GROUND WATER LEVEL BULLETIN

MAY- 2025

HIMACHAL PRADESH

ABSTRACT

Ground water level Scenario during May-2025 highlighting the findings, status of ground water level in different aquifers and its seasonal, annual and decadal comparison.

INTRODUCTION

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

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

Groundwater levels are being measured by Central Ground Water Board four times a year during January, May, August and December. 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 30.04.2023, located all over the country is being monitored.

STUDY AREA

Himachal Pradesh is located between the north latitude30º22'40" &33º12'40"and east longitude 75º47'55" & 79º04'20". It falls in Survey of India topographic sheets Nos. 52D, 52H, 52L, 53A, 53B, 53F, 53E and 53I and covers an area of 55,673 sq km. It is one of the predominantly hilly states in India, which lies in the western Himalayas. The length of Himachal Pradesh is about 355 km i.e., from northwestern part of Chamba to southeastern part of Kinnaur. The breadth of the state is about 270 km i.e., from western part of Una to northeast part of Lahaul and Spiti Disrtict. The state is bounded by the state of Jammu & Kashmir in north, Punjab state in west, Haryana state in south and Uttrakhand state in southeast and shares an international border with China (Tibet) in northeast.

Administratively, the state is divided in 12 Districts, 76 Tehsils, 34 Sub-Tehsils and 78 Blocks. There are 20,690 villages, 3,226 Gram Panchayats, 59 towns, 28 Nagar Panchayats and 25 Nagar Parishads including Municipal Corporations. Lahaul & Spiti is the largest and Hamirpur is the smallest District of the state with geographical area of 12,835 and 1,118 sq km respectively.

The state has a population of 68,64,602 persons (Census 2011) having an average population density of 128 person per sq km. The male population in the state is 34,81,873 persons and female population is 33,82,729. The rural

and urban population in the state is 61,76,050 and 6,00,552 persons respectively. The density of population in the state varies from as low as 2 persons/sq.km in Lahaul and Spiti District to 406 persons/sq km in Hamirpur District as compared to the state average of 128 persons/sq km.

Himachal region presents an intricate mosaic of mountain ranges, hills and valleys with altitude ranging from 350 m to 6500 m amsl. The Dhauladhar range looks in supreme majesty over the Kangra valley while the Pir Panjal, the Great Himalaya and the Zanskar ranges guard over Chamba, Lahaul & Spiti, Kullu and Kinnaur Districts. The mountain slopes are covered with forests and meadows. The valleys below are interspersed with numerous streams, fields and quiet homesteads. There is general increase in elevation from east to west and from south to north. The physiographic divisions from south to north are the Outer Himalayas also known as Siwaliks (350 to 1500 m amsl), the Lesser Himalayan Range (1500-5000 m amsl), Great Himalayan Range (5000 – 6000 m amsl) and Zanskar Range (> 6000 m amsl)

Himachal state has a unique distinction of having drainage systems of both the Indus and the Ganga basin. The major river systems of the region are the Chandra-Bhaga or the Chenab, the Ravi, the Beas, the Satluj and the Yamuna. The catchments of the rivers are fed by snow and rainfall, and are protected by fairly extensive cover of natural vegetation. Major rivers of the Indus River basin are the Chenab, the Ravi, the Beas and the Satluj. The Yamuna is the only river contributing water to Ganga basin.

The southwestern monsoon contributes about 70% of rain fall during monsoon period from July to September and about 30% occurs during non-monsoon period due to western disturbances and in the form of thunder storm. Generally, rainfall increases from south to north. Western disturbances also shower rainfall in winters. Beyond Kullu towards Lahaul & Spiti and Kinnaur, rain fall decreases due to rain shadow effect. Spiti is the driest area with 50 mm rainfall because of being enclosed by High Mountain from all sides. The average annual rainfall in the Districts of the state varies from about 600 mm in Lahaul & Spiti to more than 2400 mm in Kangra.

GROUND WATER LEVEL MONITORING

Central Ground Water Board, Northern Himalayan Region, is monitoring changes in groundwater regime in Himachal Pradesh state on quarterly basis continuously. This is facilitated by a network of monitoring stations in the State located in diverse hydrogeological and geomorphic units. The number of operational wells till January 2025, 225 wells which include 137 dug wells, 61 piezometers and 27 springs. In May-2025 there are 222 wells which include 128 dug wells, 65 piezometers and 29 springs. The district-wise breakup of the water level monitoring stations is given in **Table-1**.

