भूजल स्तर बुलेटिन

मॉनसून- पश्चात

(नवंबर 2024)

Ground water Level Bulletin

Post-Monsoon

(November 2024)

केन्द्रीय भूमि जल बोर्ड

मध्य-पूर्वी क्षेत्र

पटना

Central Ground Water Board
Mid-Eastern Region
Patna

1.0 INTRODUCTION

Groundwater bulletin is prepared by CGWB depicting changes in groundwater regime of the State 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 include 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 measured by the Central Ground Water Board four times a year, during January, March/April/May, August, and November. This regime of monitoring was initiated in 1969 by the Central Ground Water Board. For the state of Bihar, however, a network of 916 monitoring wells, known as National Hydrograph Network Stations (NHNS), is being used for monitoring.

ABOUT THE STATE

Bihar state lies between 83º 20' and 88º 00' E Longitudes and 24º 15' and 27º 23' N Latitudes. It shares international border with Nepal in the north and is bounded in the east, west and south by West Bengal, Uttar Pradesh and Jharkhand states respectively. The state covers geographical area of 94,163 Sq.km and has its capital at Patna (Fig 1).

Administratively the state is divided into 38 districts and 534 community development blocks.

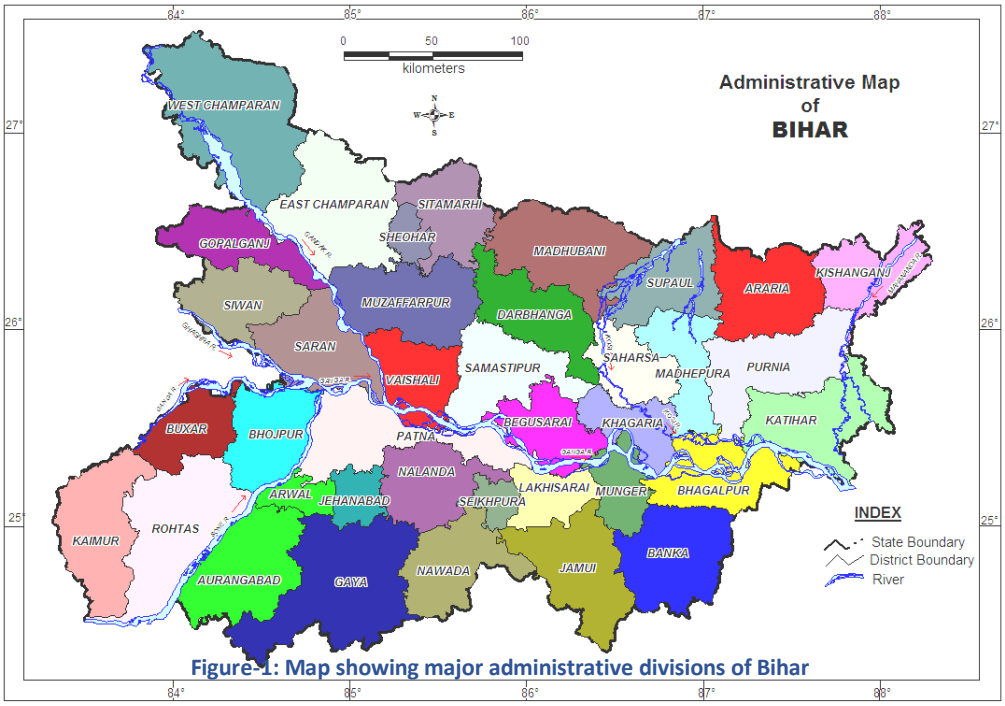

Figure-1: Map showing major administrative divisions of Bihar

Geologically, the state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. The Proterozoic and Archean Pre-Cambrian rocks, including granite, granitic-gneiss, quartzite, phyllites, slates, and metabasics, are prominent. The Chhotanagpur Granite Gneissic Complex (CGGC), with mica-bearing pegmatite in Gaya, Nawada, and Munger, is found near Jharkhand. Meta-sedimentary rocks like phyllite, schist, and quartzite also appear in these areas. Groundwater is influenced by the weathered mantle and saprolite zone thickness, ranging from 5 to 20 meters. It exists under unconfined conditions in the weathered mantle and saprolite zone and under confined to semi-confined conditions in joints and fractures.

The Vindhyan Super-Group, in Rohtas, Kaimur, and Aurangabad districts, includes sandstone, limestone, quartzite, and schist. These rocks are consolidated and mostly unaffected by tectonic disturbances. Vindhyan sandstones, with low primary porosity, host groundwater in the weathered residuum and secondary porosity under unconfined conditions. The weathered residuum is 5 to 10 meters thick.

The Siwalik formation, from the Upper Tertiary age, is found in West Champaran district. Comprising sandstone, conglomerate, red clay, and spongy limestone, these hills have faults and confined groundwater in deep sandstones.

