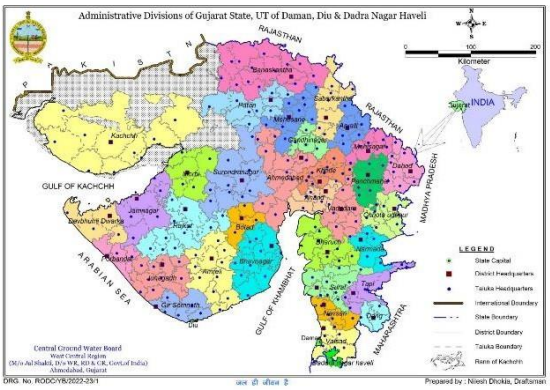
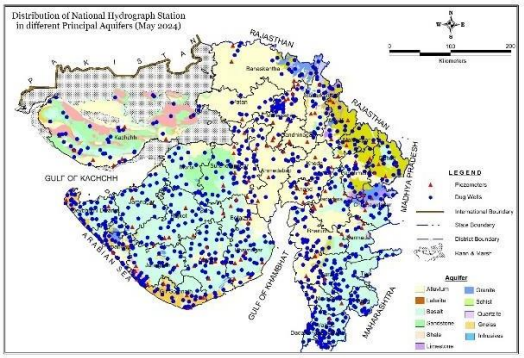
GROUND WATER LEVEL BULLETIN

May 2024

Gujarat





ABSTRACT

Ground water level Scenario during May-2024 highlighting the findings, status of ground water level in different aquifers and its annual and decadal comparison.

CGWB, WEST CENTRAL REGION, GUJARAT

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 is groundwater level. The natural conditions affecting the groundwater regime involve climatic parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include pumping 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 November. Initially, the monitoring commenced in the year 1969 with the establishment of 82 observation wells spread uniformly over the entire state, and since then, the number of stations were added regularly so as to get proper hydrological information of different hydrogeological and geo-morphological units.
A network of a network of 1293 observation wells called National Hydrograph Network Stations (NHNS), as on 31.03.2024 and 39 new stations established 30.05.2024, located all over the state is being monitored. Administrative map shown in Fig.-1.

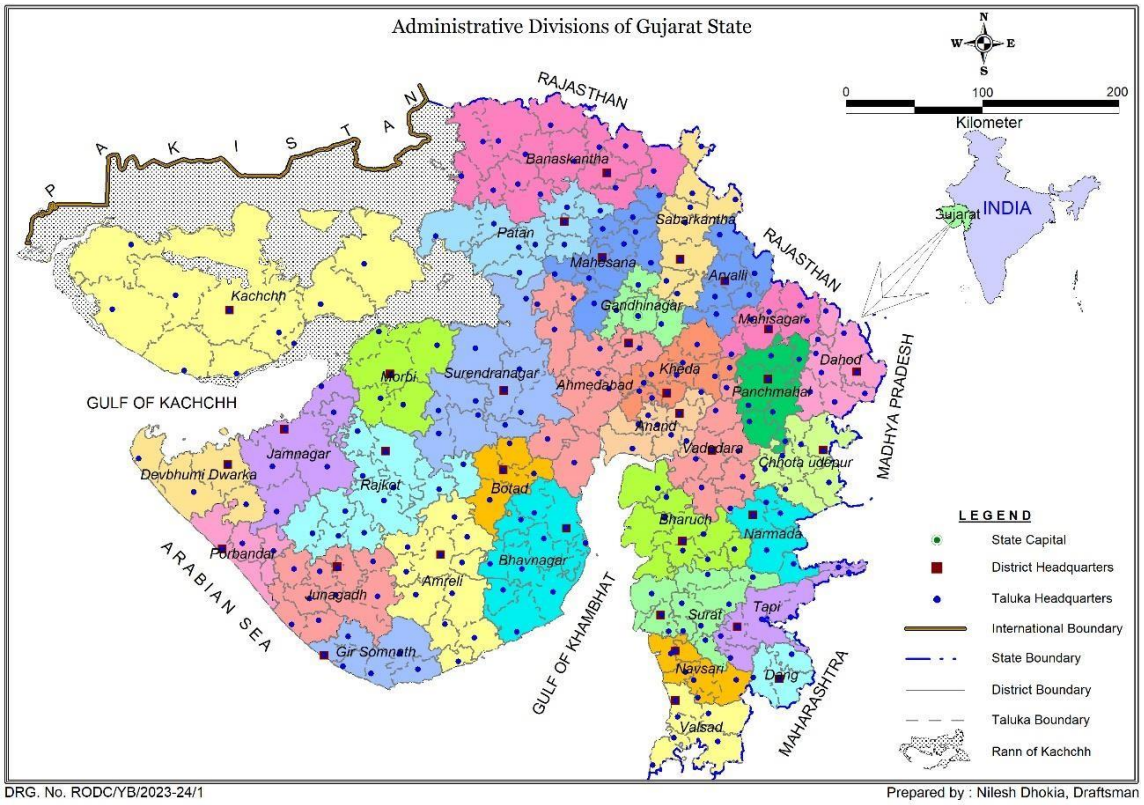


Figure 1: ***Map showing administrative divisions of Gujarat State***

Study Area

The Gujarat is one of India's most prosperous states is situated along the western coast of India between North latitudes 20° 06' 00" to 24° 42' 00" and East longitudes 68° 10' 00" to 74° 28' 00" (Figure. 1). It has nearly 1600 km long coastline, which is the longest as compared to any other state in the country. It is extending from Lakhpat in north to Daman in south. The State has common boundaries with the states of Rajasthan, Madhya Pradesh and Maharashtra and shares international border with Pakistan in northwest.

Gujarat is fifth largest state in India by area, covering about 1,96,024 km^2. There are

18,225 villages and 348 towns in Gujarat including 16 towns with more than 1,00,000 populations. The total population is 60,383,628 the state has a sex ratio of 918 females for every 1000 males of which 31,482,282 are males and 28,901,349 are females (2011 census).

Administratively, Gujarat currently has 33 districts. The capital of Gujarat is Gandhinagar, with Ahmedabad as its largest city. Kutch is the largest district of Gujarat while Dang is the smallest. Ahmedabad is the most populated district while Dang is the least. There are 252 Talukas (subdivisions of districts) in Gujarat.

Ground Water level monitoring

Central Ground Water Board, as a part of its national program, has established a network of observation wells in the state of Gujarat for periodic monitoring of groundwater levels and to study its quality variation in time and space. WCR, has set up a network of observation wells known as the Ground Water Monitoring Wells (GWMW's) located all over Gujarat which comprises 1293 GWMWs. The distributions of monitoring wells in different districts are given in Table 1. Map showing hydrograph stations monitored during the year and their distribution in different basin and the district is presented as Fig. 2

Table 1. The distributions of monitoring wells in districts.