Sl. No	Name of the District	Number of GW Monitoring Stations (JAN-2025)				
		Dug Well	Piezometer	Hand pump	Spring	Total
1	Hamirpur	6	3	-	-	9
2	Bilaspur	4	8	-	-	12
3	Kangra	42	18	-	2	62
4	Kullu	1	3	-	1	5
5	Mandi	8	4	-	4	16
6	Sirmaur	19	14	-	1	34
7	Solan	14	5	-	-	19
8	Una	33	8	-	-	41
9	Chamba	1	2	-	21	24
	TOTAL	128	65	-	29	**222**

Table-1 District-wise breakup of the water level monitoring stations

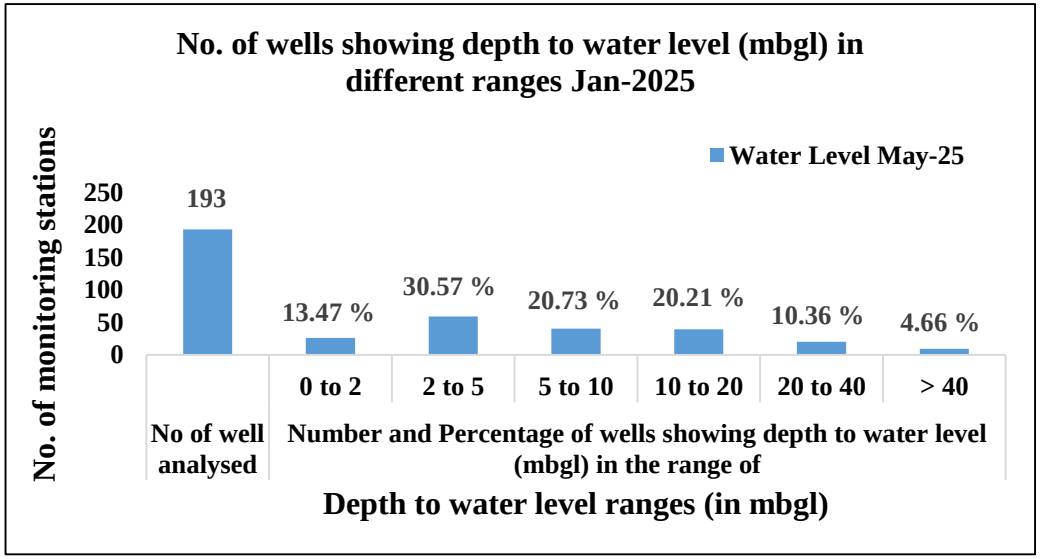
DEPTH TO WATER LEVEL (May-2025)

The depth to water level, recorded during May-2025 ranged between 0.34 m (Bandrol (Pz) Kullu District) and 96.84 m bgl (Tikkri (Pz) Solan District). Out of 193 stations monitored, the majority of 164 NHS (84.97%) recorded DTWL, in the range between 2 - 20 m bgl. 26 stations (13.47%), recorded shallow water levels, less than 2 m bgl and 29 stations (15.02%), recorded deep water levels, more than 20 m bgl in the state.

A perusal of the DTW map of May- 2025 shows that the shallow water level area occurs mainly in south southern part of Kangra Palampur valley (Kangra District), northern part of Balh valley (Mandi District) and northern and southern part of Kullu Valley. 2-5 m bgl & 5-10 m bgl water level is depicted in all the valleys of Himachal Pradesh. 10-20 m bgl water level occupies Nalagarh, Kangra-Palampur Valley and Una valley. Deeper water level, more than 20 m are in northern part of Kangra-Palampur Valley, eastern part of Nurpur-Indora Valley, some part of Nalagarh Valley and at Paonta valley.

Season	No of well analysed	Number and Percentage of wells showing depth to water level (mbgl) in the range of											
		0 to 2		2 to 5		5 to 10		10 to 20		20 to 40		> 40	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
May-25	193	26	13.47	59	30.57	40	20.73	39	20.21	20	10.36	9	4.66