Quaternary alluvium covers 89% of Bihar, with recent to sub-recent sediments over 300 meters thick in north Bihar plain, thinning southward. Groundwater is under unconfined conditions within 70 meters depth, with deeper aquifers exhibiting confined conditions.*(Source CGWB, Yearbook 2021-22)*

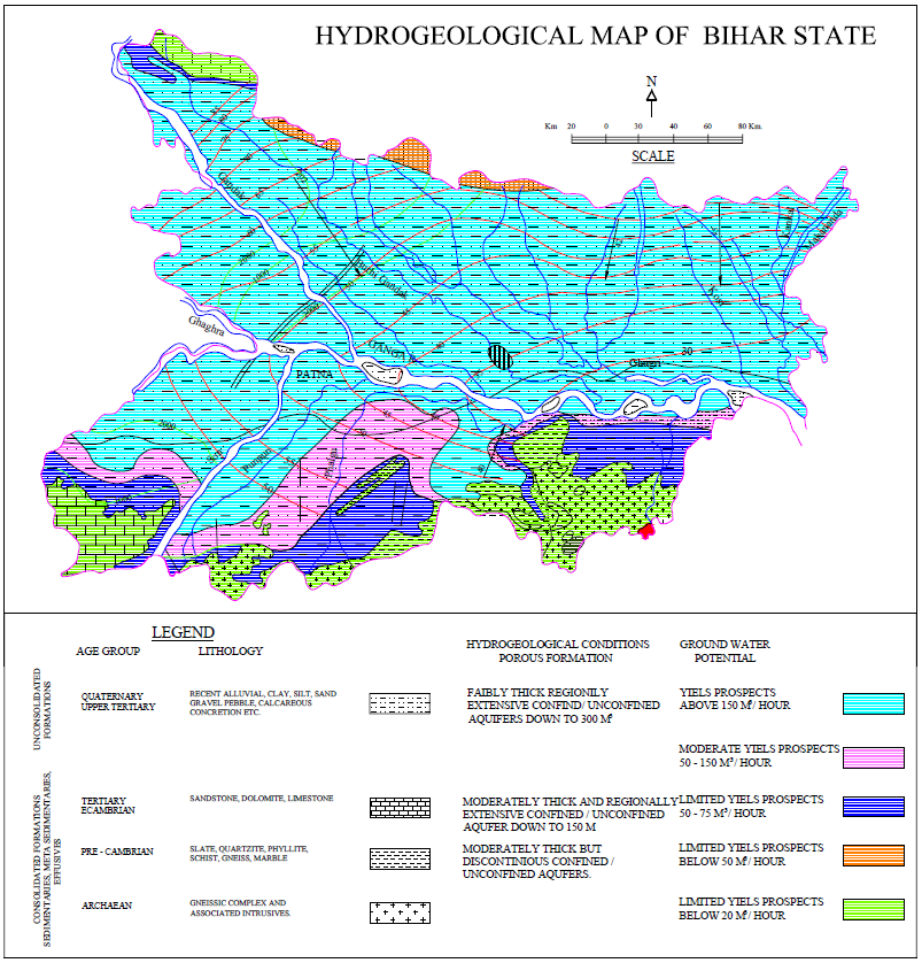

Figure-2: Hydrogeological Map of Bihar state

2.0 GROUND WATER LEVEL MONITORING

Central Ground Water Board, Mid Eastern Region, Patna, is monitoring changes in groundwater regime in the state on quarterly basis continuously. This is facilitated by a network of monitoring stations in the State located in diverse hydrogeological and geomorphic units. As of May 2024, there are 916 monitoring wells for groundwater regime monitoring. Out of the 916 monitoring stations, 817 are dug wells and the remaining 99 are piezometers. Groundwater level data was successfully collected from 778 of these wells. The remaining wells could not be monitored due to various factors. The district-wise breakup of the water level monitoring stations is given in **Table-1**.