S.N.	District	Number of Water Level Monitoring Stations 2024		
		Pz	Dug Well	Total
1	Ahmedabad	40	19	56
2	Amreli	11	43	54
3	Anand	21	13	33
4	Arvalli	8	15	20
5	Banas Kantha	42	19	52
6	Bharuch	7	30	34
7	Bhavnagar	17	35	48
8	Botad	3	7	10
9	Chhotaudepur	13	16	28
10	Dahod	15	24	33
11	Dangs	1	20	21
12	Devbhumi Dwarka	2	43	44
13	Gandhinagar	27		13
14	Gir Somnath	5	20	24
15	Jamnagar	8	21	25
16	Junagadh	11	39	49
17	Kachchh	51	44	86
18	Kheda	14	12	24
19	Mahesana	54	35	79
20	Mahisagar	5	12	16
21	Morbi	1	17	17
22	Narmada	11	8	19
23	Navsari	2	17	18
24	Panch Mahals	21	20	33

25	Patan	37	11	39
26	Porbandar	6	29	34
27	Rajkot	25	35	50
28	Sabar Kantha	10	26	35
29	Surat	6	39	45
30	Surendranagar	12	52	60
31	Tapi	1	17	17
32	Vadodara	16	15	29
33	Valsad	1	36	37
	Total	504	789	1293

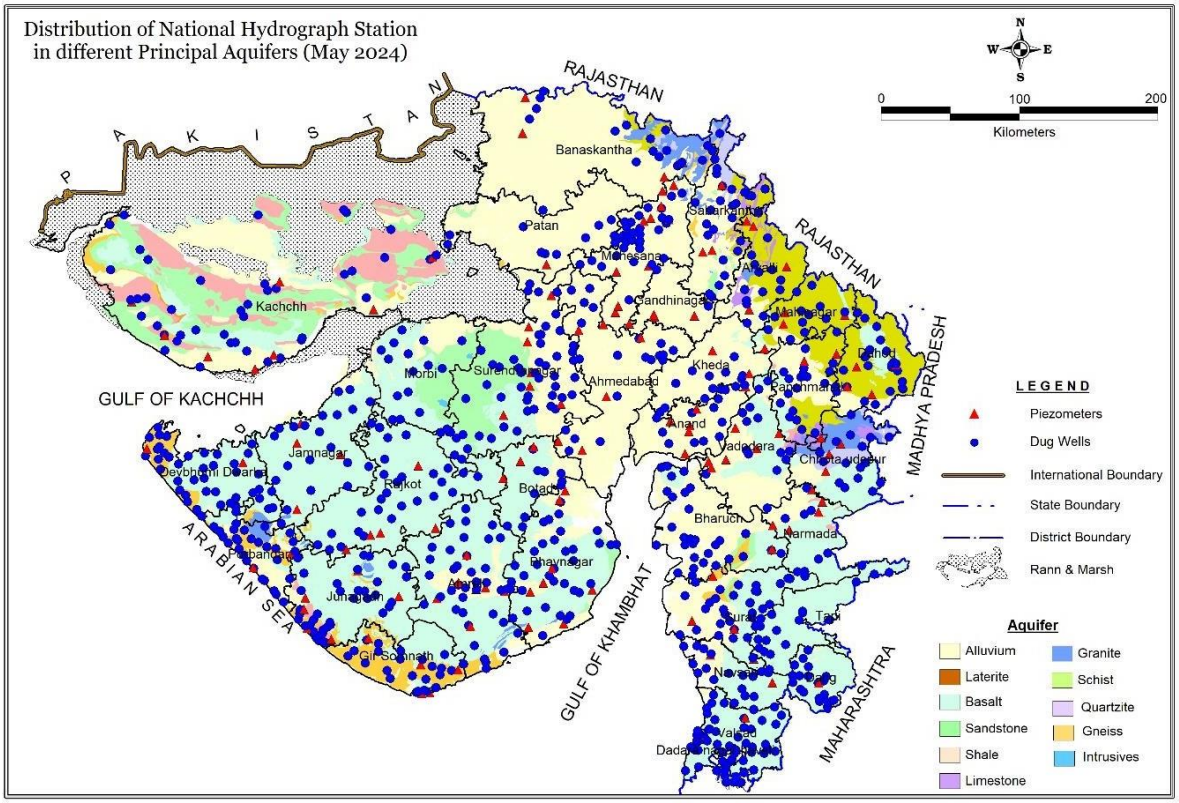


Figure 2 ***Map showing locations of monitoring wells (NHNS) in Gujarat state,***

GROUNDWATER SCENARIO (MAY 2024)

Depth to Water Level in Unconfined Aquifer (May 2024) – Gujarat State

The depth to water level of 919 wells are used for the analysis. Analysis of depth to water level data of 919 wells show that water levels vary between 0.67 m bgl (Tavi village, Surendranagar district) to 82.91 m bgl (Dhamadka village, Kachchh district). Water level of less than 2 m bgl is recorded in 4.2 % of wells, between 2 to 5 m bgl in 22.6% of wells, between 5 to 10 m bgl in 38.2% of wells, between 10 to 20 m bgl in 30.8 % of wells, between 20-40 m bgl in 7.2% of wells and water level more than 40 m bgl is registered in 0.6 % of wells. Shallow water level of less than 2 m bgl occurs as isolated patches in parts of Kachchh, Morbi,

Ahmedabad, Dahod, Tapi, Panchmahals, Jamnagar, Porbander, Surendranagar districts. Water level of 2 to 5 m bgl is observed in all the districts of Gujarat state except in Aravalli and Banaskantha. depth to water level of 5 to 10 m bgl is observed throughout the state except in Gandhinagar district. Water level of 10 to 20 m bgl with significant presence in Aravalli, Banaskantha, Mahesana, Sabarkantha, Surat, Valsad, Amreli, Bhavnagar, Gir Somnath, Devbhumi Dwarka, Junagadh, Porbander, Kachcha, Rajkot, Surendranagar districts. Water levels of 20-40 m covering mainly Banaskantha, Anand, Ahmedabad, Aravalli, Mahesana, vadodara, Amreli, Bhavnagar, Devbhumi Dwarka, Junagadh, Porbander districts. Deeper water level of more than 40 m covering districts of Banaskantha, Sabarkantha, Junagadh, Rajkot and Kachchh districts. Map and graph of Depth to Water Level in Unconfined Aquifer (May 2024) shown in Fig.3 and Fig.4 respectively.