Depth to Water Level Distribution of Percentage of Observation Wells May-2025



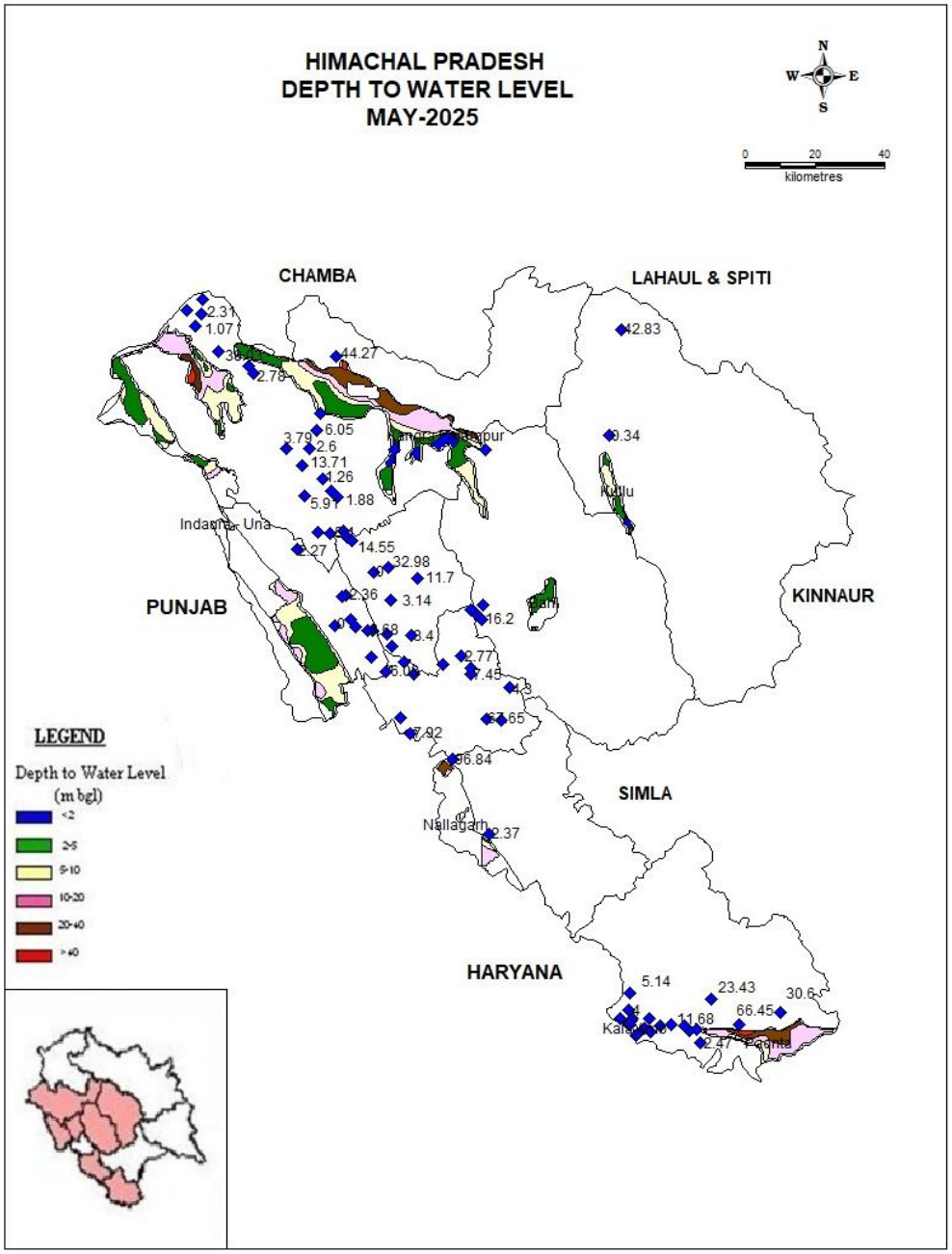


Fig:1 Depth to Water Level May-2025

ANNUAL WATER LEVEL FLUCTUATION

Annual fluctuation in water level of GWMS during different monitoring period was analysed and discussed below.

May 2023 to May 2025

Annual fluctuation of water level, has been worked out by comparing depth to water level of May-2023, with May-2025 and the data presented its frequency distribution in various rise and fall ranges.