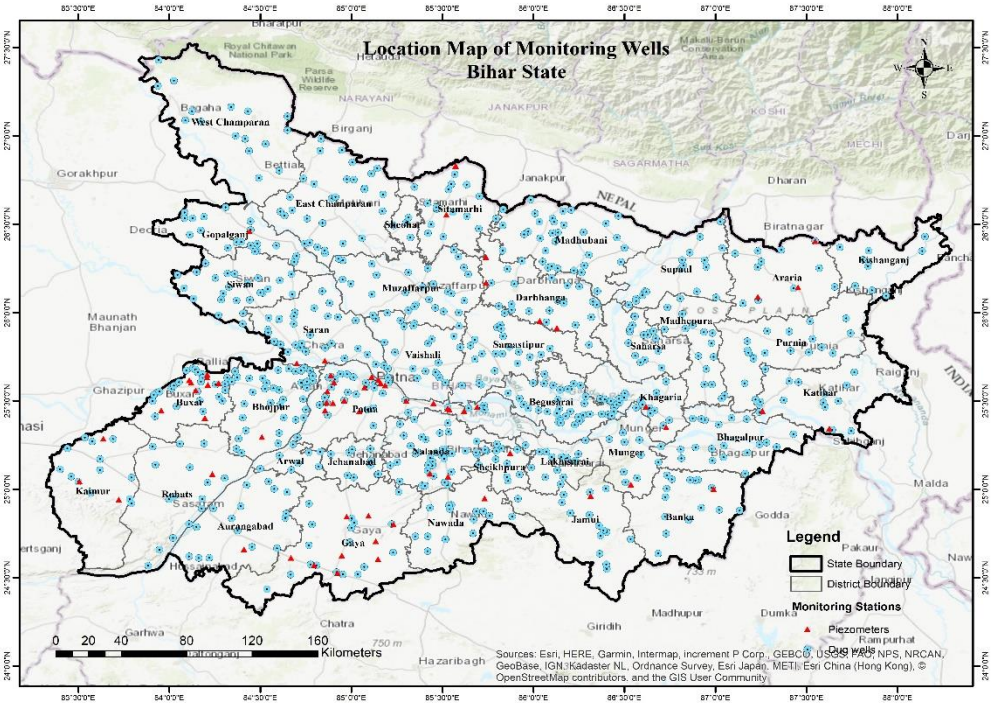

Figure 3- Map showing Location map of Monitoring wells Bihar

Table :1			
District-wise distribution of water level monitoring stations in Bihar			
Name of District	**No. of Dug wells**	**No. of Tubewells**	**Total**
ARARIA	9	4	13
ARWAL	10	0	10
AURANGABAD	15	3	18
BANKA	15	1	16
BEGUSARAI	36	0	36
BHAGALPUR	43	0	43
BHOJPUR	44	2	46
BUXAR	33	8	41
DARBHANGA	19	7	26
GAYA	17	11	28
GOPALGANJ	22	4	26
JAMUI	16	1	17
JEHANABAD	9	2	11
KAIMUR (BHABUA)	14	3	17
KATIHAR	17	3	20
KHAGARIA	17	1	18
KISHANGANJ	10	0	10
LAKHISARAI	12	0	12
MADHEPURA	16	0	16
MADHUBANI	24	0	24
MUNGER	11	0	11
MUZAFFARPUR	28	0	28
NALANDA	41	4	45
NAWADA	15	1	16
PASHCHIM CHAMPARAN	18	3	21
PATNA	39	26	65
PURBI CHAMPARAN	37	1	38
PURNIA	19	0	19
ROHTAS	19	1	20
SAHARSA	18	0	18
SAMASTIPUR	24	3	27
SARAN	38	3	41
SHEIKHPURA	11	1	12
SHEOHAR	5	0	5
SITAMARHI	16	2	18
SIWAN	26	2	28
SUPAUL	25	0	25
VAISHALI	29	2	31
TOTAL	817	99	916

Depth To Water Level in Unconfined Aquifer (November 2024).

The depth to the water table was monitored in 679 dug wells across various districts. Water levels ranged from 0.18 mbgl in Muzaffarpur district to 10.4 mbgl in Rohtas district. The distribution of water levels is as follows:

a) Less than 2 mbgl: 12.6% of the monitored wells.
b) Between 2 and 5 mbgl: 65.8% of the monitored wells.
c) Greater than 5 mbgl: 22% of the monitored wells.

Shallow water levels, ranging from 2 to 5 mbgl, are predominantly observed across the state. Water levels between 5 and 10 mbgl occur in smaller patches of the state.