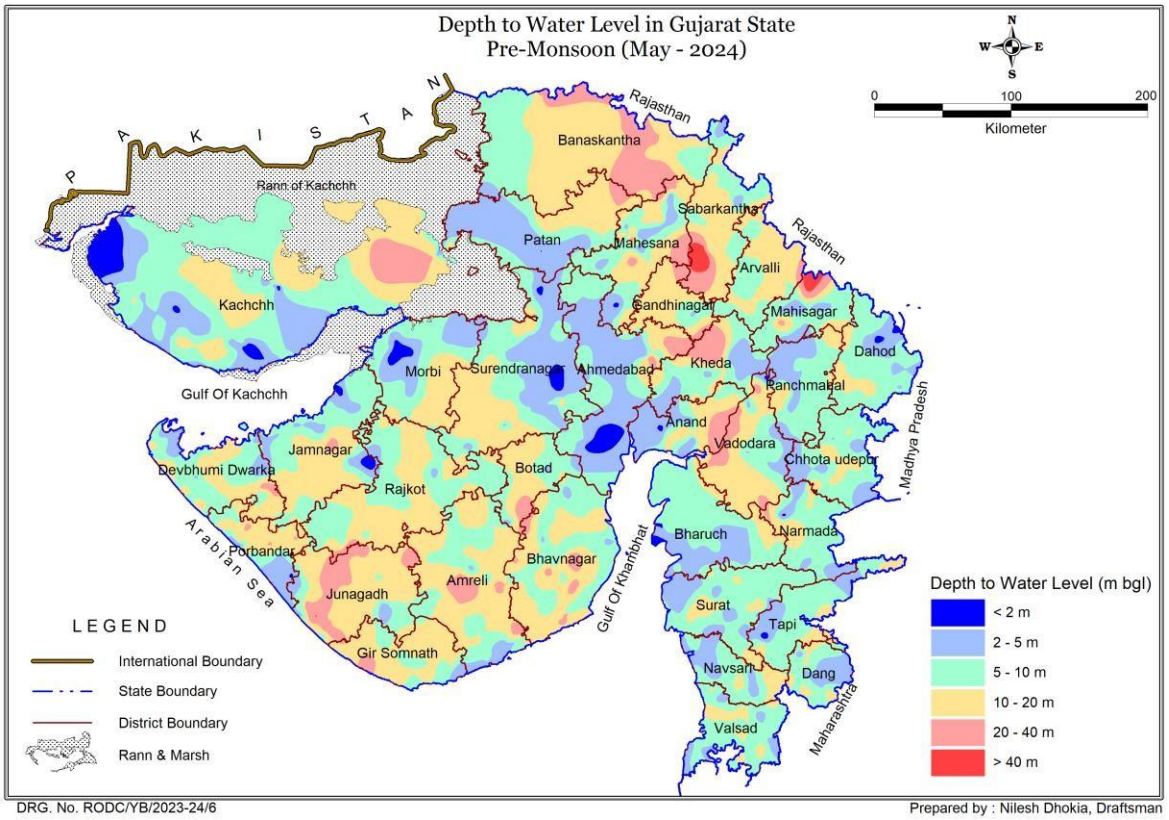


Figure 3: Depth to Water Level in Unconfined Aquifer (May 2024) – Gujarat State

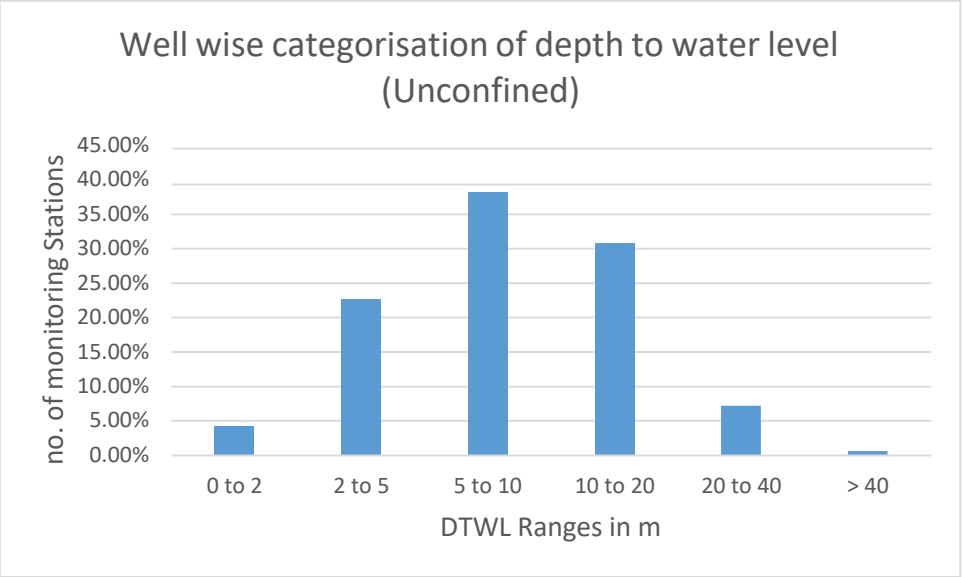


Figure 4: Well wise categorisation of depth to water level (Unconfined)

Depth to Water Level in Confined Aquifer (May 2024) - Gujarat State

The depth to water level of 309 wells is used for the analysis. Analysis of depth to water level data of 309 wells shows water levels vary between 1.5 m bgl (Dhanala village, Ahmedabad district) to 189.61 m bgl (Surajnagar village, Mahesana district). Water level of less than 2 m bgl is recorded in 1.9 % of wells, between 2 to 5 m bgl in 5.5% of wells, between 5 to 10 m bgl in 16.5% of wells, between 10 to 20 m bgl in 14.6 % of wells, between 20-40 m bgl in 17.5% of wells and water level more than 40 m bgl is registered in 44 % of wells. Map and graph of Depth to Water Level in Confined Aquifer (May 2024) shown in Fig.5 and Fig.6 respectively.

