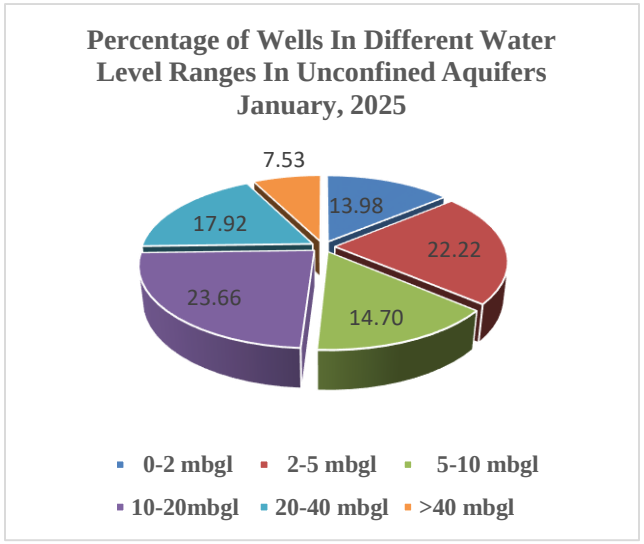

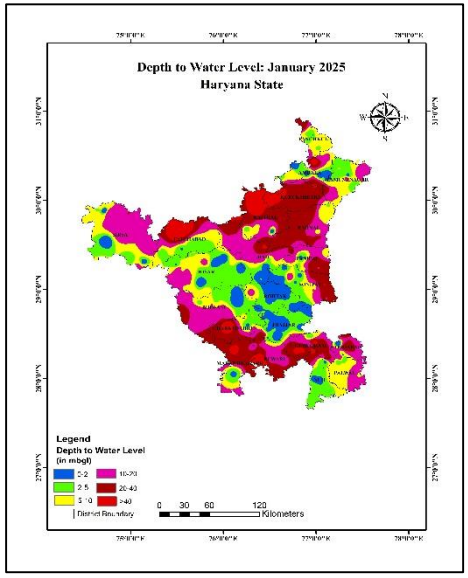

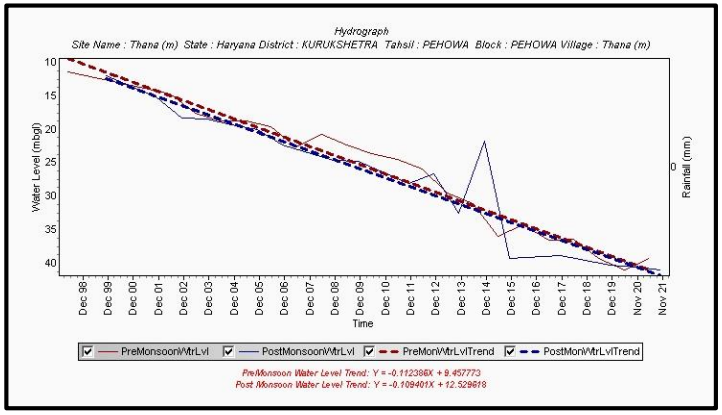

GROUND WATER LEVEL BULLETIN

HARYANA

ABSTRACT

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

CGWB, NORTH WESTERN REGION, CHANDIGARH

1.0 INTRODUCTION

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

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

Groundwater levels are being measured by Central Ground Water Board four times a year during January, June, August and November. The regime monitoring started in the year 1969 by Central Groundwater Board. A network of 1874 observation wells called **National Hydrograph Network Stations (NHNS)**, as on 30.04.2024, located all over the country is being monitored.

2.0 STUDY AREA

Ground water is among the Nation's most precious natural resources. Measurements of water levels in wells provide the most fundamental indicator of the status of this resource and are critical to meaningful evaluations of the quantity and quality of ground water and its interaction with surface water. Water-level measurements are made by Central Ground Water Board four times a year but the measurements in January are quite crucial as it provides the overall impact of irrigation into ground water system during monsoon season and ground water withdrawal for irrigation which counts nearly 65% of its annual irrigation demands during this period only.

The Haryana State is located between north latitudes 27^0 39' & 30^0 55' and east longitudes 74^0 27' & 77^0 35' covering an area of 44,212 sq. km. The State has been divided into four main divisions viz. Ambala, Gurgaon, Rohtak and Hissar, which are further sub-divided into 20 districts and 114 community development blocks. The state is sub-divided into nine physiographic units and is drained by two major rivers, Ghaggar and Yamuna. There are four irrigation systems in the state namely Western Yamuna Canal, Bhakra canal, Agra canal and Ghaggar

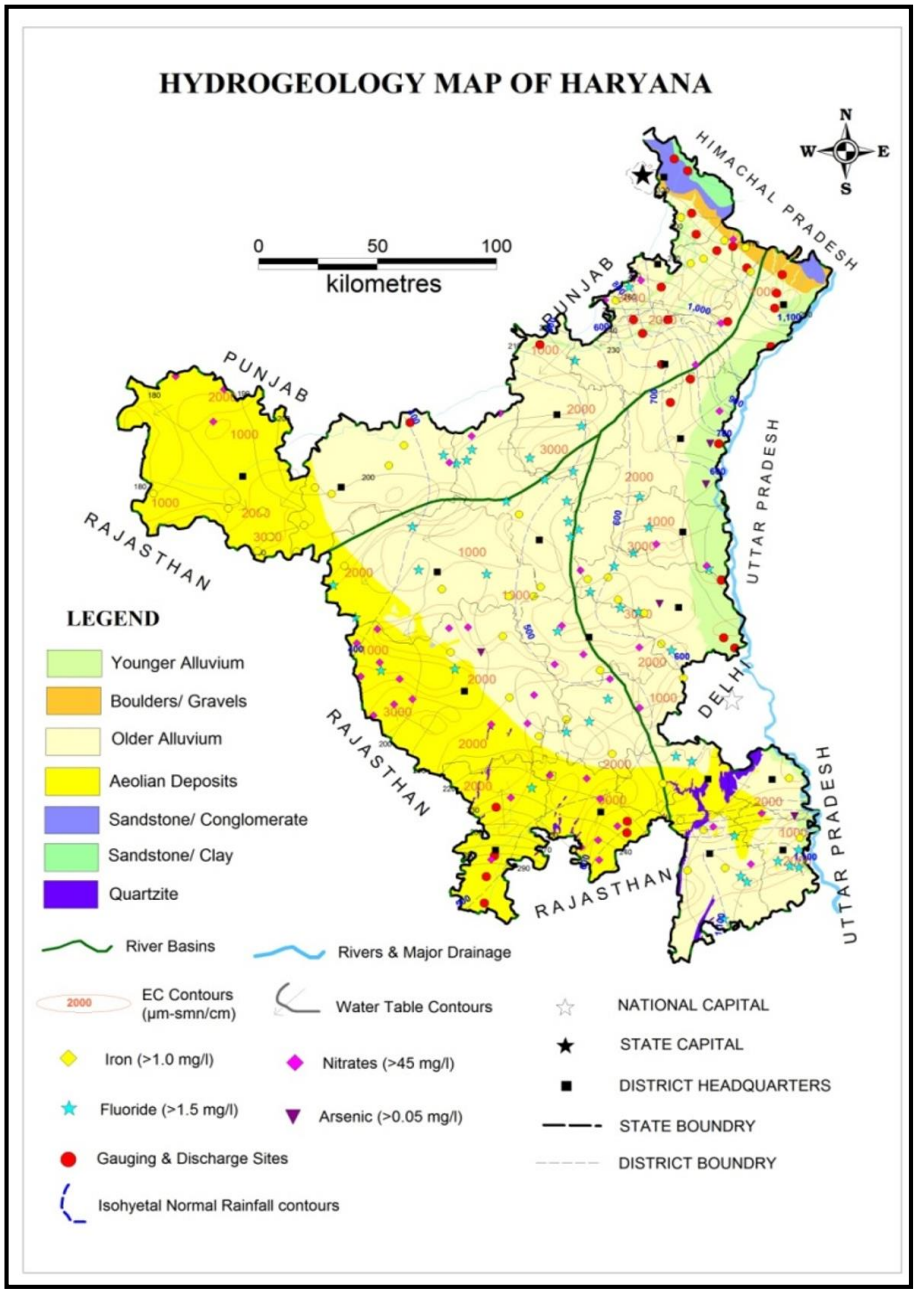

Figure-1: Map showing major aquifers and Hydrogeology of Haryana

canal. Three geological rock groups are prevalent in the state viz. Pre-Cambrian, Tertiary and Quaternary. The Quaternary Group comprises of alluvium which occupies 97% of the area of the State. The Tertiary Group is represented by the outermost zone of the Siwalik System composed mainly of sandstones, clay and boulders. The rocks of Pre-Cambrian Group which form part of the Aravalli Hill Ranges are exposed in Gurgaon, Mewat and Faridabad districts and as small outcrops in other Southern districts. The thickness of alluvium deposits decreases from North to South. The State of Haryana lies in the great Indo-Gangetic Plain. The Quaternary alluvium has been deposited at places on semi-consolidated Tertiary rocks (Siwalik Group) or on a basement of metamorphic and igneous rocks of Precambrian Era. The present and ancient rivers laid down the alluvial sediments since Pleistocene Epoch in the foredeep or a down wrap formed in front of the rising Himalayan ranges and these pediments represent the younger geological formation.