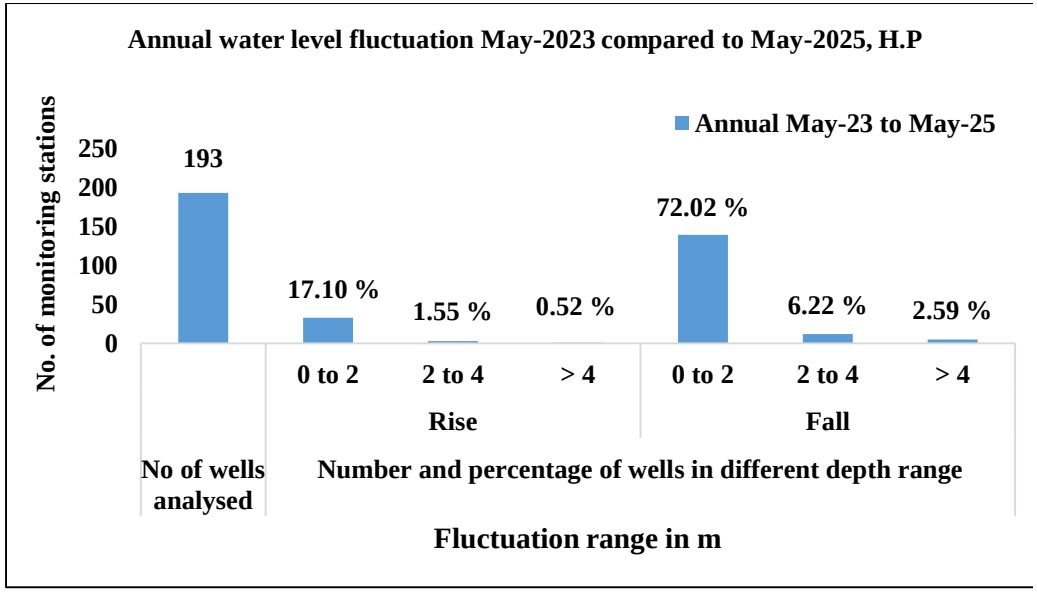
Out of the 193 stations analysed, 37 stations (19.17%) have shown rise in water level ranging from 0.02 m in Una & Hamirpur District to 6.97 m in Kangra District (Jwala Ji).

Out of 37 stations which have shown rise in water level, 33 stations show rise between the range of 0 to 2 m, 3 station has shown rise between 2 to 4 m and 1 station shown rise more than 4 m.

Similarly, for 156 stations which have shown fall in water level, 139 stations show fall between the range of 0 to 2 m, 12 stations have shown fall between 2 to 4 m and 5 stations (3.30%) has shown fall more than 4 m.

A perusal of map of annual fluctuation of May-2023 to May-2025 showing fall in water levels in Kangra-Palampur valley, Una valley, Paonta Valley, Balh Valley and Nalagarh Vally. Similarly rise in water level 0-2 m is noticed along the fringe areas of all monitoring valleys except Balh Valley (Mandi District).

Comparison	Season	No of wells analysed	Number and percentage of wells in different depth range											
			Rise						Fall					
			0 to 2	%	2 to 4	%	> 4	%	0 to 2	%	2 to 4	%	> 4	%
Annual	May-23 to May-25	193	33	17.10	3	1.55	1	0.52	139	72.02	12	6.22	5	2.59