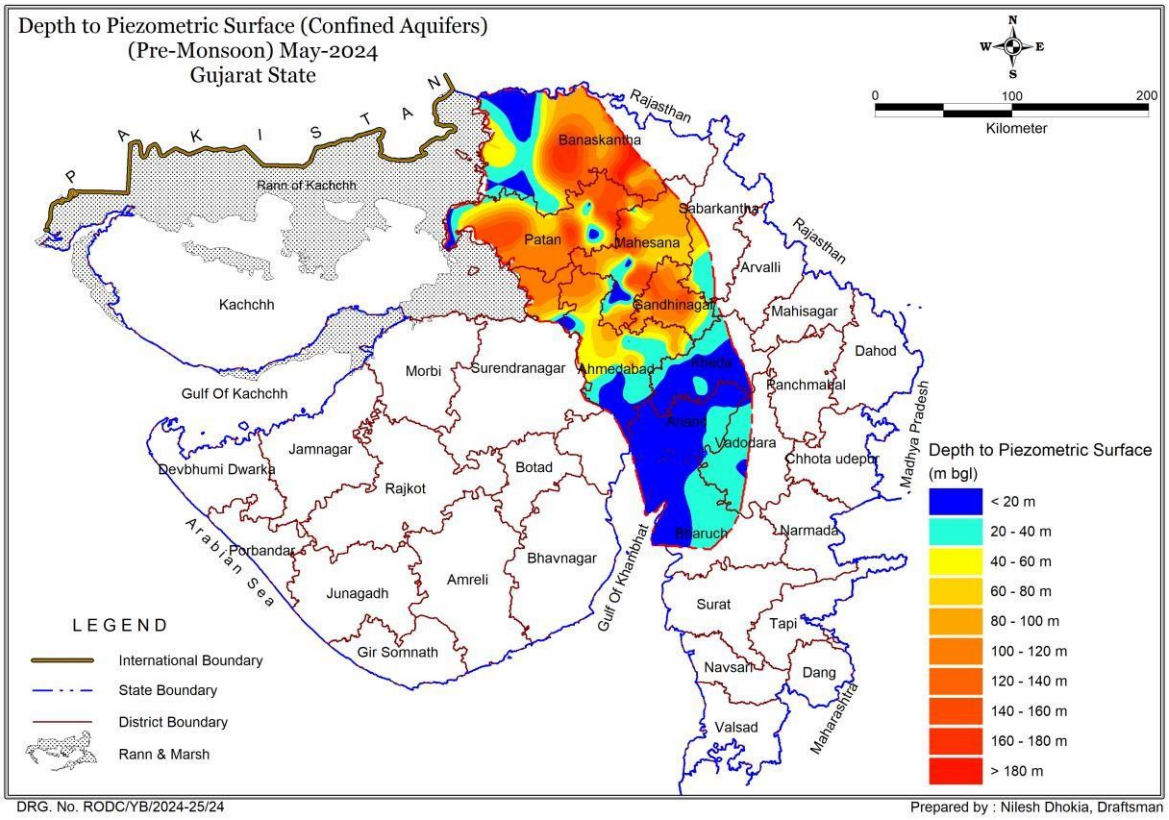


Figure 5: Depth to Water Level in Confined Aquifer (May 2024) - Gujarat State

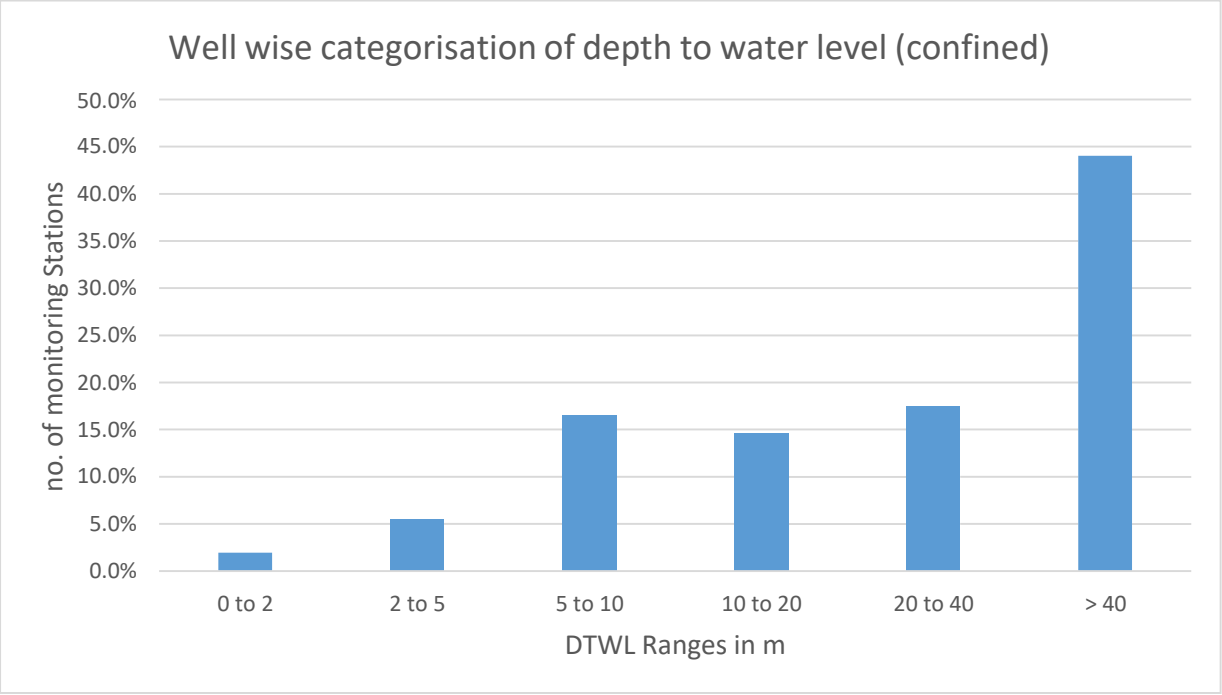


Figure 6: Well wise categorisation of depth to water level (confined)

Annual Water Level Fluctuation (May 2023 to May 2024)- Unconfined

Rise in Water Levels:

Out of 162 wells, water level rise of less than 2 m is recorded in 15.6% wells, 2 to 4 m in 3.1% wells and more than 4 m in 3.1% of the wells. Piezometric level rise of less than 2 m is seen in all the districts, Significantly in Ahmedabad, Banskantha, Kheda, Surat, Amreli, Bhavnagar, Morbi, Porbander, Surendranagar districts. Piezometric level rise of 2 to 4 m is observed mainly in districts such as, Jamnagar, Junagarh, Devbhumi Dwarka, Bhavnagar, Amreli, Valsad, Navsari, Sabarkantha, Aravali, Dahod, Ghandhinagar districts. Rise of more than 4 m is significantly observed in Aravalli, Dahod, Kheda, Mahesana, Sabarkantha, Dangs, Amreli, Bhavnagar, Devbhumi Dwarka, Gir Somnath, Junagarh, Porbander, Rajkot districts.

fall in Water Levels:

Out of 570 wells that have registered fall in water levels, 35.7% have recorded less than 2 m while 16.2% in the range of 2 to 4 m and remaining 26.3% wells registered piezometric level fall of more than 4 m. Fall of less than 2 m is mainly observed in parts of Ahmedabad, Mahesana, Patan, Anand, Narmada, Surat, Valsad, Morbi, Surendranagar, Kachch districts. Fall of 2 to 4 m is observed mainly in Rajkot, Devbhumi Dwarka, Bhavnagar, Valsad, Tapi, Dangs, Surat, Navsari, Chhotaudepur, Narmada, Panchmahal region. Fall of beyond 4 m is observed in Aravalli, Banaskantha, Sabarkantha, Vadodara, Junagarh, Rajkot districts. Map and graph of Annual Water Level Fluctuation (May 2023 to May 2024)- Unconfined shown in Fig.7 and Fig.8 respectively.