3.0 GROUND WATER LEVEL MONITORING

Central Ground Water Board, North Western Region, Chandigarh has established Ground Water Observation Wells (GWOW) in Haryana State for monitoring the water levels. As on 31.03.2024, there were 538 Ground Water Observation Wells which included 151 dug wells and 387 piezometers for monitoring unconfined, semi- confined & confined aquifers. The district wise details of Ground water observation wells are given in Table 1 and location of these Ground water observation wells is shown in Figure 2.

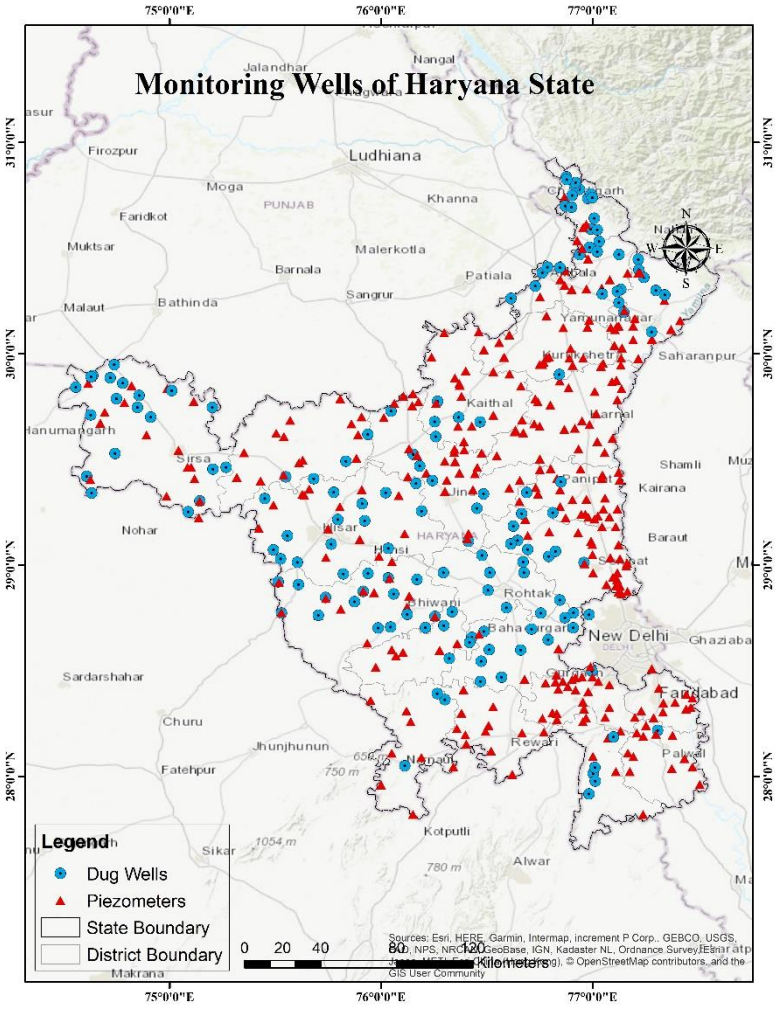

Figure- 2: Map showing locations of monitoring wells (NHNS) in Haryana

S. No.	District	Dug Well	Tube Well	Total
1	Ambala	10	21	31
2	Bhiwani	18	15	33
3	Charkhi Dadri	4	9	13
4	Faridabad	0	14	14
5	Fatehabad	2	19	21
6	Gurugram	1	25	26
7	Hisar	17	19	36
8	Jhajjar	11	3	14
9	Jind	6	30	36
10	Kaithal	6	24	30
11	Karnal	0	38	38
12	Kurukshetra	0	24	24
13	Mahendragarh	3	8	11
14	Nuh	5	4	9
15	Palwal	1	12	13
16	Panchkula	18	7	25
17	Panipat	3	28	31
18	Rewari	0	12	12
19	Rohtak	9	0	9
20	Sirsa	21	23	44
21	Sonipat	9	26	35
22	Yamunanagar	7	26	33
23	**Grand Total**	151	387	538

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

4.0 GROUND WATER LEVEL SCENARIO (JANUARY, 2025)

4.1 SHALLOW AQUIFER (UNCONFINED)

4.1.1 DEPTH TO WATER LEVEL

Depth to Water Level in Unconfined Aquifer (January, 2025)

The behavioral pattern of water level in January 2025 along with depth to water level map (Fig.3) is discussed below.

The depth to water level lies between 0.1mbgl in Jhajjar district and 67.55mbgl in Fatehabad district. Very shallow water levels of 0-2 m (causing water logging) occur in 13.98% of wells and 5.89% area of the state in isolated patches in Jhajjar, Bhiwani, Rohtak and Ambala districts. Shallow water levels of 2-5 m have been observed in 22.22% of the wells and 20.64% of the total area that lies in central parts of state i.e Hisar, Bhiwani, Rohtak, Jhajjar, Charkhi Dadri, Mahendragarh, Yamunanagar and Sonipat districts. The water levels between 5-10 m are observed in Fatehabad, Jind, Hisar, Bhiwani, Charkhi Dadri, Rohtak, Jhajjar, Mahendragarh, Nuh, Palwal, Ambala and Yamunanagar districts. About 14.70% of wells and 19.61% of the area fall in this range. Moderately Deep-water levels (10-20 m) are observed in 23.66% wells covering about 26.57% area of the State Sirsa, Fatehabad, Jind, Panipat, Karnal, Kurukshetra, Yamunanagar, Rewari, Gurgaon, Faridabad, Palwal, Bhiwani, Charkhi Dadri and Mahendragarh districts. Deep water levels (20-40 m) are observed in parts of Kurukshetra, Kaithal, Karnal, Panipat, Jind, Sirsa, Bhiwani, Gurgaon, Charkhi Dadri Rewari, Faridabad, Sonipat and Yamunanagar districts and observed in 17.92% wells covering about 22.11% area of the state. Very deep water levels (>40 m) are observed in 7.53% wells as patches in Gurgaon, Kurukshetra, Kaithal, Fatehabad and Sirsa districts covering 5.10% area of the State.