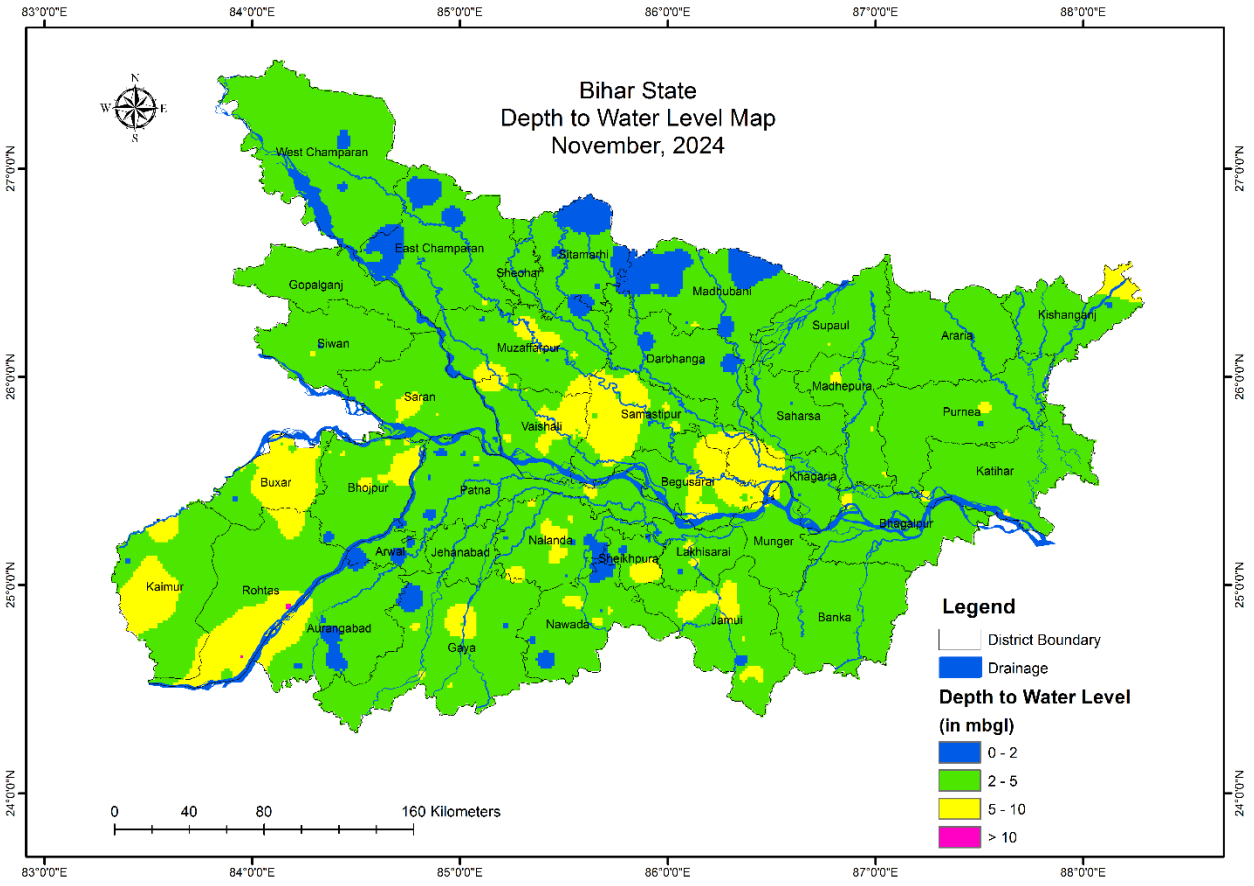

Figure 4- Map showing Depth to Water level map of Monitoring Stations (Dugwells) Bihar

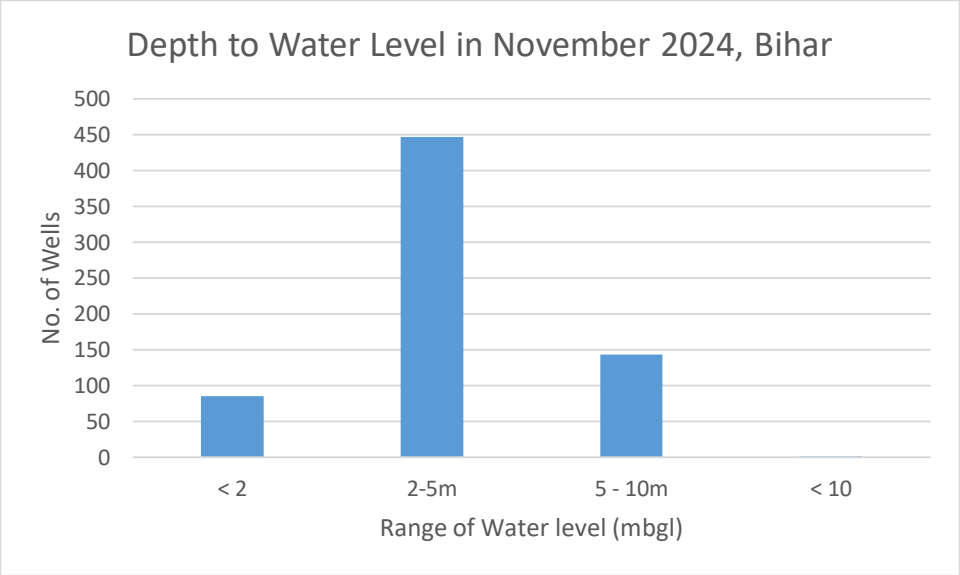

Figure 5- Graph showing Depth to Water level of Monitoring Stations (Dugwells) Bihar

Annual Fluctuation of Water Level in Unconfined Aquifer (Nov 2023 to Nov 2024)

Rise in Water Levels:

Out of 620 dug wells considered for analysis, 240 wells exhibited a rise in water levels, and out of 240 wells 80 % of wells recorded an increase of less than 2 meters and 14 % recorded an increase between 2 and 4 meters and 5% recorded more than 4. Rise of less than 2m are mainly observed in districts Aurangabad, Bhojpur, Buxar, Gaya Gopalganj, Kaimur(Bhabua), Lakhisarai, Muzaffarpur, Nalanda, Nawada, Pashchim Champaran, Patna, Purbi Champaran, Purnia, Rohtas, Sheikhpura, Sheohar, Sitamarhi, Siwan and Vaishali The 18% of wells that showed a rise of 2 to 4 meters were primarily located in Arwal, Aurangabad, Bhojpur, Gaya, Kaimur (Bhabua), Madhubani, Muzaffarpur, Nalanda, Nawada, Patna, Rohtas, Sheikhpura, Siwan. districts

Fall in Water Levels:

Out of 620 dug wells considered for analysis, 380 wells recorded a fall in water levels, and out of the 380 wells 87% of wells showed a decrease of less than 2 meters, while the 11% recorded a fall between 2 to 4 meters and 1.5% of wells recorded more than 4 m. A decrease of less than 2 meters was observed across all districts, significantly Jamui, Begusarai, Bhagalpur, Bhojpur, Buxar, and Darbhanga, districts. The 13 % of wells that showed a fall of 2 to 4 meters were primarily located in Bhojpur, Lakhishrai, and Buxar, districts.