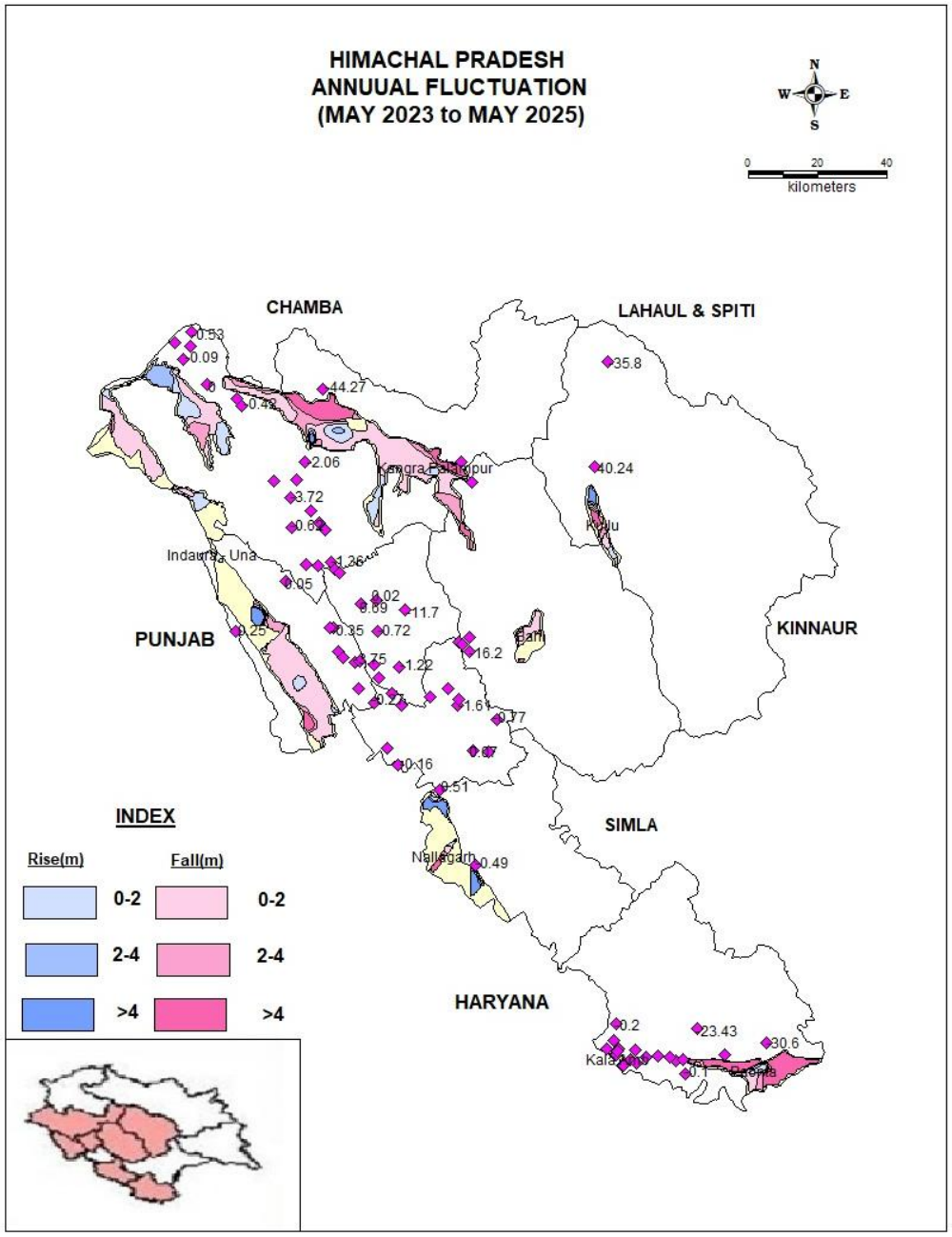


Fig:5 Annual fluctuations for the period May 2023 – May 2025

May 2024 to May 2025

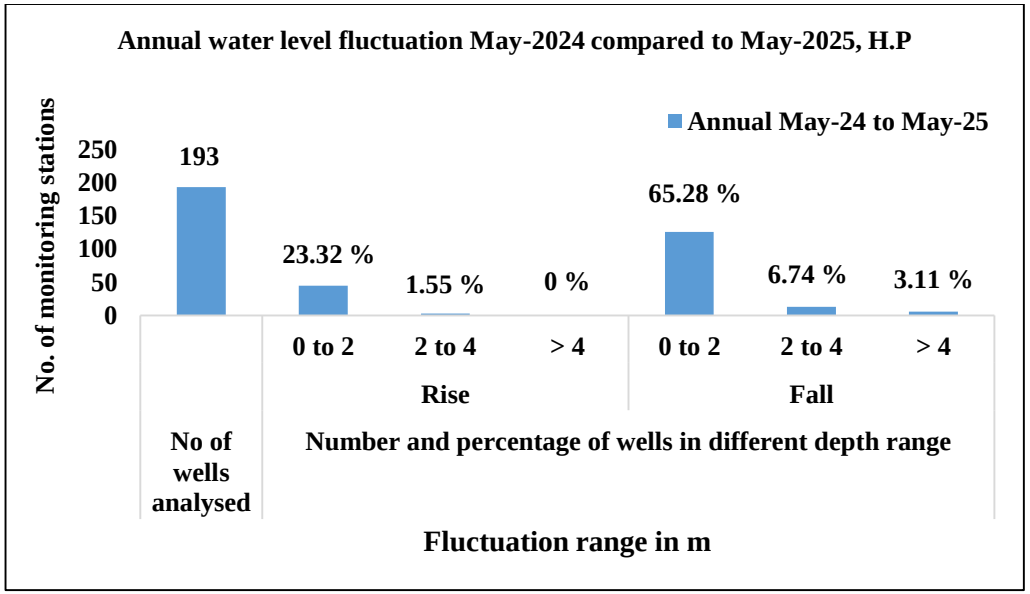
Annual fluctuation of water level, has been worked out by comparing depth to water level of May 2024, with May 2025 and the data presented its frequency distribution in various rise and fall ranges.

Out of the 193 stations analysed, 48 stations (24.87%) have shown rise in water level ranging from 0.01 in Una (Tomlet Pz) and Kangra District (Rakkar) to 3.1 m in Kangra District (Bir Pz).

Out of 48 stations which have shown rise in water level, 45 stations show rise between the range of 0 to 2 m, 3 station has shown rise between 2 to 4 m and 0 station shown rise more than 4 m.

Similarly, for 145 stations which have shown fall in water level, 126 stations show fall between the range of 0 to 2 m, 13 stations have shown fall between 2 to 4 m and 6 stations has shown fall more than 4 m.