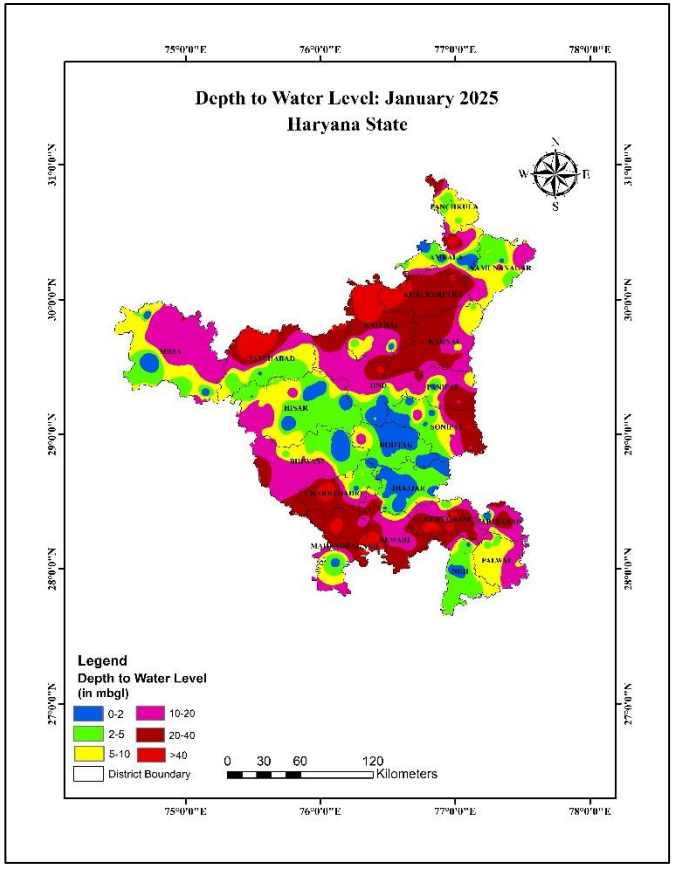

Figure-3: Depth to Water Level Map Unconfined Aquifer, January 2025

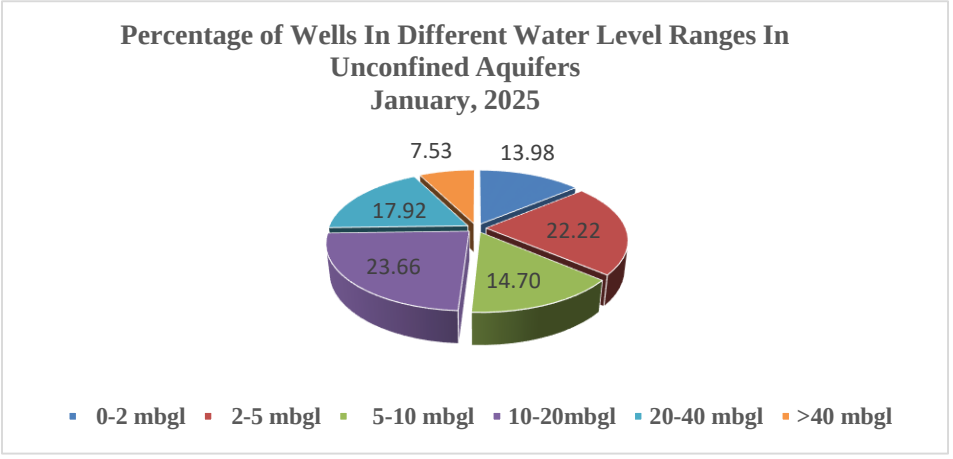

Figure-4: Percentage of wells in different water level ranges in unconfined aquifer.

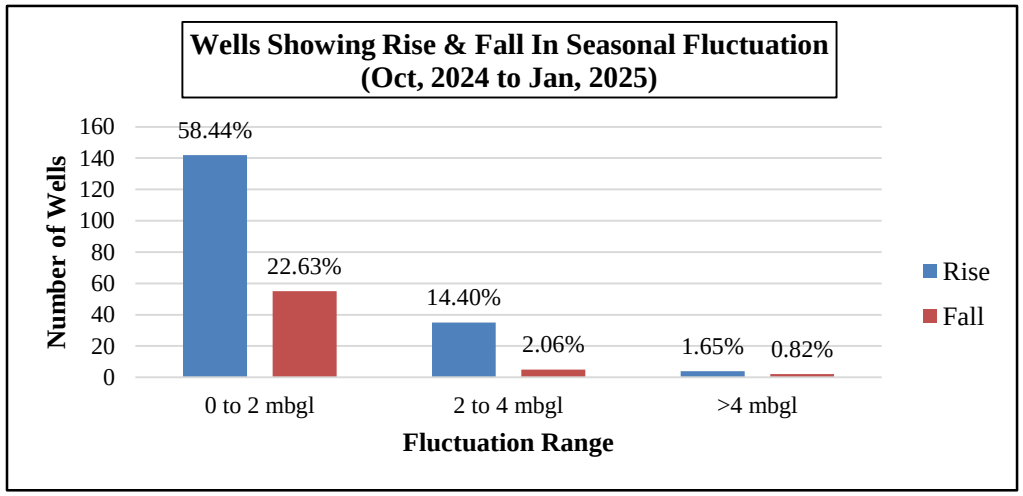

Figure-5: Percentage of wells showing rise and fall in WL in Unconfined aquifer (October 2024 to January 2025)

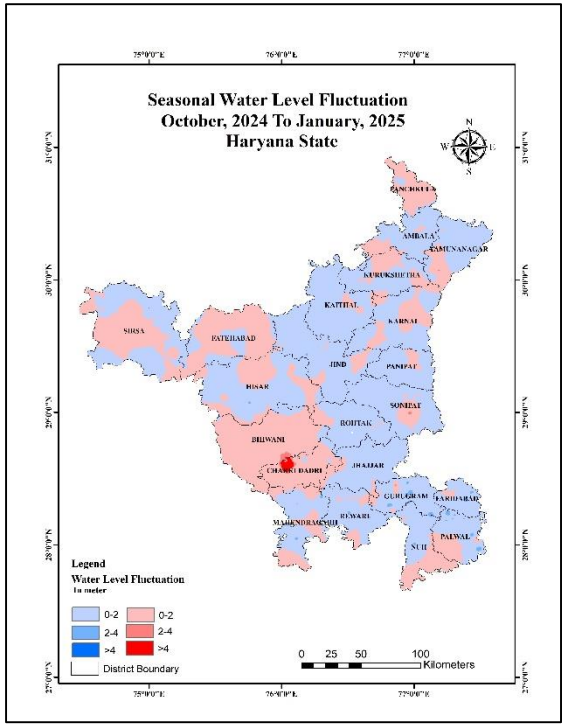

Figure-6: Seasonal water level fluctuation in unconfined Aquifer (October 2024 to January 2025)

4.1.2 SEASONAL FLUCTUATION IN WATER LEVEL

Seasonal Fluctuation of Water Level in Unconfined Aquifer (October 2024 to January 2025)

Water level data of January 2025 when compared with previous measurement data i.e. October 2024 is termed as seasonal water level fluctuations. The behavioral pattern of this seasonal fluctuation is discussed below. The map depicting seasonal water level fluctuations is shown in Fig.6.

Rise in Water Levels:

The water level rise has been recorded in 74.49% of wells monitored and covering 60.73% area of the State. Water level rise in the range of 0-2 m is observed in 58.44% of wells and 60.47% of the area. Water level rise 2-4m is observed in 14.40% of the wells & less than 1% area. Water level rise of >4m is observed in 1.65% wells and in less than 1% area as isolated patches in Hisar, Kaithal, Jind, Karnal and Ambala districts.

Fall in Water Levels:

The seasonal fluctuation shows that there is a general decline of water levels in 25.51% of wells monitored and covering 39.27% area of the State. The decline has been observed in all districts except some isolated patches scattered over the state. Water level decline in the range of 0-2 m is observed in 22.63% of wells and 38.85% of area. Water level decline in the range of 2-4 m is observed in 2.06% of wells and less than 1% of area. Water level decline of >4m is observed in 0.82% of wells and less than 1% of area as isolated patches in Mahendragarh, Ambala and Yamunanagar districts.

