

**GOVERNMENT OF KERALA  
GROUNDWATER DEPARTMENT**

**GROUNDWATER LEVEL MONITORING REPORT – JANUARY 2021**

**Water** is a replenishable natural resource which is essential for the existence of all living beings. In the past, the demand of water is mostly limited to domestic and in the agricultural sector. Due to the developments in agricultural and industrial sector the demand of water is increasing many folds since last few decades. Surface water resource alone couldn't meet the increasing demand and hence persuaded to depend on groundwater resource during the past few decades made stress on groundwater regime. In order to sustain the groundwater resources, proper groundwater management practices are needed.

**Rainfall** is the primary source for groundwater recharge and has a vital role in the sustainability of groundwater resource in the state. Groundwater level fluctuation results from the seasonal availability of rainfall. Kerala state experiences four distinct seasons namely winter (January-February), Pre-monsoon (March-May), Monsoon (South-West) June to September and Post-monsoon (North-East) from October to December. Average annual precipitation in the state is nearly 3000 mm. The rainfall in the State is controlled primarily by the South-West and North-East monsoons. About 90% of the rainfall occurs during six monsoon months (South-West monsoon contributes major portion of rainfall (65-70%) and about 16% from the North-East) and remaining from summer showers.

The winter rainfall (January-February) occurred in the state during 2020 is 9.6 mm, which is 57% deficient than that of the normal Rainfall (22.4 mm).

While the winter rainfall occurred in the state during 2021 (January - February) is 114.1mm, which is 410% large excess than that of the normal rainfall. Most of the locations in the state get recharged from the excess rainfall occurred during this season.

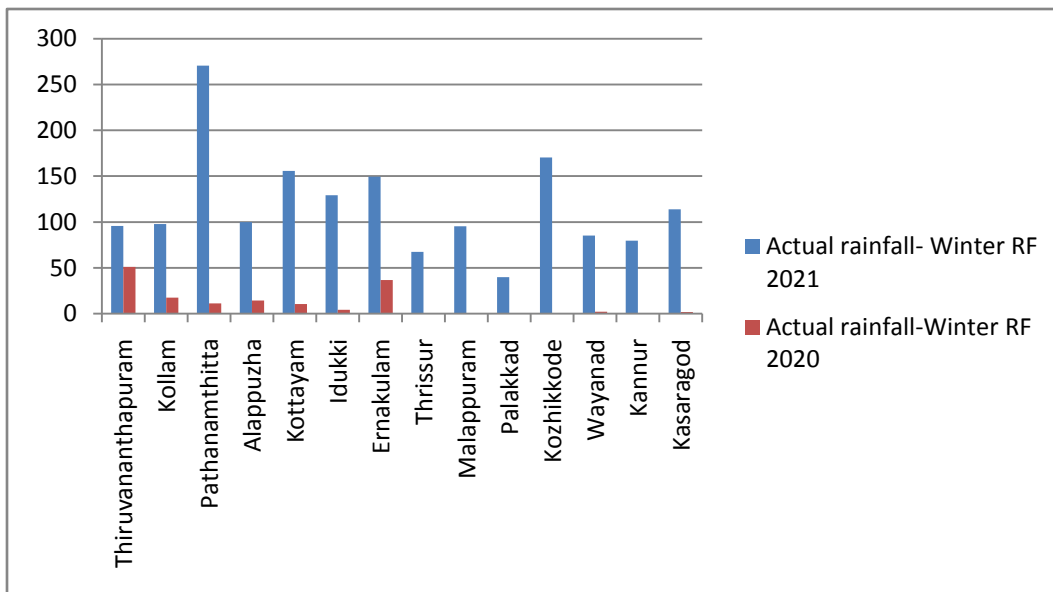


Fig:1. Comparison of actual winter rainfall occurred during 2021 wrt 2020

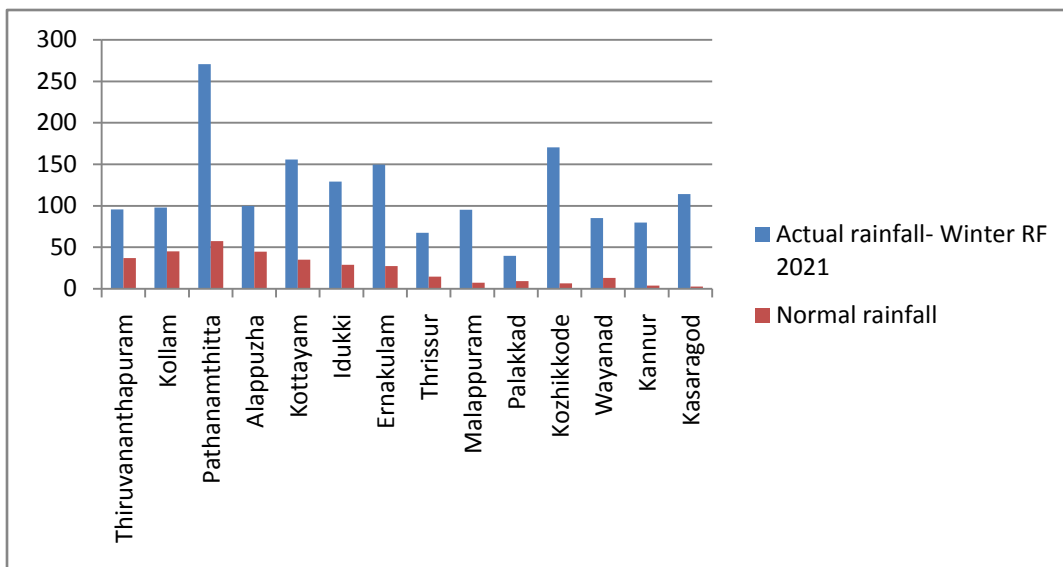


Fig:2. Comparison of actual winter rainfall occurred during 2021 wrt Normal Rainfall