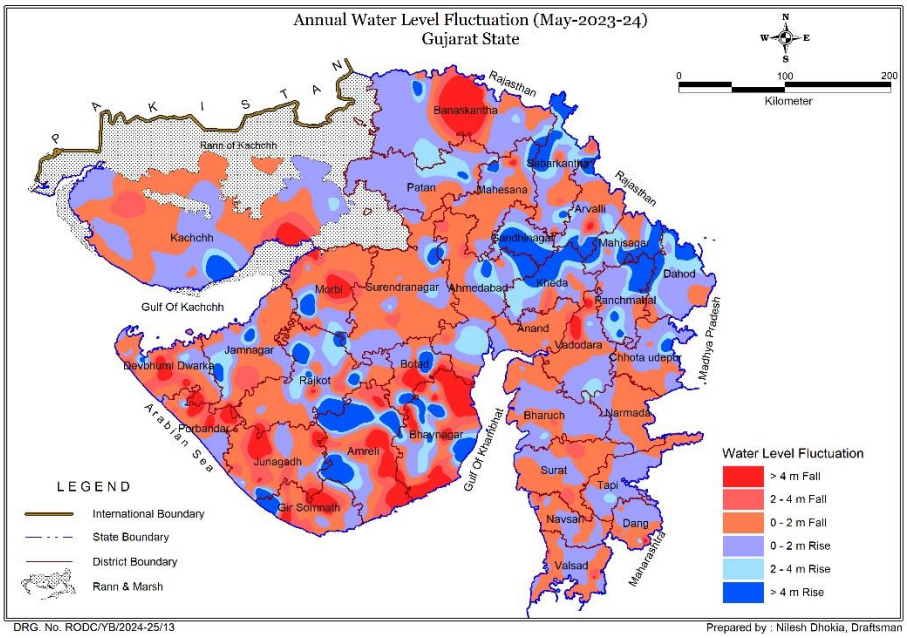


Figure 7: Annual Water Level Fluctuation (May 2023 to May 2024)- Unconfined

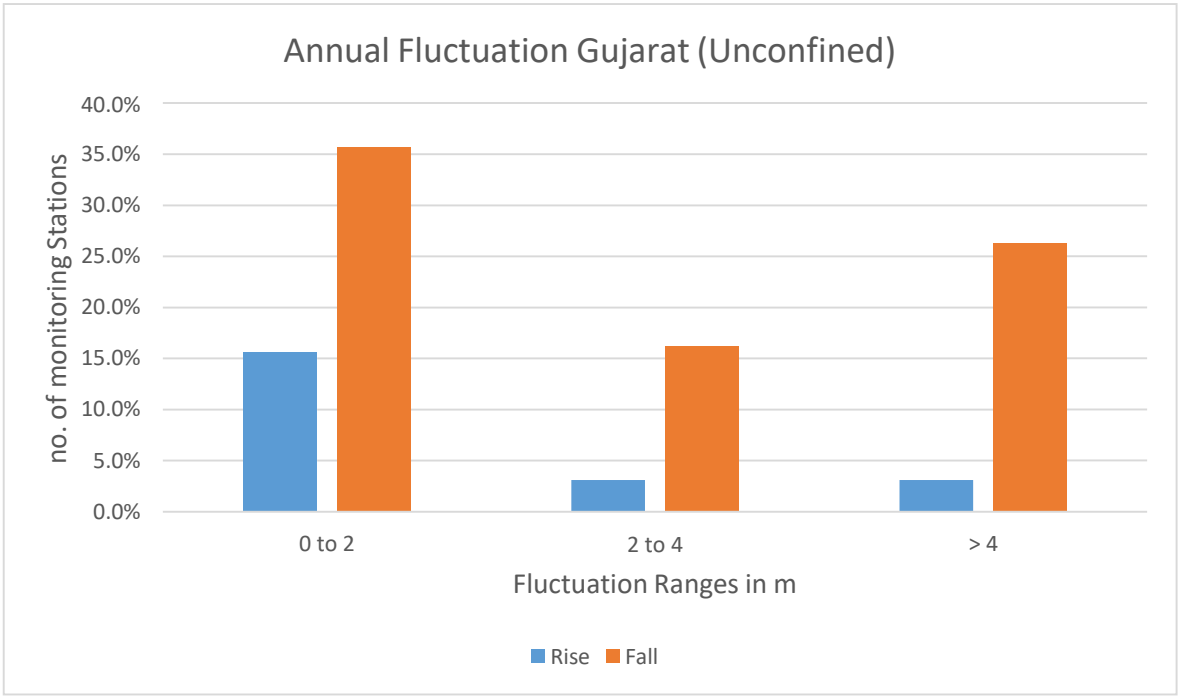


Figure 8: Annual Water Level Fluctuation (May 2023 to May 2024)- Unconfined

Annual Water Level Fluctuation (May 2023 to May 2024)- Confined

Rise In Piezometric Levels:

Out of 45 wells, piezometric level rise of less than 2 m is recorded in 45.5% wells, 2 to 4 m in 16.4% wells and more than 4 m in 20% of the wells. Piezometric level rise of less than 2 m is seen in all the districts, Significantly in Ahmedabad, Mahesana, Banaskantha, Vadodara, Kachch districts. Piezometric level rise of 2 to 4 m is observed mainly in districts such as, Anand Ghandhinagar, Kheda, Bharuch, Kachch districts. Rise of more than 4 m is significantly observed in Ahmedabad, Ghandhinagar, Patan, Bhavnagar, Kheda, Banaskantha districts.

Fall in Piezometric Levels:

Out of 10 wells that have registered fall in piezometric levels, 18.2% have recorded less than 2 m Fall of less than 2 m is mainly observed in parts of Rajkot, Morbi, Patan, Mahesana, Banaskantha, Ahmedabad districts. Map and graph of Annual Water Level Fluctuation (May 2023 to May 2024)-confined shown in Fig.9 and Fig.10 respectively.