A perusal of map of annual fluctuation of May-2024 to May-2025 showing fall in water levels in Nurpur Indora valley and central part of Una valley, Paonta Valley, Balh Valley, Nalagarh Vally and in Kullu. Similarly rise in water level 0-2 m is noticed along the fringe areas of all monitoring valleys.



Comparison	Season	No of wells analysed	Number and percentage of wells in different depth range											
			Rise						Fall					
			0 to 2	%	2 to 4	%	> 4	%	0 to 2	%	2 to 4	%	> 4	%
Annual	May-24 to May-25	193	45	23.32	3	1.55	0	0	126	65.28	13	6.74	6	3.11

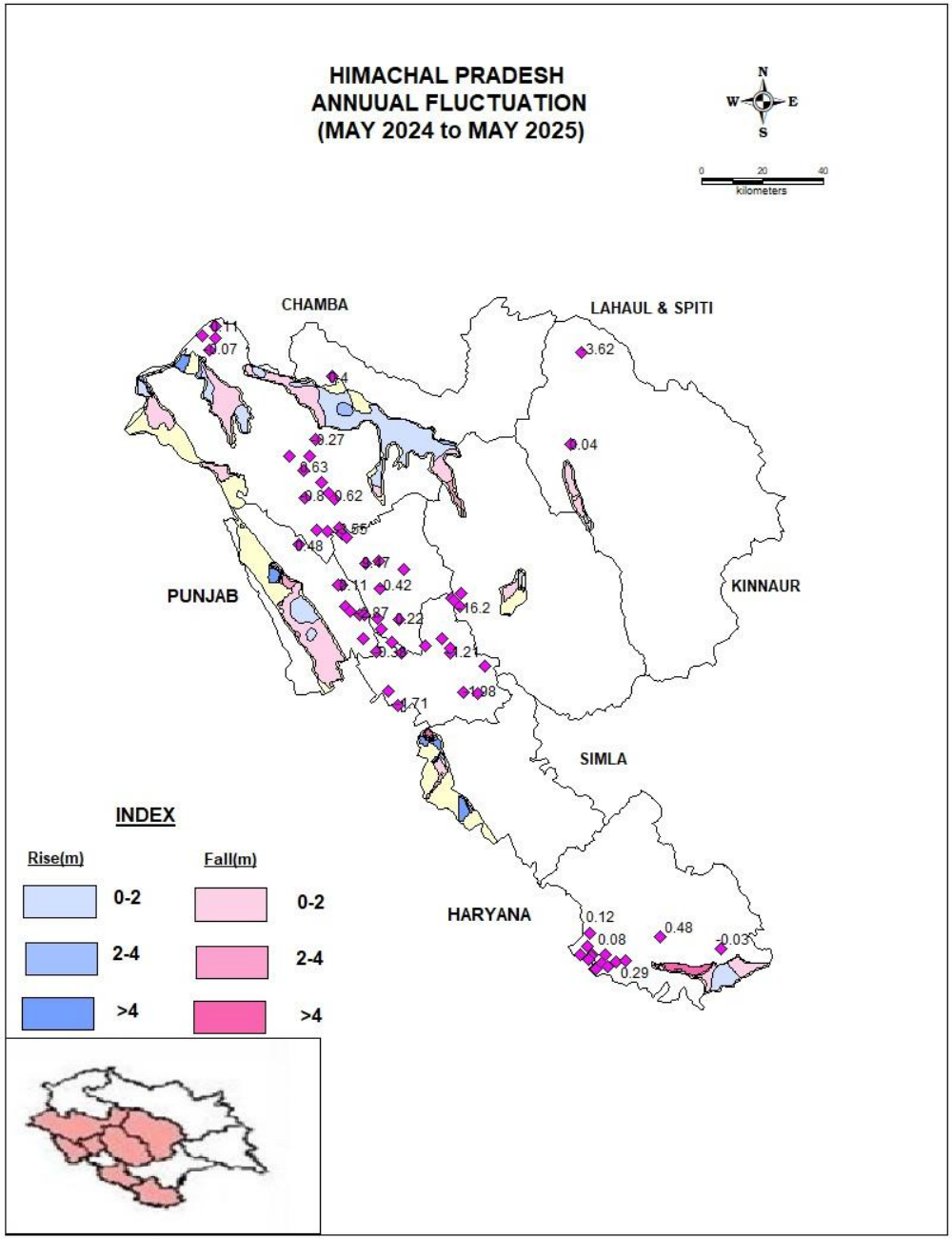


Fig:6 Annual fluctuations for the period May 2024 – May 2025

DECADAL FLUCTUATIONS

The decadal variations were analyzed considering the decadal average of water level and the water level for the respective period.