**Geology:** Kerala, the southernmost state of Indian peninsula, is having a geographical area of 38863 km<sup>2</sup>. The land area extends between latitude 8°17'30" and 12°27'40" and longitude 74°51'57" and 77°24'47". Physiographically, Kerala state is sandwiched between Western Ghats on the east and Arabian Sea on the west. Being the part of the southern Indian peninsula, the peninsular geological formations exist in the state. The major geological formations in the state comprises crystalline rocks of Archaean Age, sedimentary rock formations of tertiary age and sub recent to recent rock formations of quaternary age.

**Occurrence of Groundwater resource:** Groundwater occurs under phreatic, semi-confined and confined conditions, Groundwater in unconfined aquifer is mainly utilized through tube wells in sedimentary terrain and through bore wells in hard rock areas.

**Groundwater monitoring network:** Short term and long term changes in the climatic conditions influence the groundwater scenario of an area. Groundwater level data are the principal information required for assessing the groundwater status and groundwater resource estimation.

Groundwater Department is maintaining a network of observation wells throughout the state representing various hydrogeological units. Observation wells includes dug wells (owned by public and private) and purpose built piezometers (bore wells and tube wells). Water level data has been collected monthly and water samples collected and analysis done periodically.

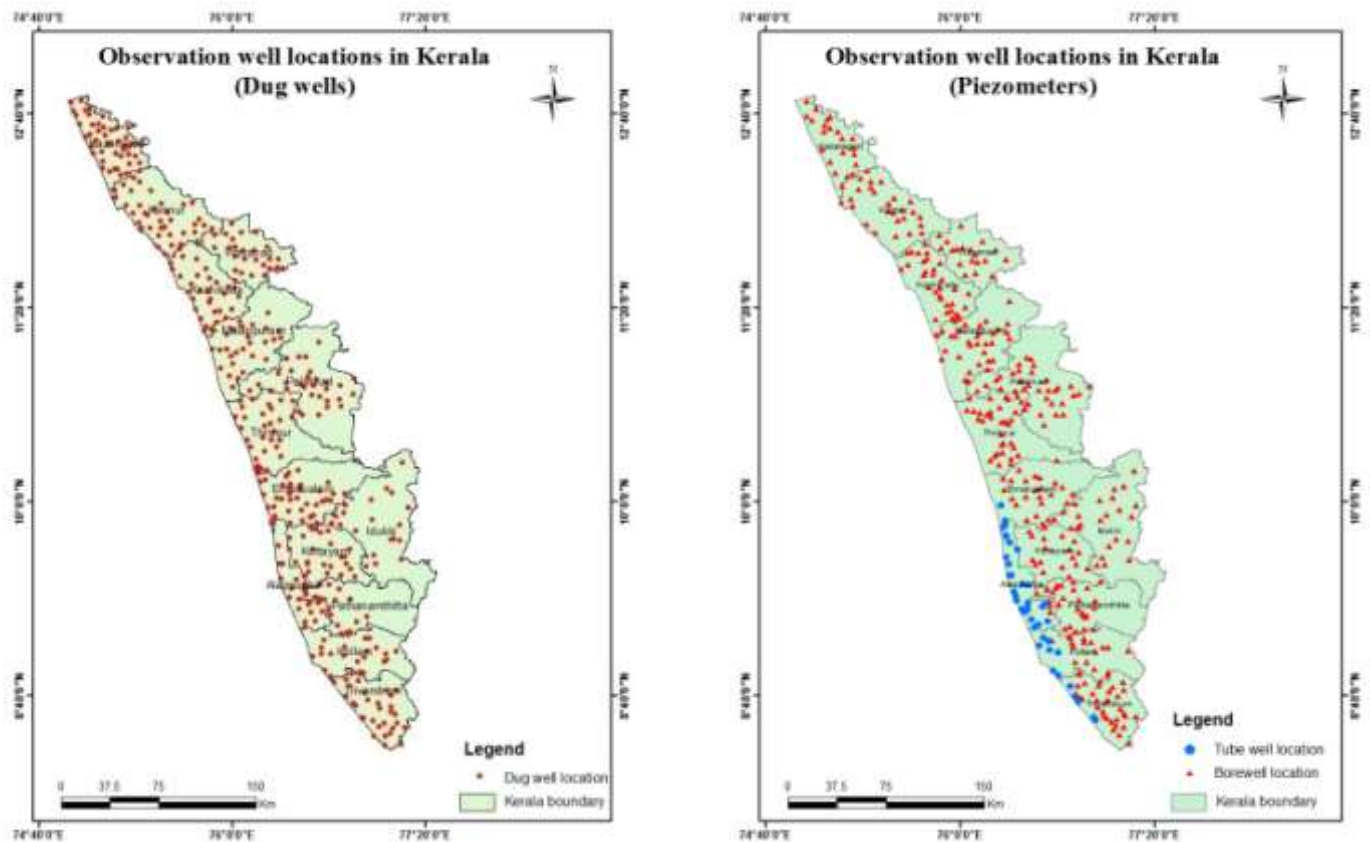


Fig:3. Location map of observation dug wells and piezometers (bore wells & tube wells)