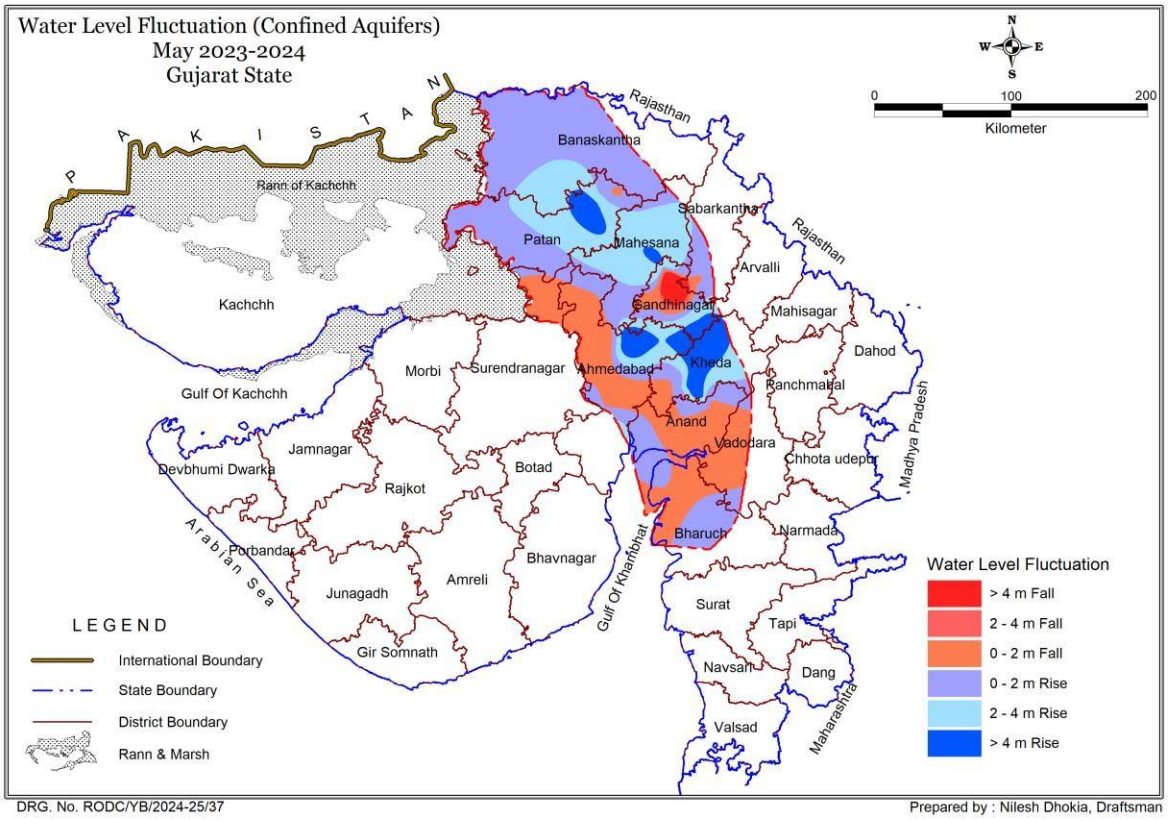


Figure 9: Annual Water Level Fluctuation (May 2023 to May 2024)- Confined

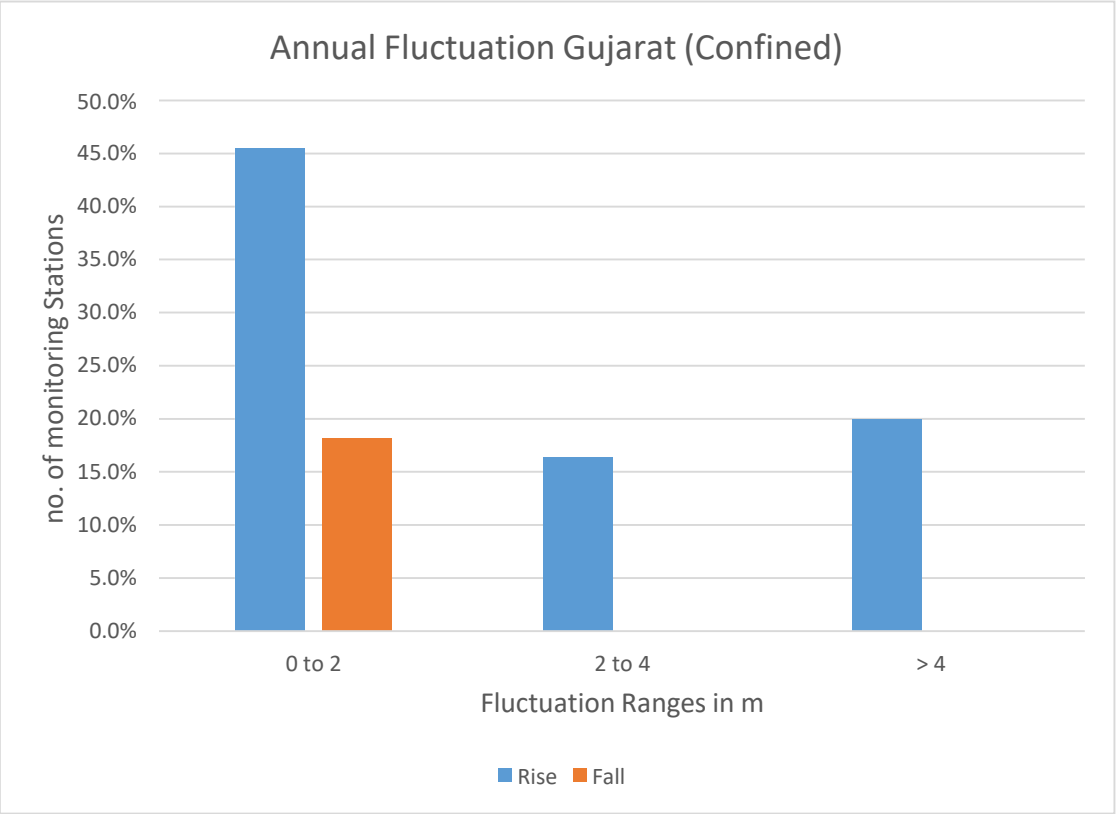


Figure 10: Annual Water Level Fluctuation (May 2023 to May 2024)- Confined

Decadal Fluctuation in Unconfined Aquifer (Decadal Mean May (2014-2023) to May 2024)

Rise in Water Levels:

Out of 963 wells, water level rise of less than 2 m is recorded in 6.36%wells, in all districts except Bhavnagar 2 to 4 m in 7.8% wells in all districts and more than 4 m in 19.65% of the wells in all districts

Fall in Water Levels:

Out of the 75 wells that have registered fall in water levels, Water level rise of less than 2 m is seen in 1.54% Water level fall of 2 to 4 m is observed in 0.96% and fall of more than 4 m is seen in 0.77% Water level significantly observed in Dahod, Kheda, Mahesana, Sabar Kantha, Bhavnagar, Devbhumi Dwarka, and Gir Somnath, districts. Map and graph of Decadal Fluctuation in Unconfined Aquifer (Decadal Mean May (2014-2023) to May 2024) shown in Fig.11 and Fig.12 respectively.