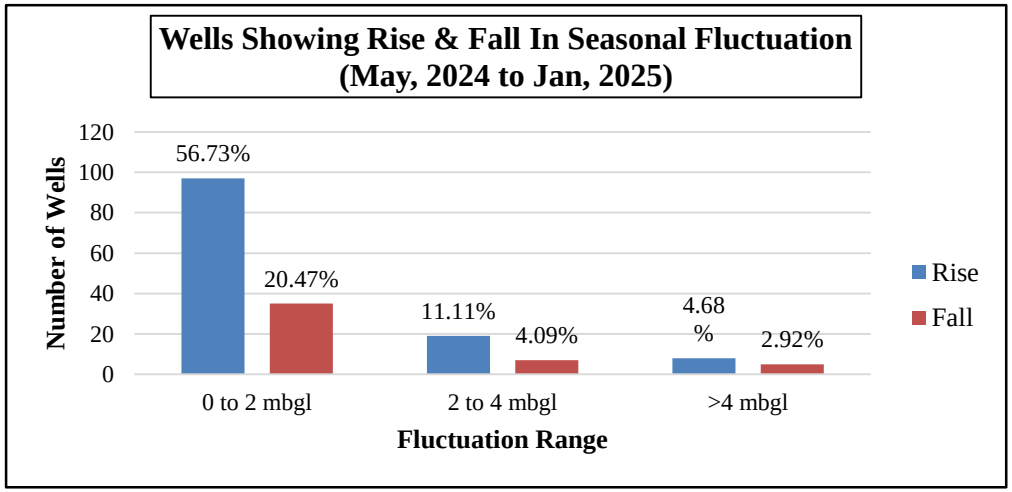

Figure-7: Percentage of wells showing rise and fall in WL in Unconfined aquifer (May 2024 to January 2025)

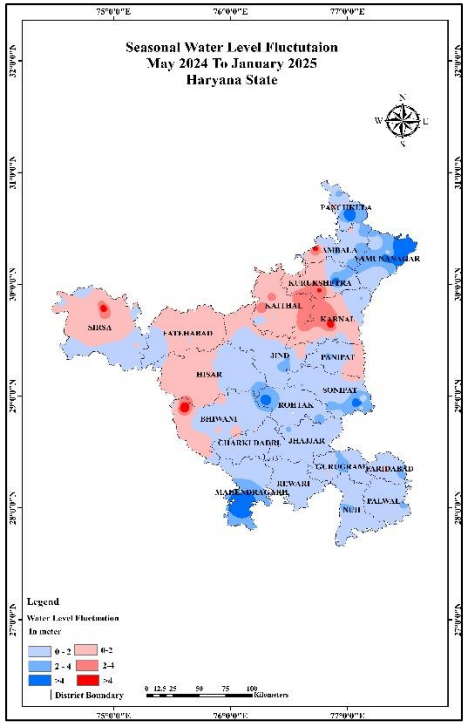

Figure-8: Seasonal water level fluctuation in unconfined Aquifer (May 2024 to January 2025)

4.1.3 SEASONAL FLUCTUATION IN WATER LEVEL

Seasonal Fluctuation of Water Level in Unconfined Aquifer (May 2024 to January 2025)

Water level data of January 2025 when compared with previous measurement data i.e. May 2024 is termed as seasonal water level fluctuations. The behavioral pattern of this seasonal fluctuation is discussed below. The map depicting seasonal water level fluctuations is shown in Fig.8.

Rise in Water Levels:

The water level rise has been recorded in 72.52% of wells monitored and covering 66.29% area of the State. Water level rise in the range of 0-2 m is observed in 56.73% of wells and 55.24% of the area. Water level rise 2-4m is observed in 11.11% of the wells & 8.37% area. Water level rise of >4m is observed in 4.68% wells and in 2.68% area as isolated patches in Hisar, Kaithal, Jind, Karnal and Ambala districts.

Fall in Water Levels:

The seasonal fluctuation shows that there is a general decline of water levels in 27.48% of wells monitored and covering 33.71% area of the State. The decline has been observed in all districts except some isolated patches scattered over the state. Water level decline in the range of 0-2 m is observed in 20.47% of wells and 29.51% of area. Water level decline in the range of 2-4 m is observed in 4.09% of wells and 4.13% of area. Water level decline of >4m is observed in 2.92% of wells and less than 1% of area as isolated patches in Hisar, Kaithal and Karnal districts.

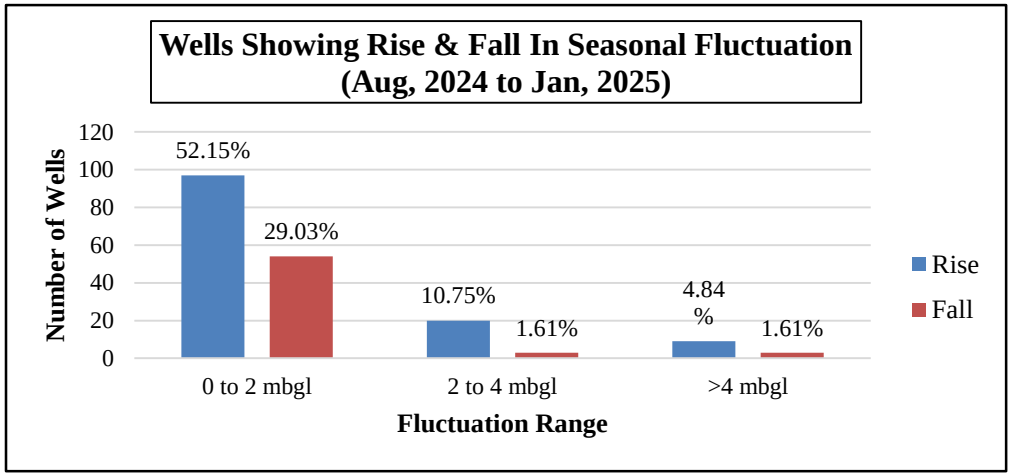

Figure-9: Percentage of wells showing rise and fall in WL in Unconfined aquifer (Aug 2024 to January 2025)

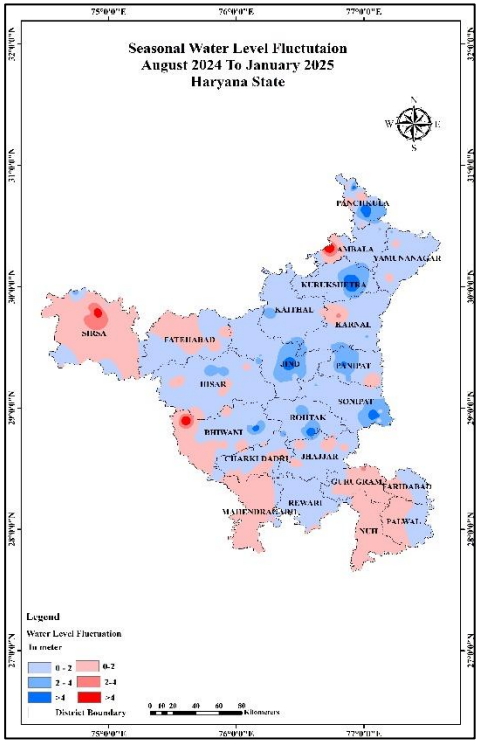

Figure-10: Seasonal water level fluctuation in unconfined Aquifer (Aug 2024 to January 2025)

4.1.4 SEASONAL FLUCTUATION IN WATER LEVEL

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

Water level data of January 2025 when compared with previous measurement data i.e. August 2024 is termed as seasonal water level fluctuations. The behavioral pattern of this seasonal fluctuation is discussed below. The map depicting seasonal water level fluctuations is shown in Fig.10.

Rise in Water Levels:

The water level rise has been recorded in 67.74% of wells monitored and covering 69.39% area of the State. Water level rise in the range of 0-2 m is observed in 52.15% of wells and 61.78% of the area. Water level rise 2-4m is observed in 10.75% of the wells & 6.58% area. Water level rise of >4m is observed in 4.84% wells and in 1.03% area as isolated patches in Hisar, Kaithal, Jind, Karnal and Ambala districts.

Fall in Water Levels:

The seasonal fluctuation shows that there is a general decline of water levels in 32.26% of wells monitored and covering 30.61% area of the State. The decline has been observed in all districts except some isolated patches scattered over the state. Water level decline in the range of 0-2 m is observed in 29.03% of wells and 29.12% of area. Water level decline in the range of 2-4 m is observed in 1.61% of wells and less than 1% of area. Water level decline of >4m is observed in 1.61% of wells and less than 1% of area as isolated patches in Hisar, Kaithal and Karnal districts.