### Analysis of Groundwater level data – January 2021

During the month of January 2021, groundwater level in 376 dug wells and 380 purpose built piezometers (bore wells- 342 and tube wells – 38) has been monitored. The data collected

from the observation wells during the month of January 2021 has been compared with previous year's corresponding month and also with respect to decadal mean of the corresponding month to assess the groundwater scenario in the state.

### I. Depth to Groundwater level during January 2021

Dug wells- The depth to groundwater level in the observation dug wells during the month of January 2021 ranges from a minimum of 0.15 m to a maximum of 17.06 mbgl. Out of 376 dug wells monitored water level in 15% of dug wells shows a depth to water level ranges from 0-2 m, 34% ranges between 2-5 m, 41% ranges between 5-10 m and 10% dug wells recorded depth to water level ranges between 10-20 mbgl. Table showing well frequency during January 2021 is appended. (Annexure-I)

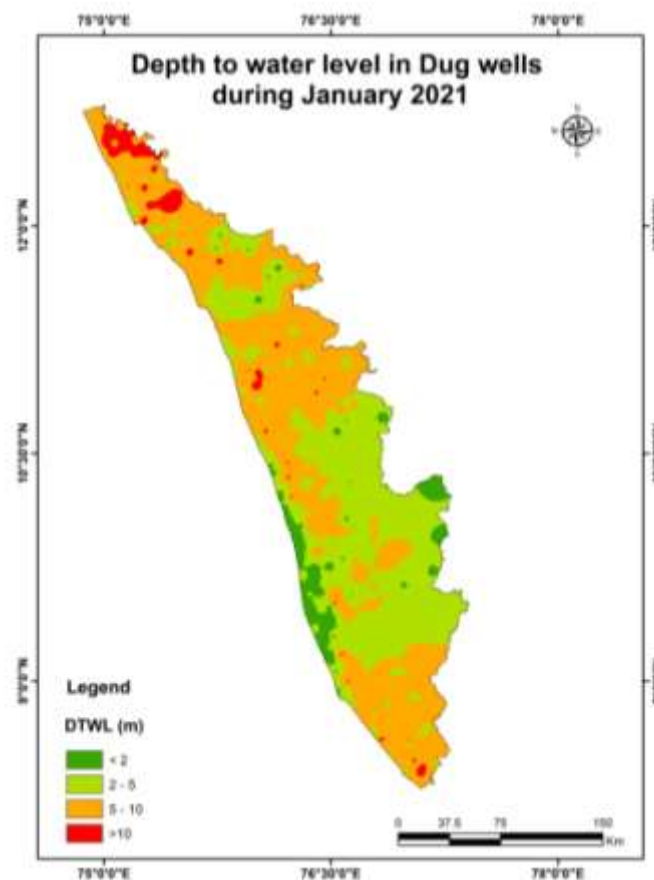
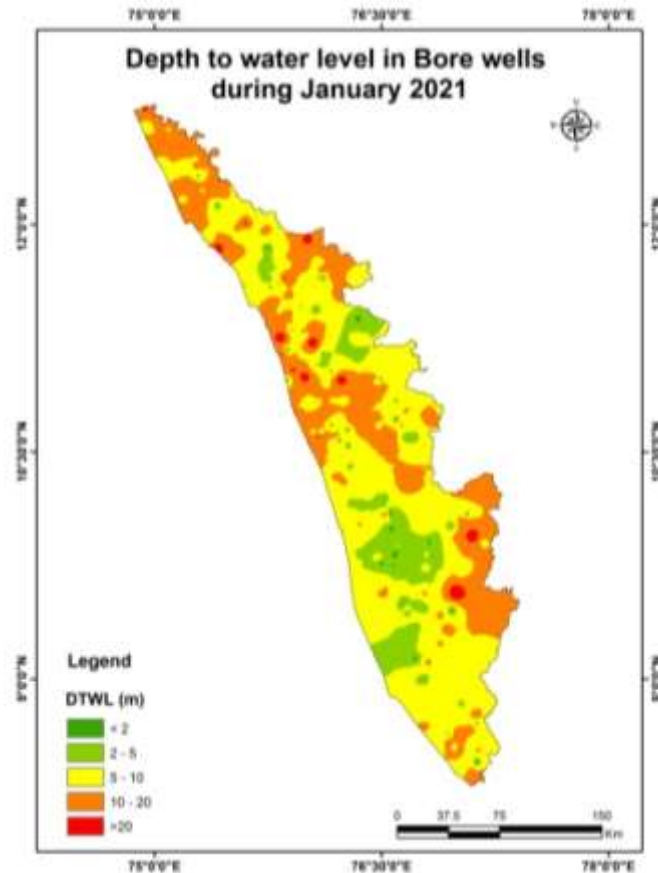