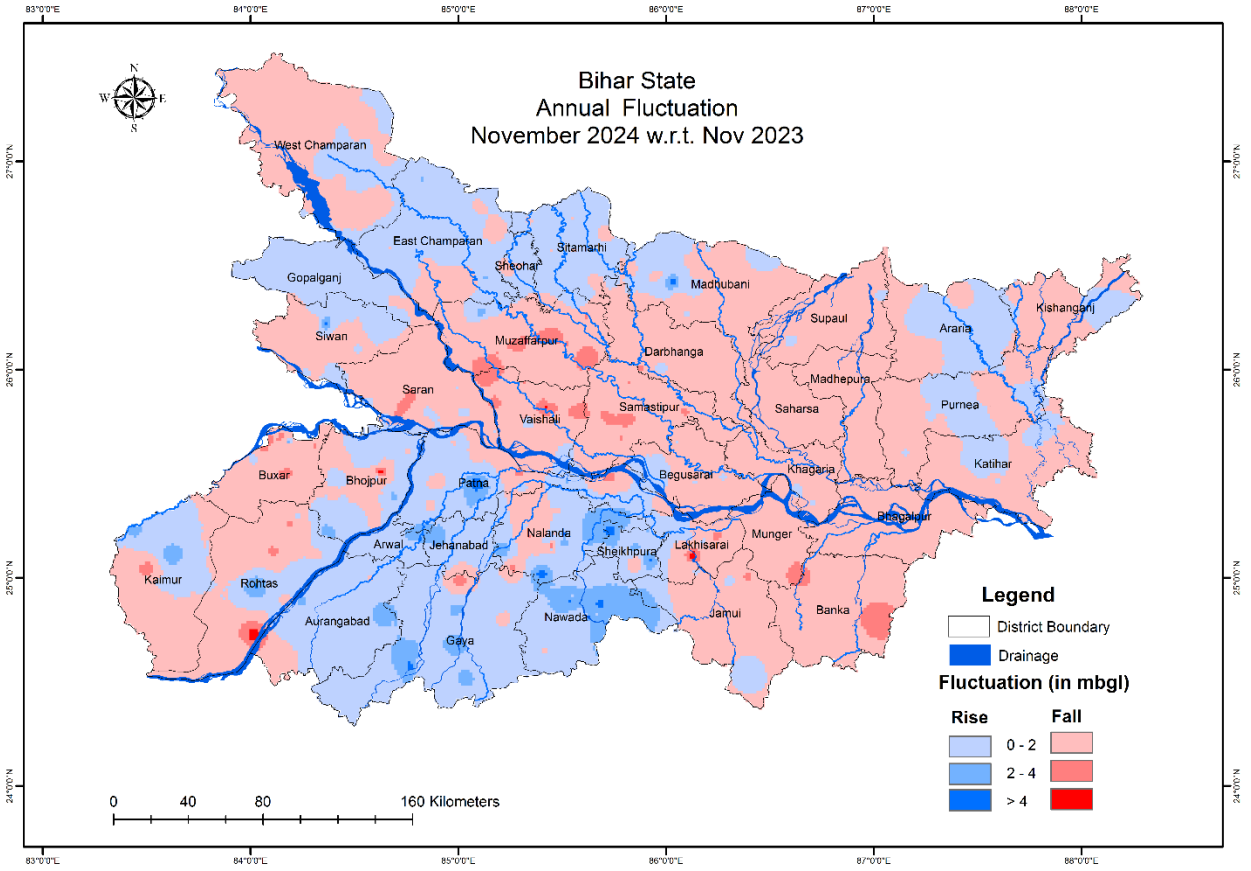

Figure 6-Map showing Annual Water level fluctuation map of unconfined aquifer of Bihar