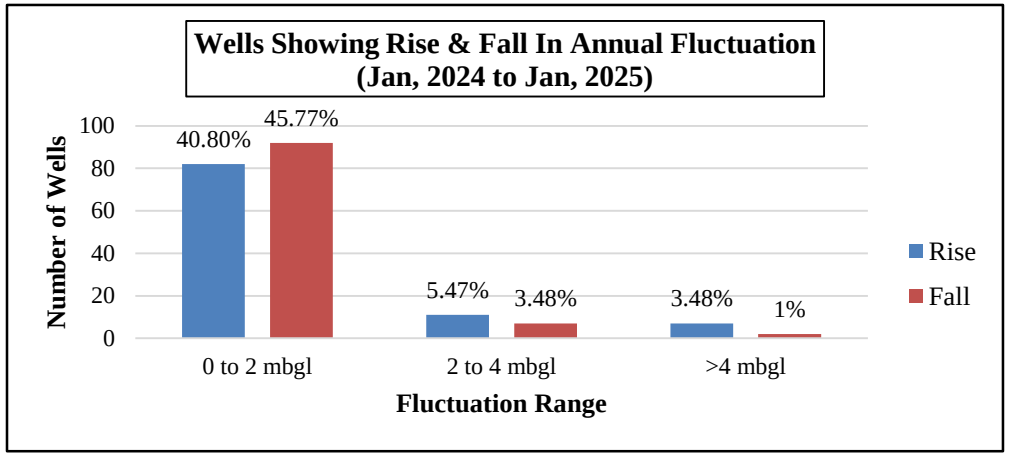

Figure-11: Percentage of wells showing rise and fall in WL in unconfined aquifer (January 2024 to January 2025)

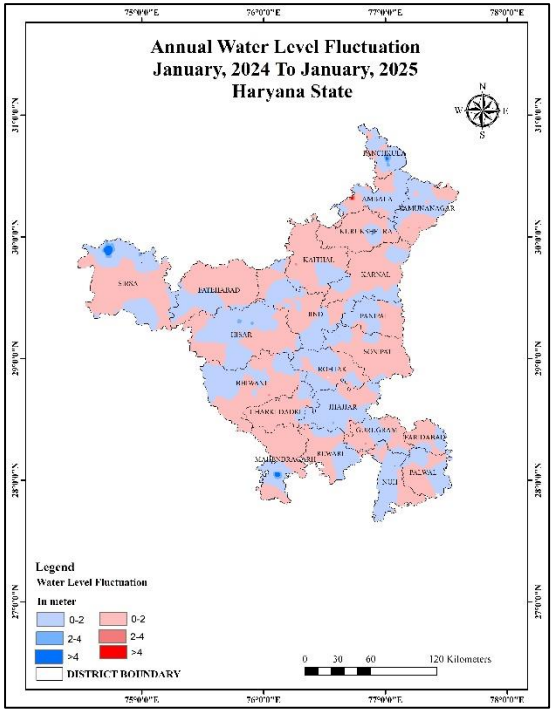

Figure-12: Annual water level fluctuation in unconfined aquifer(January 2024 to January 2025)

4.1.5 ANNUAL FLUCTUATION IN WATER LEVEL

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

In order to know the impact of rainfall and ground water withdrawal during last one-year, annual water level fluctuations for period January 2024 and January 2025 are calculated. The behavior of annual fluctuations is discussed in the following paragraph and depicted in Fig.12.

Rise in Water Levels:

The water level rise has been recorded in 49.75% of wells monitored and covering 40.03% area of the State. Water level rise in the range of 0-2 m is observed in 40.80% wells and 39.56% of area. Water level rise 2-4m is observed in 5.47% wells and less than 1% of area. The water level rise of >4m is observed in 3.48 % wells and less than 1% of area as isolated patch in Sirsa and Fatehabad.

Fall in Water Levels:

The annual fluctuation depicts general decline of water levels in 50.25% of wells monitored and covering 59.97% area of the State. The decline has been observed in all districts of the state except Palwal. Water level decline the range of 0-2 m is observed in 45.77% of wells and 59.86% of the area. Water level decline in the range of 2-4 m is observed in 3.48% of wells and less than 1% of the area. Whereas, the water level decline of >4m is observed in 1% of wells and less than 1% of the area during the period, as isolated patches in Palwal, Gurgaon, Panchkula and Fatehabad districts.

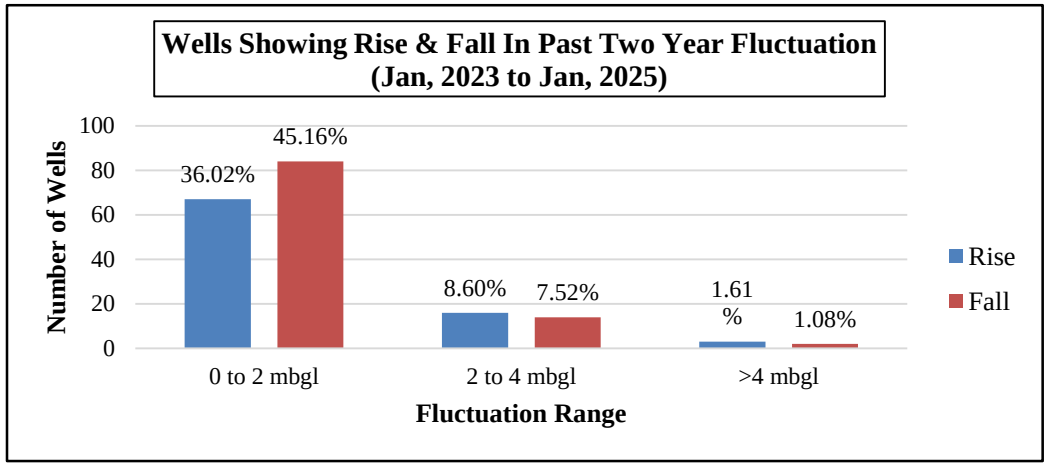

Figure-13: Percentage of wells showing rise and fall in WL in unconfined aquifers (January 2023 to January 2025)

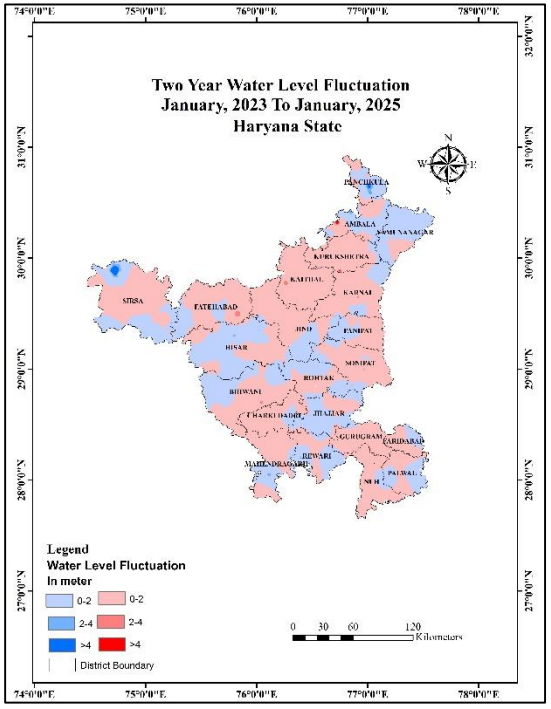

Figure-14: Water Level Fluctuation Map (January 2023 to January 2025)

4.1.6 PAST TWO YEAR FLUCTUATION IN WATER LEVEL

Past Two-Year Fluctuation of Water Level in Unconfined Aquifer (January 2023 to January 2025)

In order to know the impact of rainfall and ground water withdrawal during last two years, past two year water level fluctuations for period January 2023 and January 2025 are calculated. The behavior of annual fluctuations is discussed in the following paragraph and depicted in Fig.14.

Rise in Water Levels

The water level rise has been recorded in 46.23% of wells monitored and covering 34.19% area of the State. Water level rise in the range of 0-2 m is observed in 36.02% wells and 33.79% of area. Water level rise 2-4m is observed in 8.60% wells and less than 1% of area. The water level rise of >4m is observed in 1.61% wells and less than 1% of area as isolated patches in Sirsa, Bhiwani, Charkhi Dadri, Karnal and Ambala districts.

Fall in Water Levels

The annual fluctuation depicts general decline of water levels in 53.77% of wells monitored and covering 65.81% area of the State. The decline has been observed in all districts of the state. Water level decline the range of 0-2 m is observed in 45.16% of wells and 65.63% of the area. Water level decline in the range of 2-4 m is observed in 7.52% of wells and less than 1% of the area. Whereas, the water level decline of >4m is observed in 1.08% of wells and less than 1% of the area during the period, as isolated patches in Bhiwani, Fatehabad, Hisar, Jind, Kaithal, Rewari and Charkhi Dadri districts.