Fig:4. Depth to water level in Dug wells during January 2021

Borewells (hardrock terrain):- The depth to groundwater level in the observation bore wells during the month of January 2021 ranges from a minimum of -0.12 m to a maximum of 42.47 mbgl. Out of 342 bore wells monitored, water level in 8% of bore wells shows a depth to

water level range from 0-2 m, 20 % ranges between 2-5 m, 38% ranges between 5-10 m, 27% of bore wells ranges between 10-20 m, and 6% ranges more than 20 m . Table showing well frequency during January 2021 is appended. (Annexure-I)

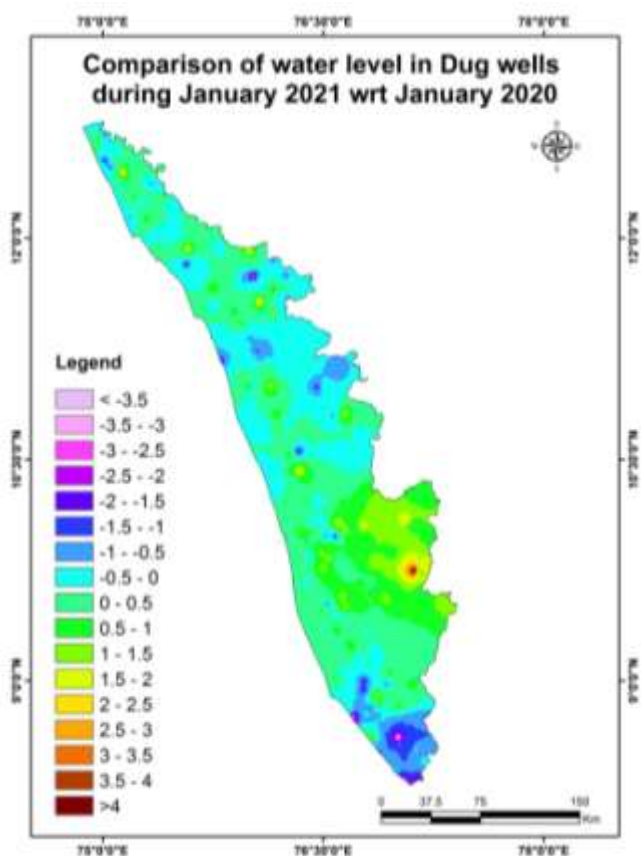


**Fig:5. Depth to water level in Bore wells during January 2021**

Tube wells (coastal sedimentary terrain) - The depth to groundwater level in the observation tube wells during the month of January 2021 range from a minimum of 0.47 m to a maximum of 34.28 mbgl . Out of 38 tube wells monitored in the state, water level in 21 % of tube wells shows a depth to water level range from 0-2m, 37% of tube wells ranges between 2-5 m, 21 % of tube wells ranges between 5-10 m , 13% ranges between 10-20 m and 8% ranges more than 20m. Table showing well frequency is appended.(Annexure-I )

## II. Comparison of Groundwater level in January 2021 with respect to January 2020

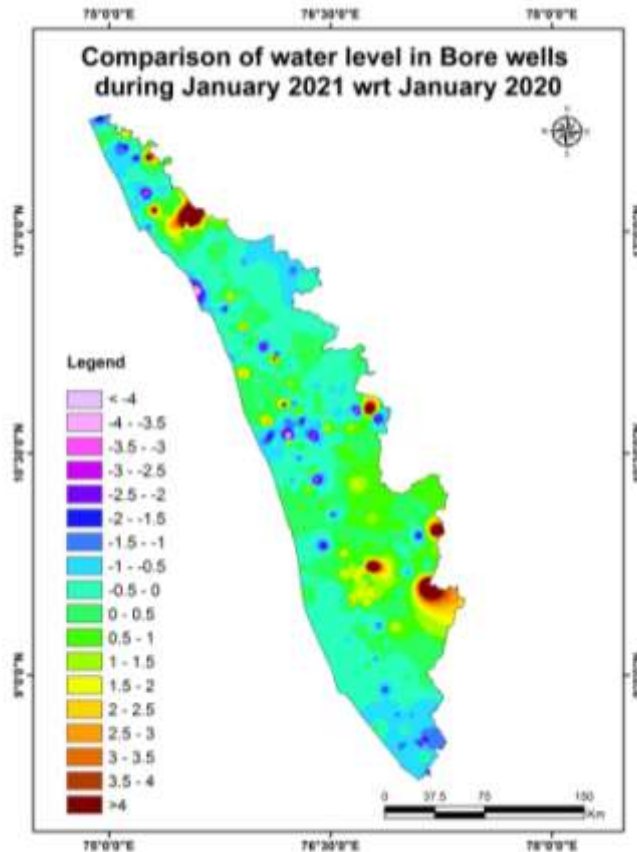
Comparison of the groundwater level in January 2021 with respect to the corresponding month in the previous year, indicates that 42 % of observation dug wells show a fall in water level and 58 % of the wells shows no remarkable change /marginal rise in water level. Out of 42% of the dug wells shows a falling trend, 69% recorded fall in water level less than 0.5m , 19 % of dug wells show fall in the range between 0.5-1m, 8 % of dug wells show fall in the range between 1-1.5 m, 1% of dug wells show a fall in the range between 1.5 -2m and 3% dug wells show a fall in water level more than 2m. Table showing water level comparison of dug wells during January 2021 with respect to January 2020 is appended. (Annexure-II).