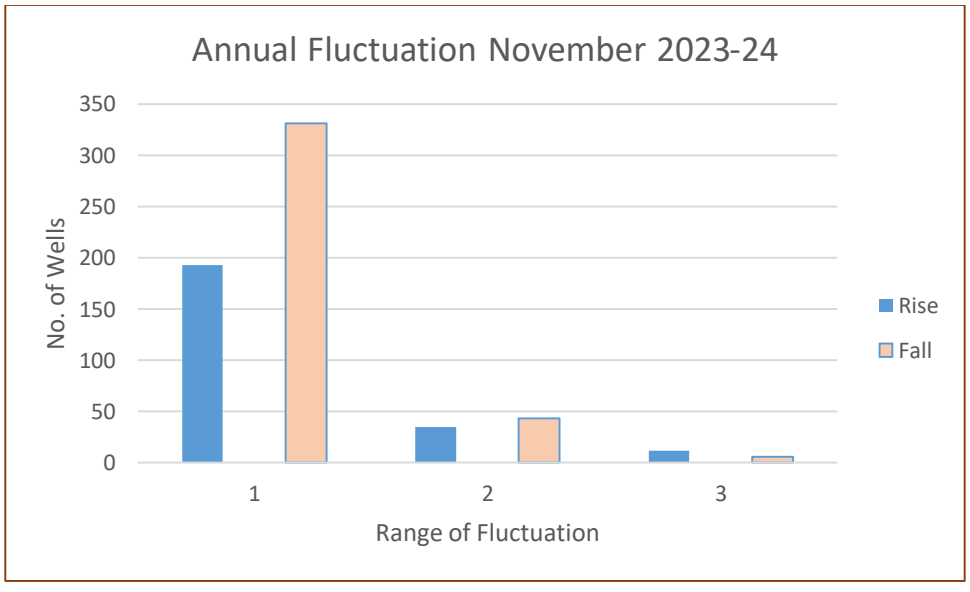

Figure 7- Graph showing Annual Water level fluctuation of Monitoring Stations (Dugwells) Bihar

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

Rise in Water Levels:

Out of 504 dug wells considered for analysis, 460 wells exhibited a rise in water levels, and out of 460 wells 65 % of wells recorded an increase of less than 2 meters and 27% recorded an increase between 2 and 4 meters while rest fall more than 4 meters. Rise of less than 2m are mainly observed in Begusarai, Bhojpur, Buxar, Darbhanga, Katihar, Madhepura, Madhubani, Samastipur, Purnia and Supaul districts. The 18% of wells that showed a rise of 2 to 4 meters were primarily located In Begusarai, Bhojpur, Rohtas, Saran and Sitamarhi districts.

Fall in Water Levels:

Out of 504 dug wells considered for analysis, 44 wells recorded a fall in water levels, and out of the 44 wells 91% of wells showed a decrease of less than 2 meters, while rest fall between 2 to 4 meters .A decrease of less than 2 meters was mainly observed in Nalanda and Supaul districts.

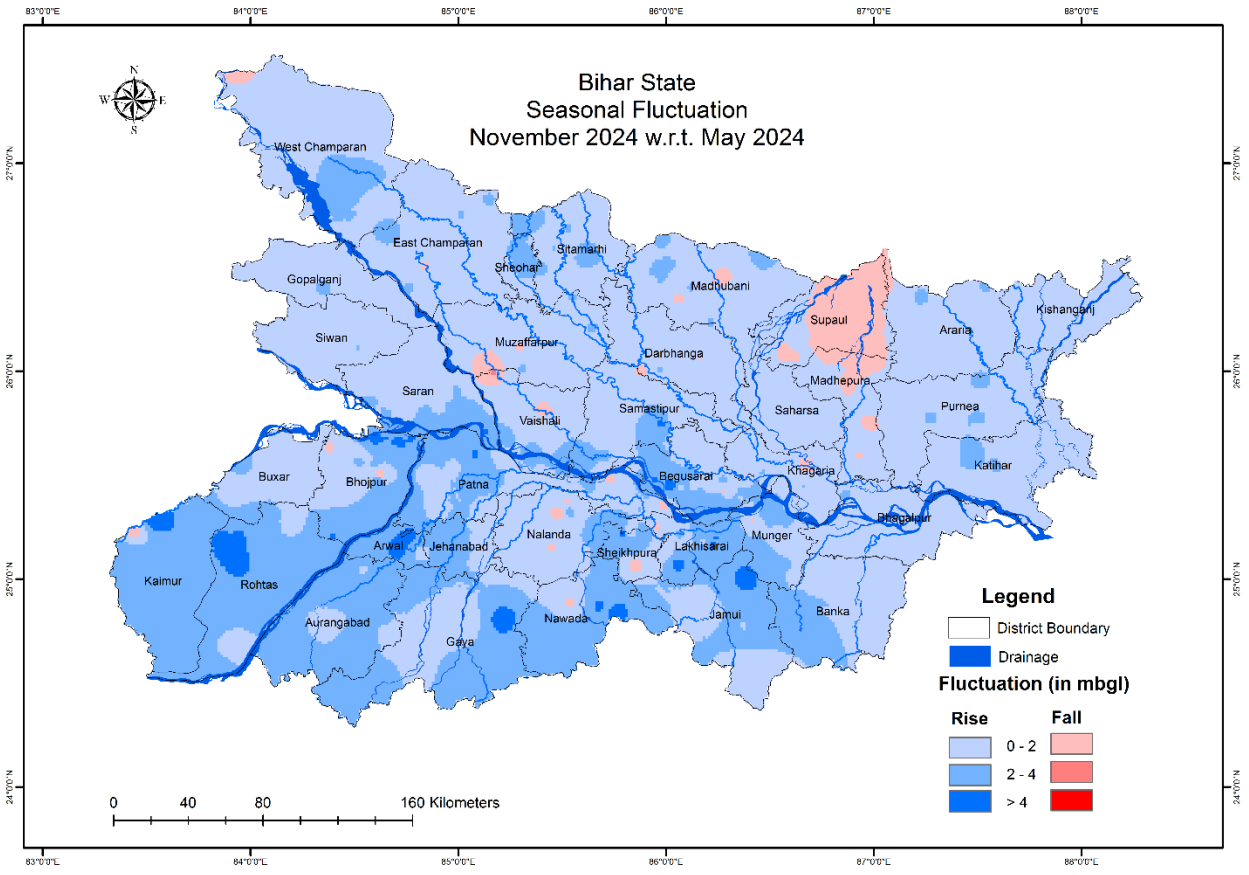

Figure 8- Map showing Seasonal Water level fluctuation map of unconfined aquifer of Bihar