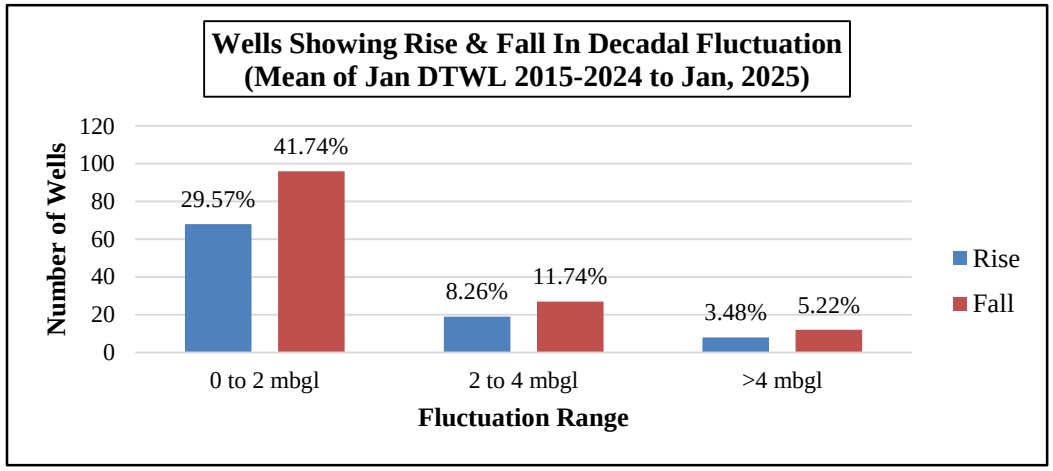

Figure-15: Percentage of wells showing rise and fall in WL in unconfined Aquifer (Decadal Mean January (2015-2024) to January 2025)

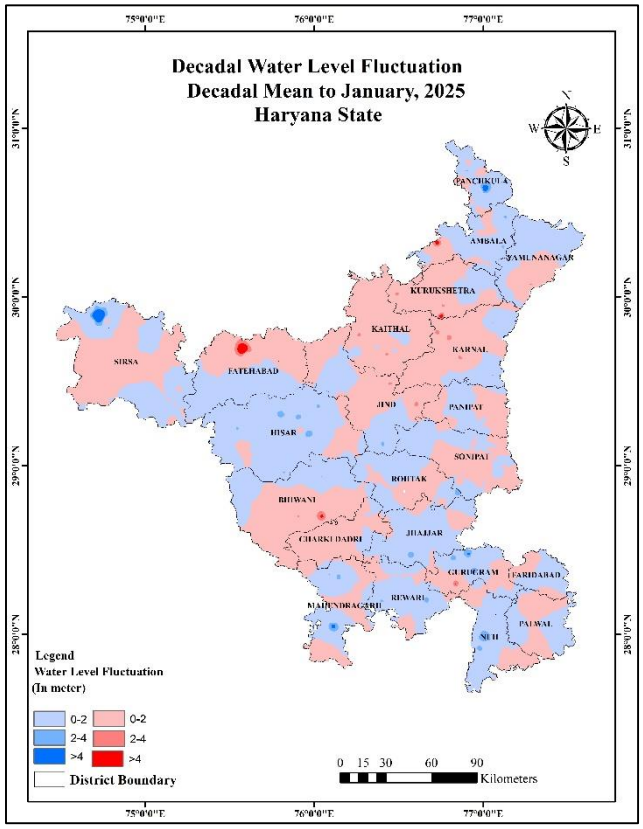

Figure-16: Water level fluctuation in unconfined Aquifer(Decadal Mean (2015-2024) to January 2025)

4.1.7 DECADAL FLUCTUATION IN WATER LEVEL

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

Changes in water level behaviour since last one decade are determined using decadal mean data. Water level mean of past one decade (2015-2024) for each ground water observation well is computed and compared with the respective water level data of January 2025. The behaviour of water level over the period under reference is discussed in paragraph below along with Fig.16.

Rise in Water Levels:
The decadal mean fluctuations show that rise in 41.31% of observation wells monitored covering about 49.08% area of the state. Water level rise in the range of 0-2 m is observed in 29.57% of wells and 48.43% of the area. Water level rise of 2-4m is observed in 8.26% of wells and less than 1% of the area. Water level rise of >4m is observed in 3.48% of wells and less than 1% of the state area as isolated patch in Sirsa, Mahendragarh, Bhiwani and Ambala districts.

Fall in Water Levels:
The decadal mean fluctuations show that decline in 58.69% of observation wells monitored covering about 50.92% area of the state. The decline has been observed in all districts of the state. The decline of 0-2 m has been observed in about 41.74% of wells and 50.49% of area. Water level decline of 2-4 m is observed in 11.74% of the wells and less than 1% of the area. Water level decline of >4m is observed in 5.22% of the wells and less than 1% of area during the period, in Sirsa, Fatehabad, Karnal, Kaithal, Panipat, Rohtak, Rewari, Gurgaon, Bhiwani and Charkhi Dadri districts.

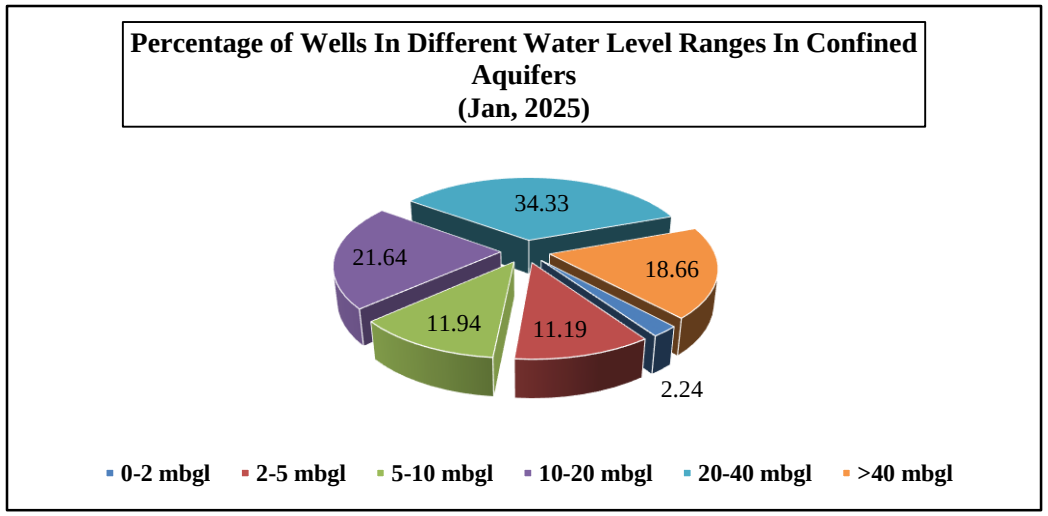

Figure-17: Percentage of wells in different water level ranges in Confined/Semi-Confined aquifer.