**Fig:6. Comparison of water level in Dug wells during January 2021 wrt January 2020**

Comparison of the water level in observation bore wells (hard rock terrain in midland and high land areas) in January 2021 with that of the previous year, it has been noticed that 53% of bore wells show fall in water level and 47% of the wells shows no remarkable change / marginal rise in water level. Out of 53 % of the bore wells shows a falling trend , 53 % of the

bore wells recorded fall in water level less than 0.5m, 25 % show fall in the range between 0.5 - 1m, 9 % of bore wells show fall in the range between 1 - 1.5m, 6 % of bore wells show a fall in range between, 1.5-2m, 7% of bore wells show a fall in water level more than 2m. Table showing water level comparison of bore wells during January 2021 with respect to January 2020 is appended. (Annexure-II)



**Fig:7. Comparison of water level in Bore wells during January 2021 wrt January 2020**

Comparison of the water level in observation tube wells (in the coastal sedimentary areas) during January 2021 with that of the previous year reveals that 46 % of tube wells recorded a falling trend and 54 % of the wells shows no remarkable change /marginal rise of water level. Out of 46% of the tube wells showing a falling trend, 42% wells recorded fall in water level less than 0.5m, 37% wells show a fall in range between 0.5 to 1m. and 11% wells show a fall in range between 1 to 1.5m, 5 % of tube wells show a fall in range between 1.5-2m and 5% of tube wells show a fall in water level more than 2m. Table showing comparison of water level during January 2021 with respect to January 2020 is appended. (Annexure-II)



### III. Comparison of Groundwater level in January 2021 with respect to Decadal mean (2010- 19)

Comparison of the water level in January 2021 with respect to the decadal mean, it has been noticed that 27 % of observation dug wells recorded a fall in water level and 73% of the wells shows marginal rise /no remarkable change in water level. Out of 27% of the dug wells show a falling trend, 71% of the dug wells recorded fall in water level less than 0.5m, 17% show fall in the range between 0.5-1m, 7% of dug wells show fall in the range between 1-1.5m, 3 % of dug wells show a fall in range between 1.5-2m and 2% of dug wells show a fall in range more than 2m. Table showing water level comparison of dug wells during January 2021 with respect to decadal mean is appended. (Annexure-III)

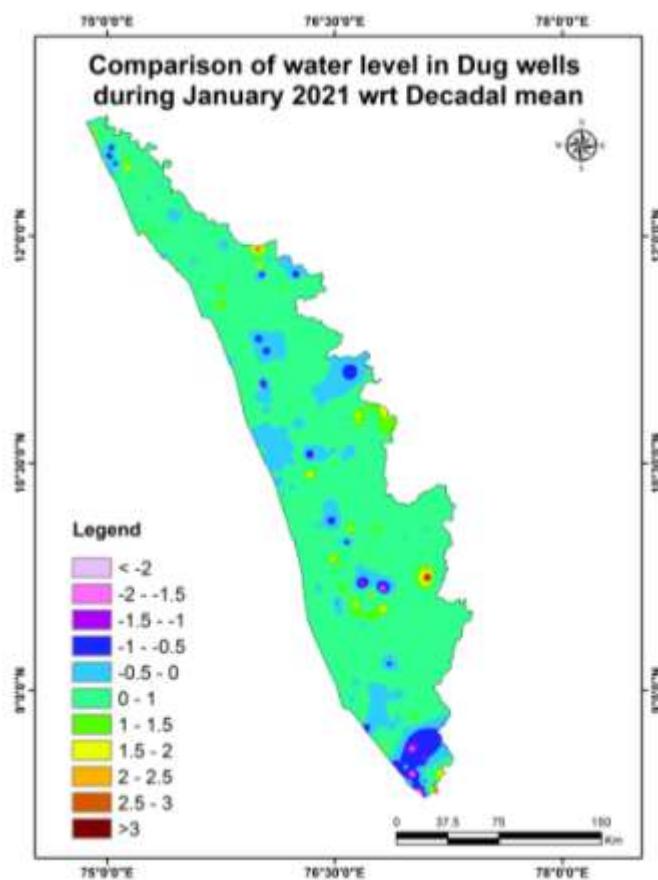
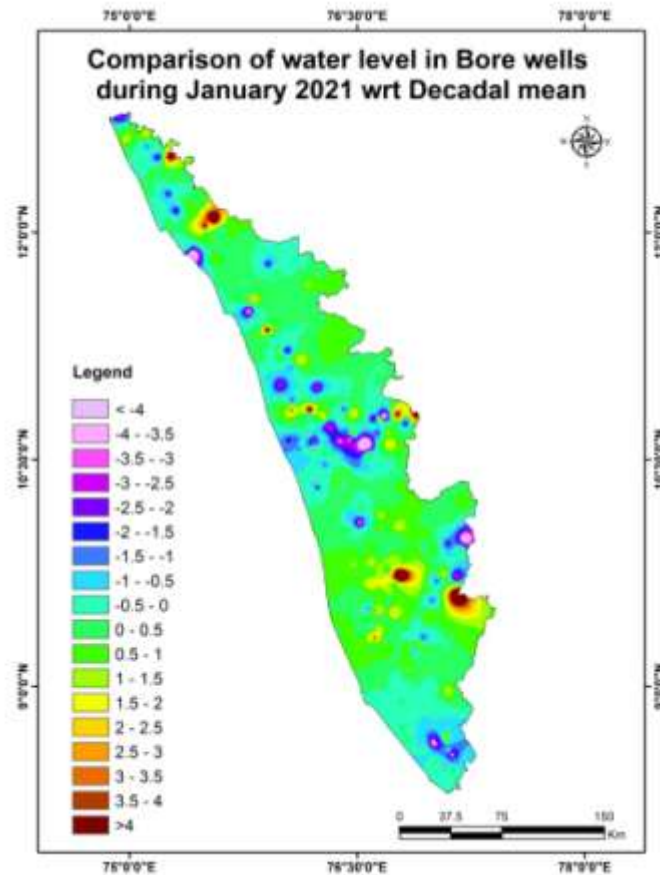