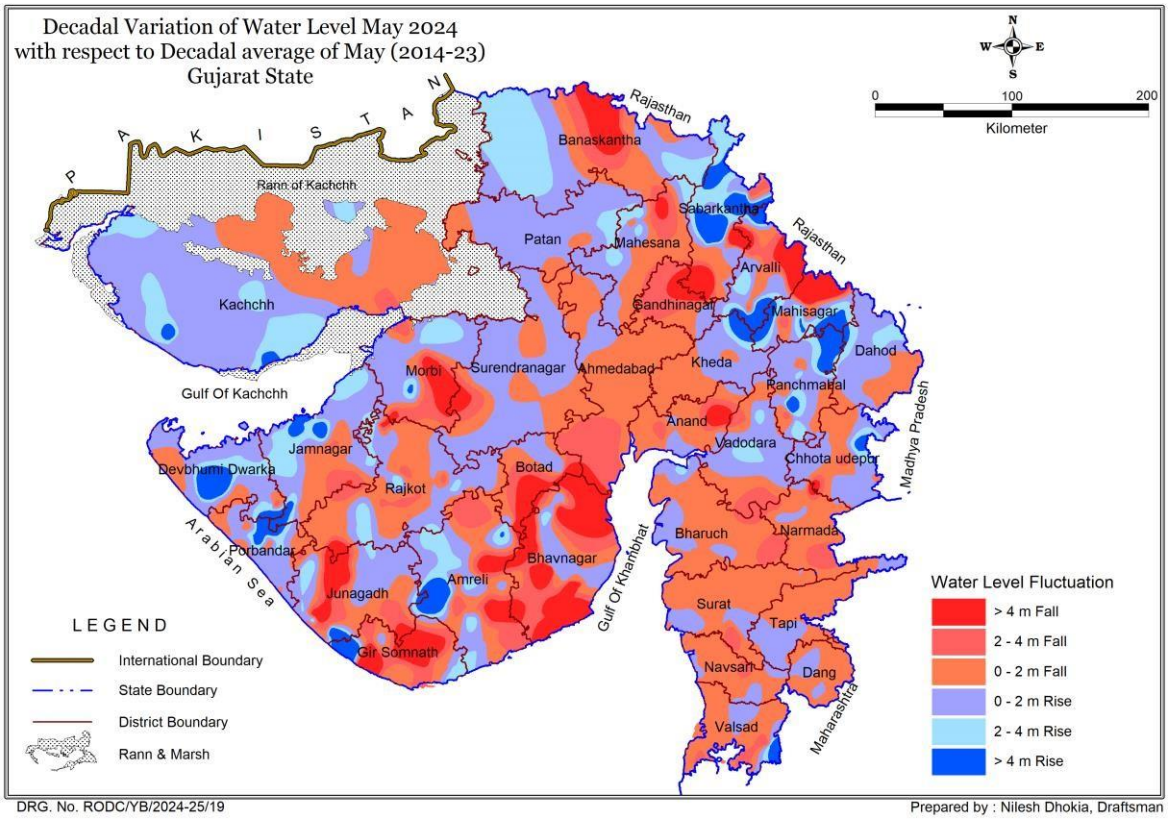


Figure11: Decadal Fluctuation in Unconfined Aquifer (Decadal Mean May (2014-2023) to May 2024)

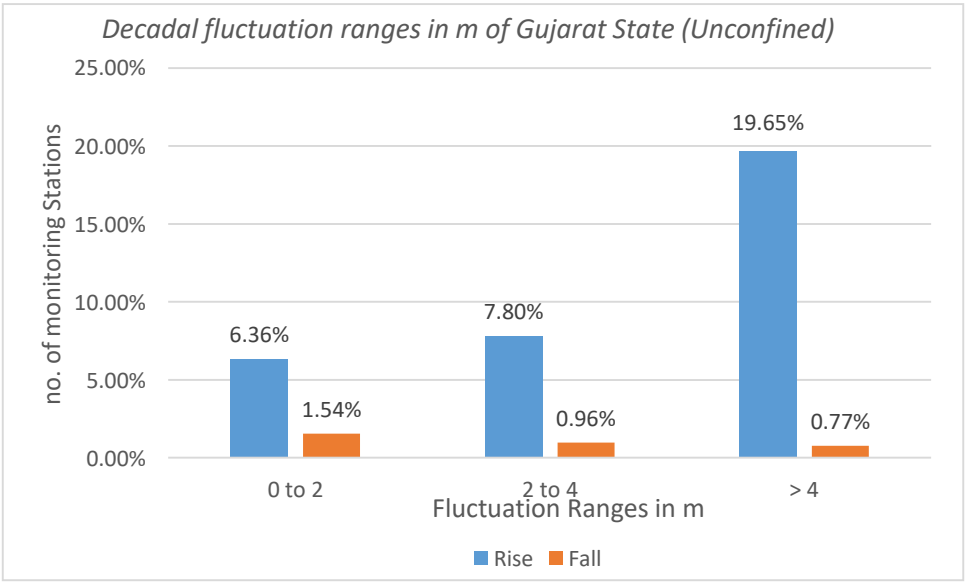


Figure 12: Decadal fluctuation ranges in m of Gujarat State (Unconfined)

Decadal Fluctuation of Piezometric Level in Confined / Semi- confined Aquifer (Decadal Mean May 2014-2023) to May 2024)

Rise in piezometric levels:

Out of 125 wells, piezometric level rise of less than 2 m is recorded in 5.8% wells, 2 to 4 m in 13.0% wells and more than 4 m in 71.7% of the wells. Piezometric level rise of less than 2 m is seen in all the districts, significantly in, Anand,. Piezometric level rise of 2 to 4 m is observed mainly in Ahmedabad, Anand, Bharuch, Vadodara, districts and rise of more than 4 m is significantly observed in Ahmedabad, Banas Kantha, Gandhinagar, Mahesana and Patan districts.

Fall in piezometric levels:

Out of the 13 wells that have registered fall in piezometric levels, 1.4% have recorded less than 2 m while 2.2% in the range of 2 to 4 m and remaining 5.8% of wells registered piezometric level fall of more than 4 m.

Fall of less than 2 m is observed in all districts mainly in North Gujarat in Anand and Banas Kantha districts. Fall of 2 to 4 m, recorded in Gandhinagar and Mahesana districts. Fall beyond 4 m is recorded mainly in, North and South Gujarat districts. Map and graph of Decadal Fluctuation in Confined Aquifer (Decadal Mean May (2014-2023) to May 2024) shown in Fig.13 and Fig.14 respectively.