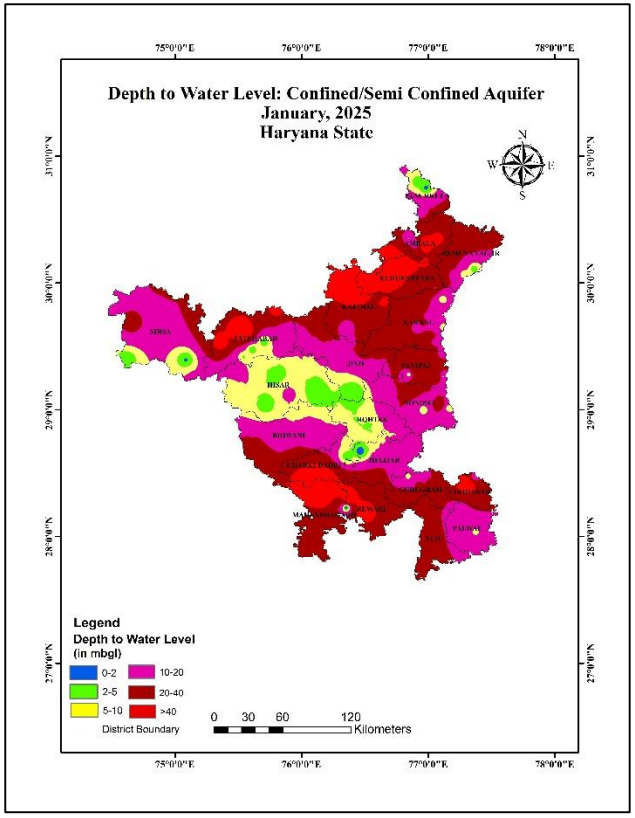

Figure-18: Depth to Water Level Map Confined/Semi-Confined Aquifer, January 2025

4.2 DEEPER AQUIFER (CONFINED/ SEMI-CONFINED)

4.2.1 DEPTH TO PIEZOMETRIC LEVEL

The behavioral pattern of water level in January 2025 along with depth to water level map (Fig. 18) is discussed here. The depth to water level lies between 0.4 mbgl in Jhajjar district and 95.81 mbgl in Mahendragarh district. Very shallow water levels of 0-2 m (causing water logging) does occur in 2.24% of the wells and less than 1% of the total area. Shallow water levels of 2-5 m have been observed in 11.19% of the wells and 3.13% of the total area. The water levels between 5-10 m are about 11.94% of wells and 14.22% of the area fall in this range. Moderately Deep-water levels (10-20 m) are observed in 21.64% wells covering about 32.90% area of the State. Deep water levels (20-40 m) are observed in 34.33% wells covering about 39.34% area of the state. Very deep-water levels (>40 m) are observed in 18.66% of wells and covering 10.27% area of the State.

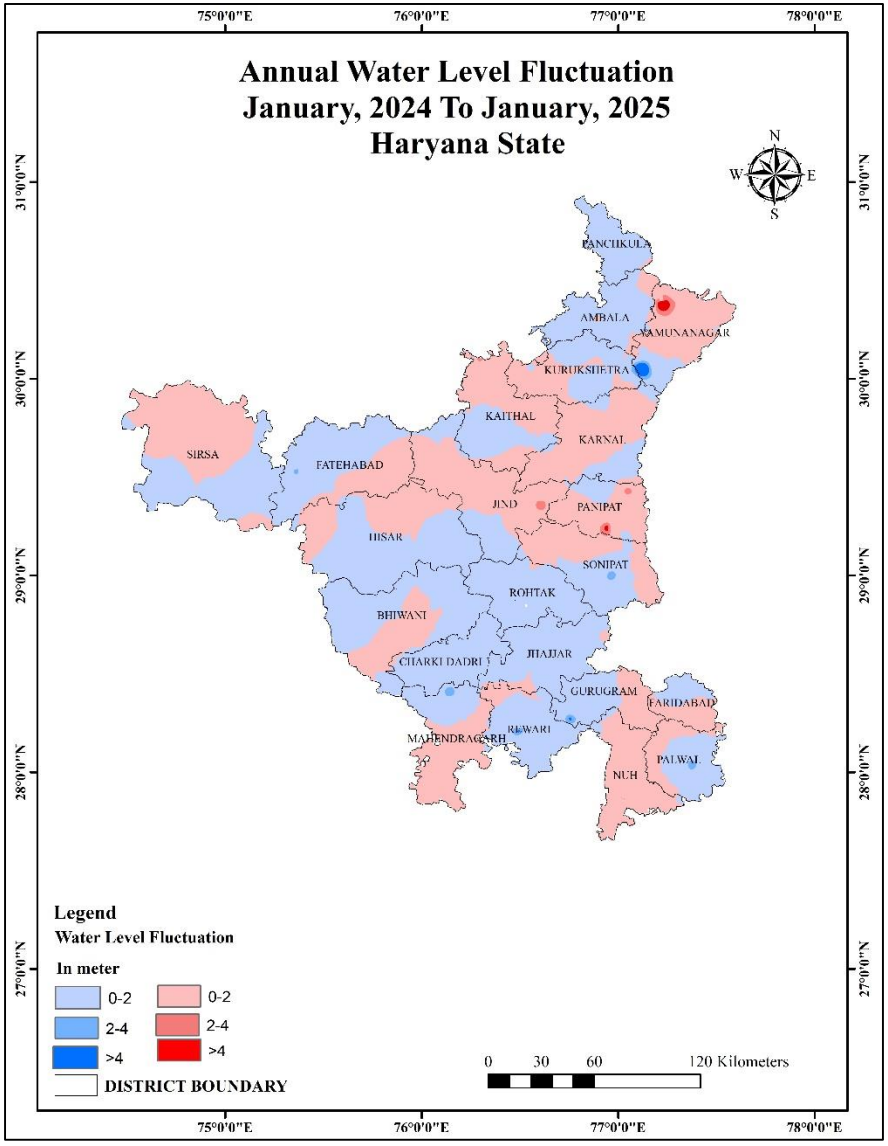

Figure-19: Annual water level fluctuation in Confined/Semi-Confined aquifer (January 2024 to January 2025)

4.2.2 ANNUAL FLUCTUATION IN WATER LEVEL

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

In order to know the impact of rainfall and ground water withdrawal during last one-year, annual water level fluctuations for period January 2024 and January 2025 for the confined aquifers and semi-confined aquifers are calculated. The behavior of annual fluctuations is discussed in the following paragraph and depicted in Fig 19.

Rise in Water Levels:

The water level rise has been recorded in 53.72% area of the State. Water level rise in the range of 0-2 m is observed in 53.34% of area. Water level rise 2-4m is observed in less than 1% of area. The water level rise of >4m is observed in less than 1% of area as in Kaithal, Jind, Fatehabad and Yamunanagar districts.

Fall in Water Levels:

The annual fluctuation depicts general decline of water levels in 46.28% area of the State. The decline has been observed in most of the districts of the state. Water level decline the range of 0-2 m is observed in 45.96% of the area. Water level decline in the range of 2-4 m is observed in less than 1% of the area. Whereas, the water level decline of >4m is observed in less than 1% of the area during the period in Yamunanagar district.

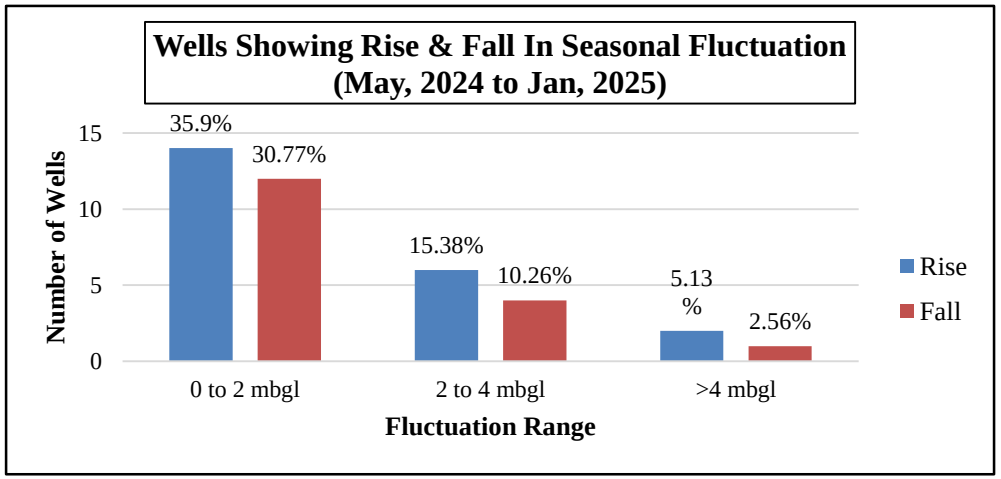

Figure-20: Percentage of wells showing rise and fall in WL in Confined aquifer (May 2024 to January 2025)