Fig:7. Comparison of water level in Dug wells during January 2021 wrt Decadal mean

Comparison of the water level in the observation bore wells during January 2021 with that of the decadal mean. It has been noticed that 40% of bore wells show fall in water level, and 60% of the wells shows marginal rise, no remarkable change in water level. Out of 40 % of the



bore wells shows a falling trend, 47 % shows a fall in water level less than 0.5m, 17 % show fall in the range between 0.5 - 1m, 11% show fall in the range between 1-1.5 m, 9% of wells show a fall in range between 1.5 - 2m, 16% show a fall in water level more than 2 m. Table showing water level comparison of bore wells during January 2021 with respect to decadal mean is appended. (Annexure-III)



**Fig:8. Comparison of water level in Bore wells during January 2021 wrt Decadal mean**

Comparison of the water level in the observation tube wells during January 2021 with that of the decadal mean reveals that 29 % of tube wells recorded a falling trend and 71 % of the tube wells show marginal rise/no remarkable change in water level. Out of 29 % of the tube wells shows a falling trend, 37% of the tube wells show fall in water level less than 0.5m and 25% of tube wells show fall in the range between 0.5 - 1m and 8% show fall in the range between 1-1.5m. Table showing water level comparison of tube wells during January 2021 with respect to decadal mean is appended. (Annexure-III)

## Summary

### Rainfall

- The winter rainfall (January-February) occurred in the state during 2020 is 9.6 mm, which is 57% deficient than that of the normal Rainfall (22.4 mm).
- The winter rainfall occurred in the state during 2021 (January - February) is 114.1mm, which is 410% large excess than that of the normal rainfall.

### Groundwater level

- The depth to groundwater level in the observation dug wells during the month of January 2021 range from a minimum of 0.15 m to a maximum of 17.06 mbgl, in bore wells -0.12 m to a maximum of 42.47 mbgl and in the tube wells 0.47 m to a maximum of 34.28 mbgl.
- Comparison of the water level in January 2021 with respect to the previous year, reveals that 42 % of observation dug wells, 53 % of bore wells and 46% of tube wells recorded a falling trend.
- Comparison of groundwater level in January 2021 with respect to the decadal mean reveals that 27 % of observation dug wells, 40 % of bore wells and 29% of tube wells recorded a falling trend. Majority of the observationwells show decline in water level less than 0.5 m.
- Wells showing decline of water level more than 2 m during long term analysis will be monitored closely.
- Most of the locations in the state get recharged from the excess rainfall occurred during January 2021 than that of the previous year (January 2020).

Districtwise Observation well Frequency on January 2021							Annexure I				
District	Well Type	No. of WL measured	DTWL(mbgl)		Location		Depth range of wells (mts)				
			Min	Max	Min	Max	0 to 2	2 to 5	5 to 10	10 to 20	>20
Thiruvananthapuram	Dug well	29	1.58	13.02	Thiruvallom-Kovalam	Veilloor-Murukkumpuzha	2	7	15	5	0
	Bore well	31	0.00	19.80	Perumkadavila	Nedumangad	2	3	17	9	0
	Tube well	4	3.97	9.41	Azhoor	Sarkara-Chirayinkeezhu	0	1	3	0	0
Kollam	Dug well	25	1.05	10.71	Ochira	Mantrothuruth	4	6	14	1	0
	Bore well	16	1.19	10.25	Kottarakkara	Pathanapuram	1	1	13	1	0
	Tube well	9	2.83	34.28	Panmana	Mynagappally	0	2	2	2	3
Pathanamthitta	Dug well	14	1.85	9.28	Peringara	Kunnamthanam	1	11	2	0	0
	Bore well	25	0.54	14.35	Parakode	Adoor	3	6	12	4	0
Alappuzha	Dug well	19	0.15	11.12	Nedumudi	Kattanam	10	8	0	1	0
	Bore well	3	2.99	4.52	Punthala	Chengannoor	0	3	0	0	0
	Tube well	24	0.47	17.75	Thrikkunnappuzha	Charumoodu	8	11	3	2	0
Kottayam	Dug well	21	0.78	11.09	Kumarakom	Panachikkad	5	8	7	1	0
	Bore well	24	-0.12	17.58	Uzhavoor	Pallom	7	6	8	3	0
Idukki	Dug well	19	0.49	7.49	Marayoor	Vazhathope	4	11	4	0	0
	Bore well	23	1.57	32.37	Elamdesom	Azhutha	2	7	6	6	2
Ernakulam	Dug well	38	0.22	9.74	Chellanam	Perumbavur	11	11	16	0	0
	Bore well	23	0.61	13.40	Assamannoor	Rayamangalam	3	7	11	2	0
	Tube well	1	10.90	10.90	Cochi	Cochi	0	0	0	1	0
Thrissur	Dug well	31	1.14	11.28	Valappad	Poyya	7	11	9	4	0
	Bore well	37	1.63	23.21	Kolazhy	Kandanassery	1	5	11	17	3
Malappuram	Dug well	26	2.05	14.89	Kondotty	Ottukungal	0	12	10	4	0
	Bore well	29	1.59	42.47	Vazhikkadavu	Areekode	2	10	9	4	4

