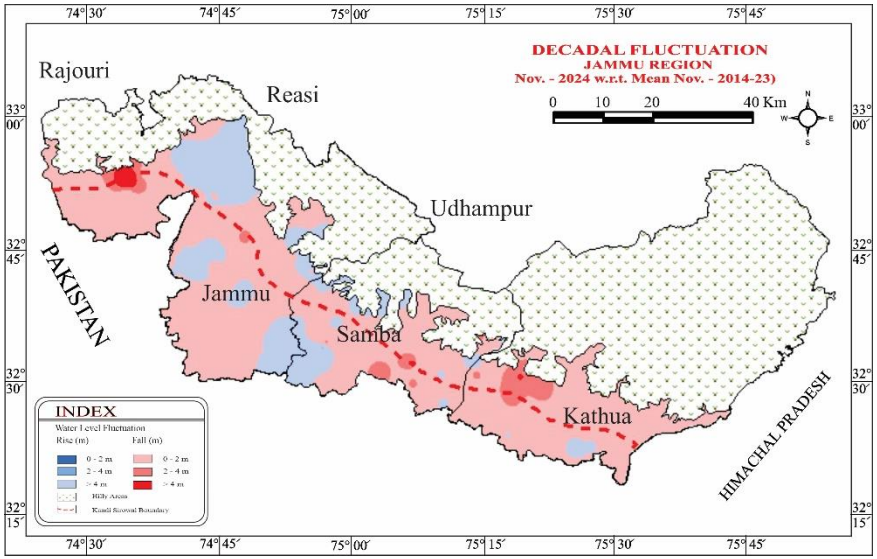

Figure 6. Decadal Fluctuation November 2024

6. RECOMMENDATIONS

Development of Deeper Aquifers: Deeper aquifers in both Jammu and Kashmir can be developed to meet water supply demands. Micro-level planning, based on aquifer geometry, parameters, and water resources data, is necessary for sustainable development.

Tube Well Construction Guidelines: Tube wells should be designed to tap only iron-free aquifers, avoiding iron-rich zones through cement sealing and selective gravel packing.

Climate Change & Spring Water Conservation: Climate change significantly threatens water resources, especially in hilly regions where springs are drying up. A systematic inventory of springs, along with the adoption of snow water harvesting and other sustainable groundwater development techniques, is required.

Well Head Protection & Sewage Management: Groundwater-based water supplies in Jammu and Srinagar require well head protection to prevent bacterial contamination (e.g., coliform, E. coli). The lack of proper sewage and sanitation across the UT is a major cause of water contamination and needs immediate action. Proper sewage treatment and drainage systems must be implemented, especially in waterlogged areas, to prevent groundwater pollution.

Groundwater Quality & Protection: Groundwater in Jammu and Kashmir UT is generally fresh and potable. As the primary water source—including springs, shallow, and deep groundwater—it also sustains surface water bodies through base flow during dry periods. Protection measures are essential to prevent contamination.

Iron & Gas Contamination in Kashmir Valley: Groundwater from deeper aquifers in Kashmir contains iron and marshy gases, requiring proper treatment before supply. Identifying iron-free aquifers through advanced scientific and geophysical exploration will help mitigate this issue.

Industrial & Urban Water Quality Monitoring: Rapid urbanization and industrialization necessitate strict water quality monitoring. State authorities should establish monitoring networks in industrial areas like Bari-Brahmana, Gangyal, and Kashmir Valley, particularly along drains carrying industrial effluents.