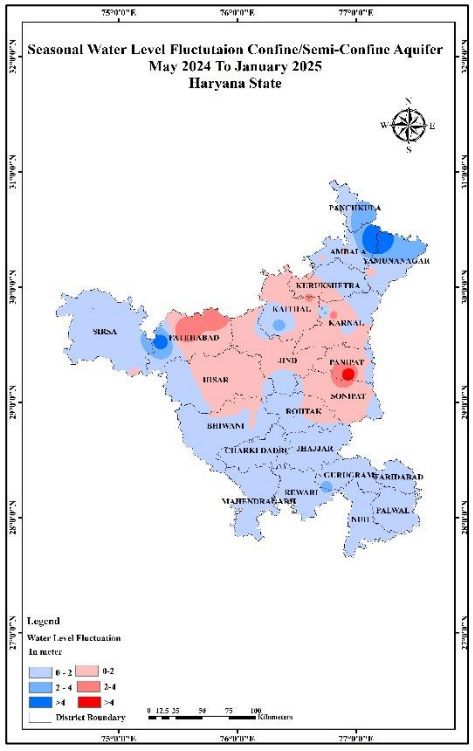

Figure-21: Seasonal water level fluctuation in Confined Aquifer (May 2024 to January 2025)

4.2.3 SEASONAL FLUCTUATION IN WATER LEVEL

Seasonal Fluctuation of Water Level in Confined Aquifer (May 2024 to January 2025)

Water level data of January 2025 when compared with previous measurement data i.e. May 2024 is termed as seasonal water level fluctuations. The behavioral pattern of this seasonal fluctuation is discussed below. The map depicting seasonal water level fluctuations of Confined Aquifer is shown in Fig.21.

Rise in Water Levels:

The water level rise has been recorded in 56.41% of wells monitored and covering 66.38% area of the State. Water level rise in the range of 0-2 m is observed in 35.9% of wells and 60.60% of the area. Water level rise 2-4m is observed in 15.38% of the wells & 4.31% area. Water level rise of >4m is observed in 5.13% wells and in 1.46% area as isolated patches in Hisar, Kaithal, Jind, Karnal and Ambala districts.

Fall in Water Levels:

The seasonal fluctuation shows that there is a general decline of water levels in 43.59% of wells monitored and covering 33.62% area of the State. The decline has been observed in all districts except some isolated patches scattered over the state. Water level decline in the range of 0-2 m is observed in 30.77% of wells and 30.40% of area. Water level decline in the range of 2-4 m is observed in 10.26% of wells and 2.84% of area. Water level decline of >4m is observed in 2.56% of wells and less than 1% of area as isolated patches in Hisar, Kaithal and Karnal districts.

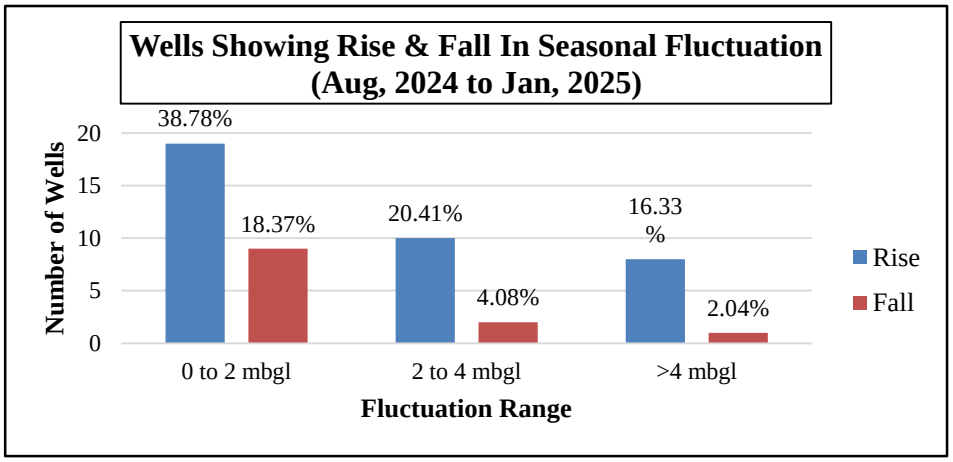

Figure-22: Percentage of wells showing rise and fall in WL in Confined aquifer (Aug 2024 to January 2025)

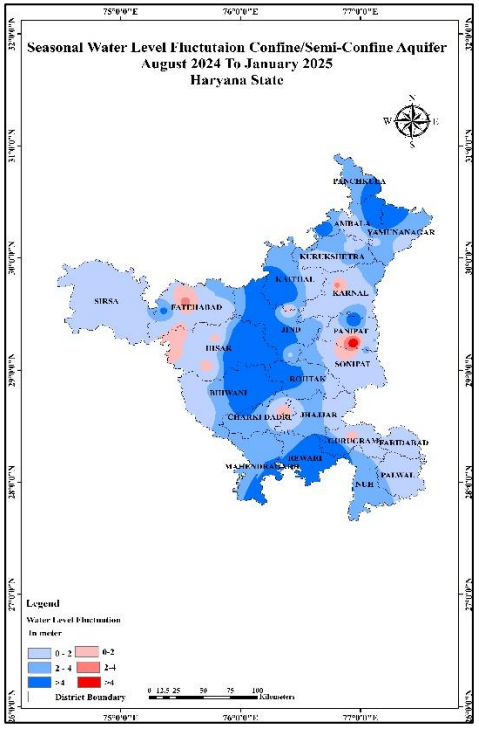

Figure-23: Seasonal water level fluctuation in Confined Aquifer (August 2024 to January 2025)

4.2.4 SEASONAL FLUCTUATION IN WATER LEVEL

Seasonal Fluctuation of Water Level in Confined Aquifer (August 2024 to January 2025)

Water level data of January 2025 when compared with previous measurement data i.e. August 2024 is termed as seasonal water level fluctuations. The behavioral pattern of this seasonal fluctuation is discussed below. The map depicting seasonal water level fluctuations of Confined Aquifer is shown in Fig.23.

Rise in Water Levels:

The water level rise has been recorded in 75.52% of wells monitored and covering 95.39% area of the State. Water level rise in the range of 0-2 m is observed in 38.78% of wells and 43.46% of the area. Water level rise 2-4m is observed in 20.41% of the wells & 30.62% area. Water level rise of >4m is observed in 16.33% wells and in 21.30% area as isolated patches in Hisar, Kaithal, Jind, Karnal and Ambala districts.

Fall in Water Levels:

The seasonal fluctuation shows that there is a general decline of water levels in 24.48% of wells monitored and covering 4.61% area of the State. The decline has been observed in very fewer patches in few districts. Water level decline in the range of 0-2 m is observed in 18.37% of wells and 4.05% of area. Water level decline in the range of 2-4 m is observed in 4.08% of wells and less than 1% of area. Water level decline of >4m is observed in 2.04% of wells and less than 1% of area as isolated patches in Panipat district.

5.0 Recommendations to improve decline in Groundwater

The declining trend of ground water level in Haryana can be improved by Demand and Supply-Side Interventions for Water Conservation which are as given below:

1. **Demand Side Interventions**

i. Change in Paddy Variant – Switching from PUSA-44 (150 days maturity) to PR-126 (117 days maturity) can save 25% of groundwater.
ii. Use of AI and Tensiometers – AI-based irrigation and tensiometers help optimize water usage, reducing irrigation needs from 1102 mm/acre to 820 mm/acre.
iii. Reduction of Standing Water Column – Lowering the water column from 145 cm to 120 cm in rice cultivation reduces water consumption.

2. **Supply Side Interventions**

i. Artificial recharge structures in government buildings can aid groundwater conservation. Lining of Unlined Channels – Converting unlined irrigation channels to lined ones can reduce groundwater overdraft.
ii. Underground Pipelines – Expanding underground pipeline coverage can decrease groundwater development.
iii. Canal Water for Irrigation – Maximizing canal water usage can improve groundwater recharge and reduce dependence on groundwater.
iv. Artificial Recharge in Paleochannels – Excavating ponds and constructing recharge trenches in paleochannels can enhance groundwater recharge.
v. Reuse of Wastewater – Treating and reusing pond water through the 3-pond system or Thapar model, with solar-powered lifting, helps conserve groundwater.
vi. Construction of Injection Wells – Injection wells at minor canal outlets can use surplus canal water to recharge groundwater; a pilot project is already underway at Lehal Canal.
vii. Rainwater Harvesting – Installing rainwater harvesting