Palakkad	Dug well	31	0.78	10.42	Alathur	Sreekrishnapuram	3	14	12	2	0
	Bore well	32	1.38	20.70	Kuzhalmannam	Ambalappara	2	6	8	13	3
Kozhikkode	Dug well	16	1.98	11.78	Perambra	Vanimel	1	5	9	1	0
	Bore well	33	0.70	30.14	Ramanattukara	Nellikkode	2	11	9	7	4
Wayanad	Dug well	26	0.24	11.25	Poothadi	Cheeral	4	9	11	2	0
	Bore well	18	1.86	22.84	Muttill North	Thirunelli	1	2	6	8	1
Kannur	Dug well	36	1.25	17.06	Aralam	Kooveri	5	7	19	5	0
	Bore well	28	0.94	25.36	Vekkalam	Edakkad	2	2	12	10	2
Kasaragod	Dug well	45	2.74	15.20	Kanhangad	Bandadka	0	7	25	13	0
	Bore well	20	3.39	20.86	Beemanady	Vorkady	0	1	8	9	2

## Comparison of Water level January 2021 with respect to January 2020

## Annexure II

District	Well Type	No. of WL Measured	Water level	Total	0 - 0.5 m	0.5 - 1 m	1-1.5m	1.5 - 2 m	>2 m
					No.	No.	No.	No.	No.
Thiruvananthapuram	Dug well	31	Rise	4	3	0	1	0	0
			Fall	27	4	13	6	1	3
	Bore well	34	Rise	6	4	2	0	0	0
			Fall	28	4	18	4	1	1
	Tube well	4	Rise	0	0	0	0	0	0
			Fall	4	1	1	0	1	1
Kollam	Dug well	24	Rise	15	9	4	1	1	0
			Fall	9	6	1	2	0	0
	Bore well	15	Rise	5	5	0	0	0	0
			Fall	10	9	0	0	1	0
	Tube well	9	Rise	1	1	0	0	0	0
			Fall	8	0	6	2	0	0

Pathanamthitta	Dug well	14	Rise	5	4	1	0	0	0
			Fall	9	9	0	0	0	0
	Bore well	25	Rise	12	8	3	0	0	1
			Fall	13	11	0	0	2	0
Alappuzha	Dug well	20	Rise	17	13	3	1	0	0
			Fall	3	3	0	0	0	0
	Bore well	2	Rise	0	0	0	0	0	0
			Fall	2	1	1	0	0	0
	Tube well	27	Rise	20	19	1	0	0	0
			Fall	7	7	0	0	0	0
Kottayam	Dug well	20	Rise	17	9	3	5	0	0
			Fall	3	2	1	0	0	0
	Bore well	24	Rise	16	7	2	0	1	6
			Fall	8	6	1	1	0	0
Idukki	Dug well	19	Rise	19	2	8	7	0	2
			Fall	0	0	0	0	0	0
	Bore well	23	Rise	16	7	7	0	0	2
			Fall	7	5	0	1	0	1
Ernakulam	Dug well	38	Rise	30	16	7	3	4	0
			Fall	8	6	1	1	0	0
	Bore well	23	Rise	19	11	7	0	1	0
			Fall	4	1	1	0	1	1
	Tube well	1	Rise	1	1	0	0	0	0
			Fall	0	0	0	0	0	0
Thrissur	Dug well	31	Rise	17	13	3	0	0	1
			Fall	14	13	0	1	0	0
	Bore well	37	Rise	13	7	1	1	2	2
			Fall	24	9	4	5	2	4
Malappuram	Dug well	26	Rise	10	8	1	0	1	0
			Fall	16	13	2	1	0	0

	Bore well	29	Rise	10	5	2	1	0	2
			Fall	19	14	3	0	0	2
Palakkad	Dug well	31	Rise	10	7	1	2	0	0
			Fall	21	17	3	1	0	0
	Bore well	32	Rise	16	8	3	1	1	3
			Fall	16	3	7	2	2	2
Kozhikkode	Dug well	16	Rise	7	4	3	0	0	0
			Fall	9	7	1	1	0	0
	Bore well	33	Rise	14	12	0	0	0	2
			Fall	19	14	1	2	1	1
Wayanad	Dug well	26	Rise	14	10	2	0	1	1
			Fall	12	7	4	0	0	1
	Bore well	17	Rise	0	0	0	0	0	0
			Fall	17	10	5	2	0	0
Kannur	Dug well	36	Rise	36	36	0	0	0	0
			Fall	0	0	0	0	0	0
	Bore well	28	Rise	14	9	2	0	0	3
			Fall	14	9	4	1	0	0
Kasaragod	Dug well	44	Rise	17	12	3	1	0	1
			Fall	27	22	4	0	1	0
	Bore well	20	Rise	20	20	0	0	0	0
			Fall	0	0	0	0	0	0