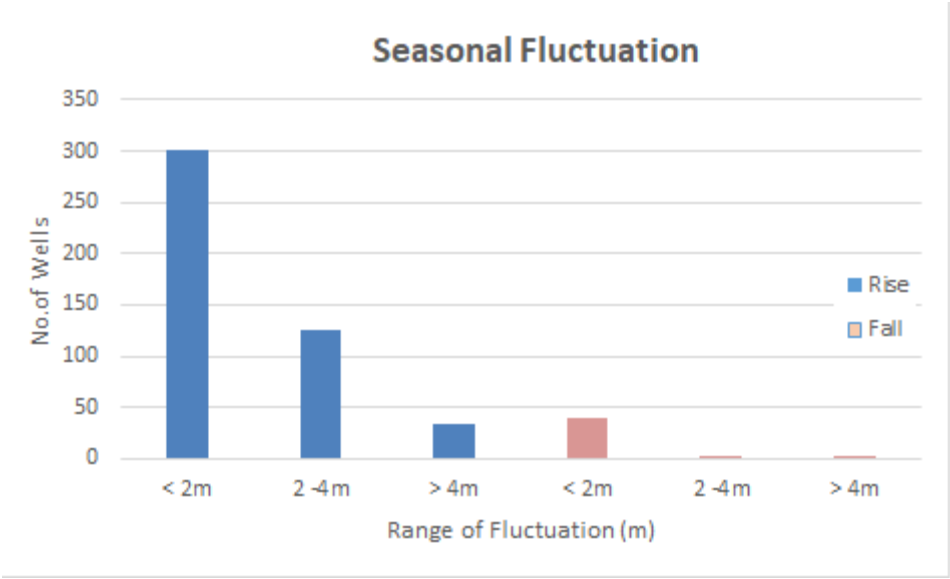

Figure 9- Graph showing Seasonal Water level fluctuation of Monitoring Stations (Dugwells) Bihar

Decadal Fluctuation of Water Level in Unconfined Aquifer (Decadal Mean Aug (2014-2023) to November 2024)

Rise in Water Levels:

Out of 261 dug wells considered for analysis, 109 wells exhibited a rise in water levels. Out of 109 wells, water level rise of less than 2 m is recorded in 96 % wells, 2 to 4 m in 11 % wells and more than 4 m in 2% of the wells. Water level rise of less than 2 m is seen in all the districts, significantly In Aurangabad, Darbhanga, Khagaria, Madhubani, Munger, Muzaffarpur, Gopalganj, Pashchim Champaran, Purbi Champaran, Samastipur, Saran and Sitamarhi districts and rise of more than 4 m is significantly observed In Aurangabad and Jamui districts.

Fall in Water Levels:

Out of the 261 wells considered for analysis, 152 wells that have exhibited fall in water levels, Out of 152 wells 91% have recorded less than 2 m while 8% in the range of 2 to 4 m and remaining 1% wells exhibited water level fall of more than 4 m. Fall of less than 2 m is observed in all districts mainly in parts of Begusarai, Katihar, Khagaria, Madhepura, Muzaffarpur, Purbi Champaran, Rohtas, Saran, Sheikhpura, Supaul and Vaishali districts. Fall beyond 2 m is recorded mainly in Khagaria, Begusarai, Madhepura, Muzaffarpur, Purbi Champaran, Samastipur and Siwan.