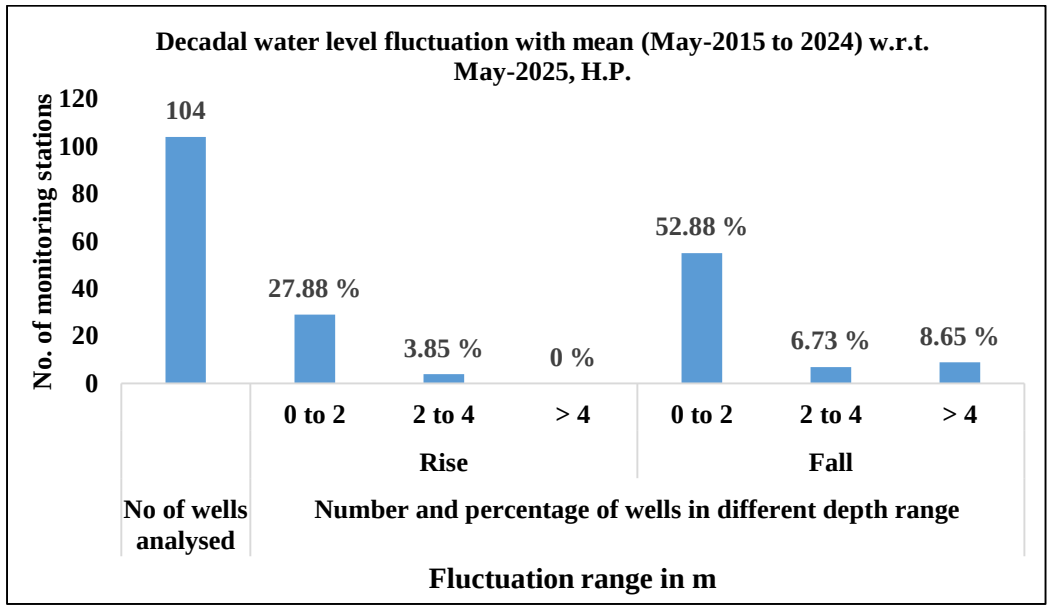
Decadal average of May (2015-2024) to May 2025

Decadal water level fluctuation has been worked out by comparing water level data of May 2025 with the average mean of 10 years' water level data of May (2015-2024) and is presented frequency distribution in various ranges.

A perusal shows that out of 104 stations analyzed, 33 stations (31.73%) have shown rise and 71 stations (68.27%), have shown fall in water level. Out of 33 stations 29 stations are showing rise in water level between 0 to 2 m, 4 stations between 2 to 4 m and 0 stations, more than 4 m. Out of 71 stations, 55 stations show fall in water level between 0 to 2 m, 7 stations between 2 to 4 m and 9 stations more than 4 m. A minimum rise in water level of 0.0256 m was noticed in Solan District and the maximum rise of 3.88 m is noticed in Kangra District. Similarly, the minimum fall of 0.021 m is noticed in Una District & maximum fall of 11.41 m is noticed in Una District.

A perusal of map of Decadal average of May (2015-2024) to May 2025 reveals rise in water level is shown in areas of Nurpur-Indaura valley and Kangra-Palampur Valley of Kangra District, some parts of Una, Nalagarh and Paonta valley. The fall was noticed in Kangra Palampur valley, Nurpur-Indora valley, Kullu and major parts of Nalagargh, Una and Ponta valley.

Comparison	Season	No of wells analysed	Number and percentage of wells in different depth range											
			Rise						Fall					
			0 to 2	%	2 to 4	%	> 4	%	0 to 2	%	2 to 4	%	> 4	%
Decadal	May-25	104	29	27.88	4	3.85	0	0	55	52.88	7	6.73	9	8.65