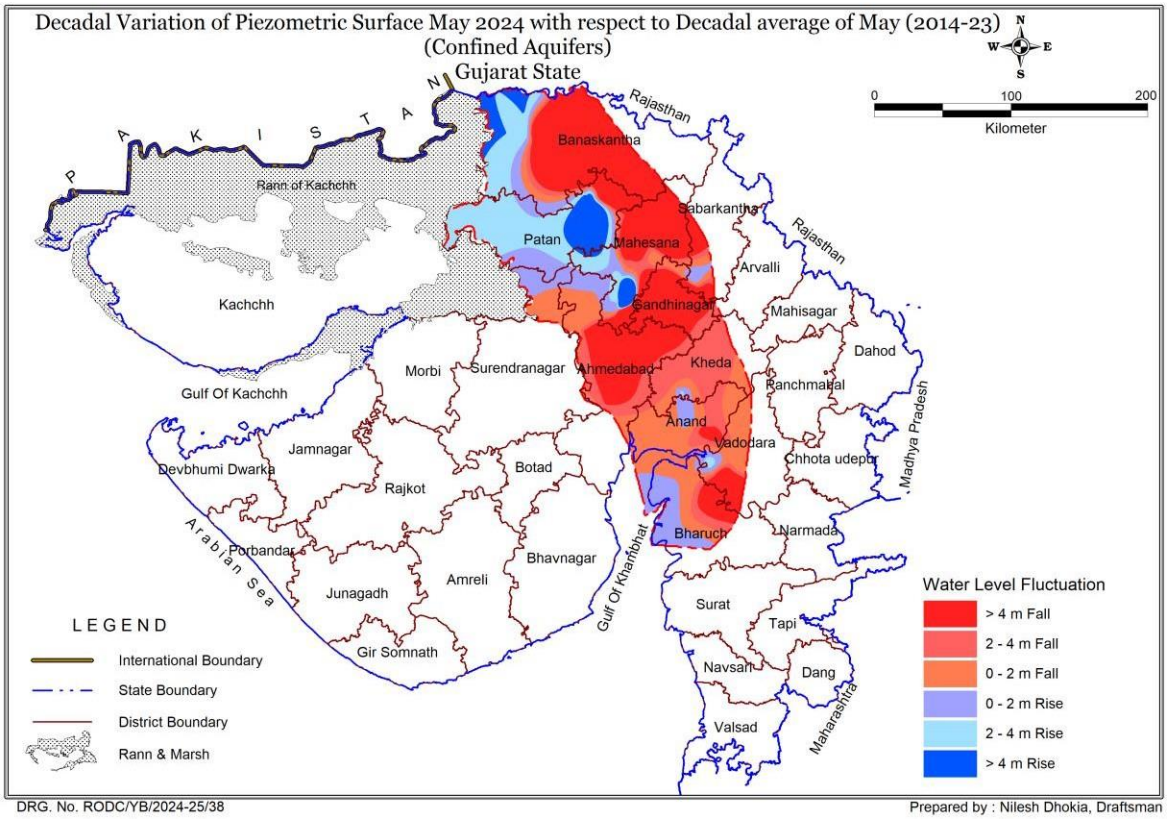


Figure 13: Decadal Fluctuation of Piezometric Level in Confined / Semi- confined Aquifer (Decadal Mean May 2014-2023) to May 2024)

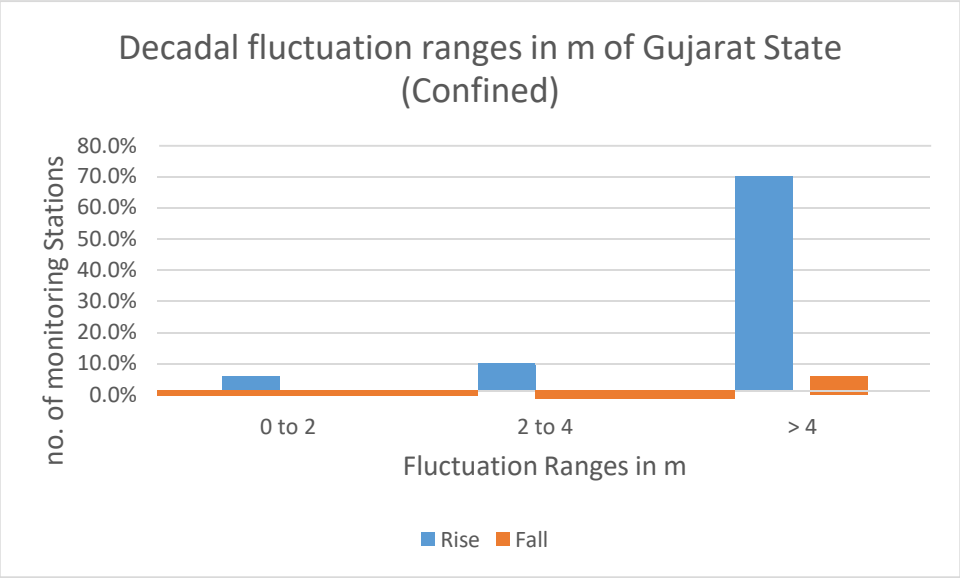


Figure 14: Decadal fluctuation ranges in m of Gujarat State (Confined)

Summary

As a component of the National Ground Water Monitoring Programme, the CGWB, WCR, Ahmedabad conducts monitoring of the ground water conditions on a quarterly basis: in January, pre-monsoon May, post monsoon August, and November. As of May 31, 2024, the WCR of the Central Ground Water Board supervises 788 dug wells and 504 piezometers. This comprehensive effort aims to portray the variations in the state's ground water conditions across different aquifers.

In May 2024, depth to water level of 5 to 10 m bgl is observed throughout the state except in Gandhinagar district. The ground water level in Gujarat during May 2024, decadal fluctuation for Piezometric level, rise of less than 2 m is seen in all the districts, significantly in, Anand,. Piezometric level rise of 2 to 4 m is observed mainly in Ahmedabad, Anand, Bharuch, Vadodara, districts. Annual fluctution for Piezometric level, rise of less than 2 m is seen in all the districts, Significantly in Ahmedabad, Mahesana, Banaskantha, Vadodara, Kachch districts. Piezometric level rise of 2 to 4 m is observed mainly in districts such as, Anand Ghandhinagar, Kheda, Bharuch, Kachch districts. Rise of more than 4 m is significantly observed in Ahmedabad, Ghandhinagar, Patan, Bhavnagar, Kheda, Banaskantha districts.