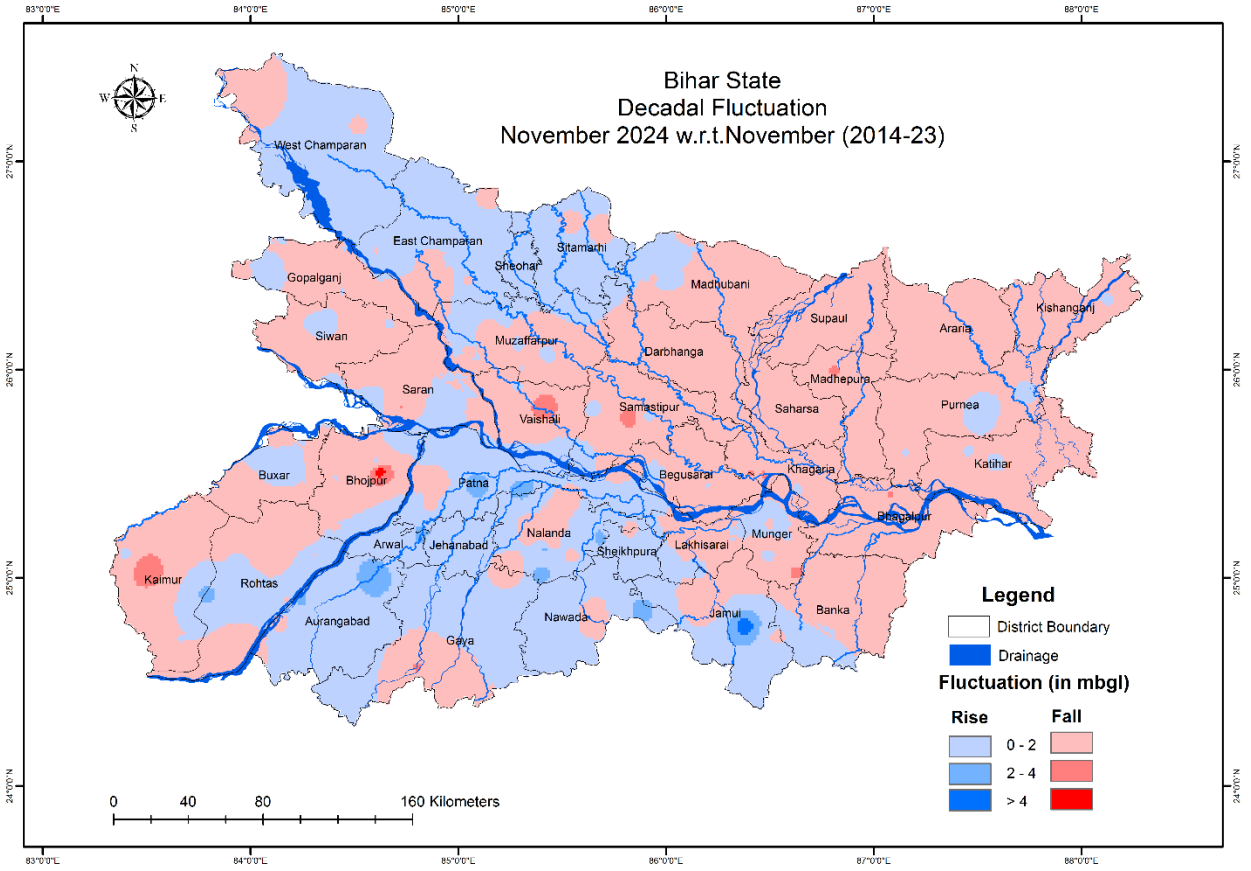

Figure 10- Map showing Decadal Water level fluctuation map of unconfined aquifer of Bihar

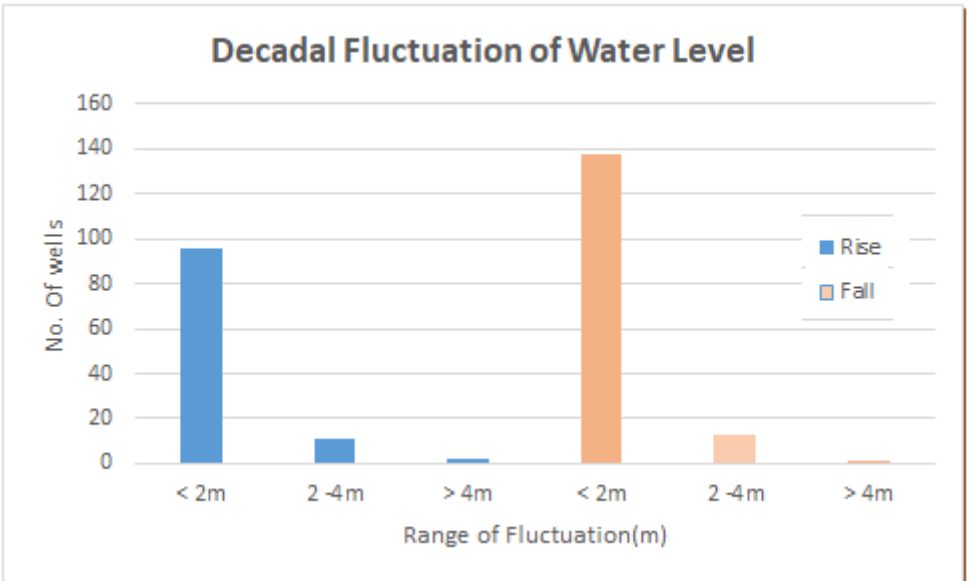

Figure 11- Graph showing Decadal Water level fluctuation map of unconfined aquifer of Bihar

Summary

As an essential component of the National Ground Water Monitoring Programme, the CGWB, MER, Patna conducts monitoring of the ground water conditions on a quarterly basis: In November 2024, the depth to the water table in unconfined aquifers across various districts of Bihar varied from 0.18 meters in Muzaffarpur to 10.4 meters in Rohtas, with the majority of wells having water levels between 2 and 5 meters below ground level. Seasonal and annual fluctuations showed both rises and falls in water levels, with a significant number of wells experiencing increases, particularly in the range of less than 2 meters, across districts like Aurangabad, Bhojpur, and Muzaffarpur. Conversely, many wells also showed declines, predominantly under 2 meters, in regions including Begusarai and Bhagalpur. Long-term data indicated consistent trends of water level changes, with most wells showing a rise of less than 2 meters, especially in districts like Aurangabad and Muzaffarpur, and falls in water levels in areas like Madhepura and Muzaffarpur.