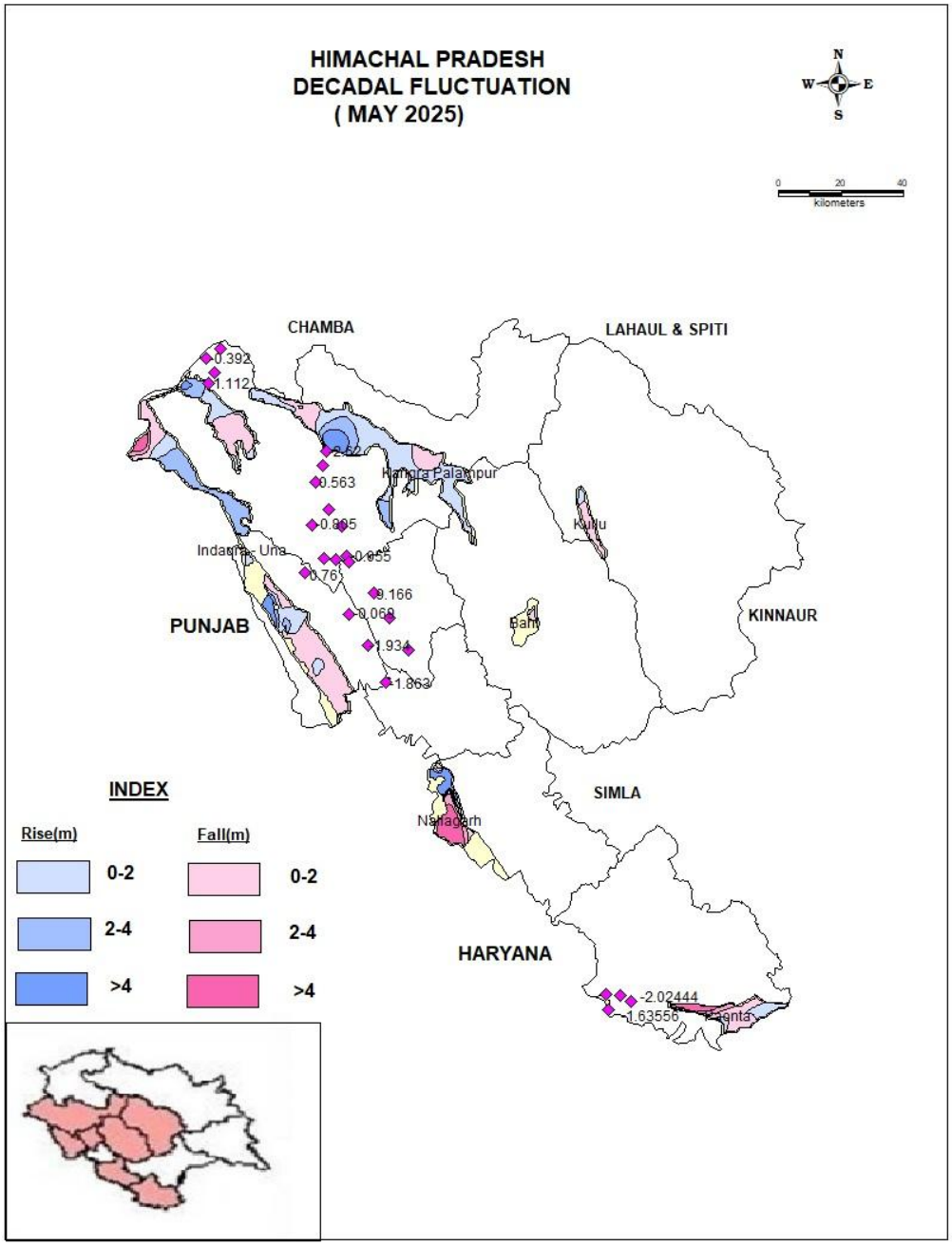


Fig. 7: Decadal water level fluctuation, Decadal mean May (2015-2024) Vs May-2025

SUMMARY

As a component of the National Ground Water Monitoring Programme, the CGWB, NHR, Dharamshala conducts monitoring of the ground water conditions on a quarterly basis: in January, Pre-monsoon (May), August and Post-monsoon (November). Additionally, a yearly assessment of ground water quality is performed in May and Nov, the Northern Himalayan Region of the Central Ground Water Board monitored 128 dug wells, 65 piezometers and 29 springs. This comprehensive effort aims to portray the variations in the state's ground water conditions across different aquifers.

In May 2025, 84.98% of the state's area exhibited a depth to water level within 20 meters below ground level. Deeper water levels of more than 20 m cover 15.02 % area of the State covering mainly Una, Sirmaur,Solan, Kangra, districts. Annual water level comparison with previous year May-2023 to May-2025 and May-2024 to May-2025 has shown that about 19.17% and 24.87% area of the state experienced rise in annual water level fluctuation respectively. 31.73% of the area experienced rise in decadal mean water level of 2015-2024 with respect to May, 2025.

RECOMMENDATIONS:

Himachal Pradesh is one of the predominantly hilly state in India, which lies in the western Himalayas. Deeper water levels more than 20 m covers only 15.02 % area of the State, mainly in Una, Sirmaur,Solan and some valley parts of Kangra, districts. In such valleys of Districts where the water level goes deeper, artificial recharge structures are recommended, like a Check Dam and rain water harvesting.