## Comparison of Water level January 2021 with respect to 10 yrs mean

## Annexure III

District	Well Type	No. of WL Measured	Water level	Total	0 - 0.5 m	0.5 - 1 m	1 - 1.5 m	1.5 - 2 m	<2 m
					No.	No.	No.	No.	No.
Thiruvananthapuram	Dug well	31	Rise	11	6	2	0	1	2
			Fall	20	8	7	2	1	2
	Bore well	34	Rise	11	9	1	0	1	0
			Fall	23	7	12	2	0	2
	Tube well	4	Rise	1	1	0	0	0	0
			Fall	3	1	2	0	0	0
Kollam	Dug well	25	Rise	19	16	2	1	0	0
			Fall	6	6	0	0	0	0
	Bore well	16	Rise	5	4	0	0	1	0
			Fall	11	11	0	0	0	0
	Tube well	9	Rise	5	3	0	0	0	2
			Fall	4	3	1	0	0	0
Pathanamthitta	Dug well	14	Rise	10	8	2	0	0	0
			Fall	4	3	1	0	0	0
	Bore well	24	Rise	16	9	2	4	0	1
			Fall	8	5	1	1	1	0
Alappuzha	Dug well	19	Rise	18	9	7	2	0	0
			Fall	1	1	0	0	0	0
	Bore well	2	Rise	1	0	1	0	0	0
			Fall	1	1	0	0	0	0
	Tube well	27	Rise	23	18	5	0	0	0
			Fall	4	4	0	0	0	0
Kottayam	Dug well	21	Rise	16	8	2	2	3	1
			Fall	5	2	1	1	1	0



	Bore well	24	Rise	20	9	2	4	1	4
			Fall	4	3	0	1	0	0
	Dug well	19	Rise	17	11	4	0	1	1
			Fall	2	2	0	0	0	0
Idukki	Bore well	23	Rise	16	8	4	2	0	2
			Fall	7	2	0	2	1	2
	Dug well	38	Rise	31	18	7	4	2	0
			Fall	7	5	1	1	0	0
	Bore well	23	Rise	20	13	4	2	1	0
			Fall	3	0	1	1	0	1
Ernakulam	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	0	1	0	0
	Dug well	31	Rise	18	14	1	2	0	1
			Fall	13	12	0	1	0	0
Thrissur	Bore well	37	Rise	16	13	2	1	0	0
			Fall	21	7	1	5	3	5
	Dug well	26	Rise	20	12	8	0	0	0
			Fall	6	4	1	0	1	0
Malappuram	Bore well	29	Rise	16	8	5	1	1	1
			Fall	13	4	4	1	1	3
	Dug well	31	Rise	21	15	2	0	4	0
			Fall	10	9	1	0	0	0
Palakkad	Bore well	32	Rise	21	6	5	2	1	7
			Fall	11	2	1	0	4	4
	Dug well	16	Rise	14	8	4	2	0	0
			Fall	2	1	1	0	0	0
Kozhikkode	Bore well	33	Rise	19	16	1	0	0	2
			Fall	14	11	1	1	0	1
Wayanad	Dug well	26	Rise	20	11	6	1	0	2
			Fall	6	4	1	1	0	0

	Bore well	18	Rise	13	11	1	1	0	0
			Fall	5	4	0	0	1	0
Kannur	Dug well	36	Rise	29	21	6	2	0	0
			Fall	7	6	1	0	0	0
	Bore well	28	Rise	21	15	4	0	0	2
			Fall	7	4	1	0	0	2
Kasaragod	Dug well	43	Rise	32	17	9	3	1	2
			Fall	11	8	2	1	0	0
	Bore well	20	Rise	11	6	1	1	2	1
			Fall	9	4	1	1	1	2

## Observation well frequency on January 2021

## Abstract 1

Well Type	No of WL measured	DTWL (mbgl)		Location		Depth range of wells (m)				
		min	max	min	max	0 to 2	2 to 5	5 to 10	10 to 20	>20
Dug well	376	0.15	17.06	Thrikkunnappuzha (Alappuzha)	Edakkad (Kannur)	57 15%	127 34%	153 41%	39 10%	0 0%
Bore well	342	-0.12	42.47	Uzhavoor (Kottayam)	Areekode (Malappuram)	28 8%	70 20%	130 38%	93 27%	21 6%
Tube well	38	0.47	34.28	Thrikkunnappuzha (Alappuzha)	Mynagappally (Kollam)	8 21%	14 37%	8 21%	5 13%	3 8%

**Comparison of Water level January 2021 with respect to January 2020 Abstract II**

Well type	No. of WL Measured	Water level	Total	0 - 0.5 m	0.5 - 1 m	1 - 1.5 m	1.5 - 2 m	>2 m
Dug well	376	Rise	218	146	39	21	7	5
		%	58%	67%	18%	10%	3%	2%
		Fall	158	109	30	13	2	4
		%	42%	69%	19%	8%	1%	3%
Bore well	342	Rise	161	103	29	3	5	21
		%	47%	64%	18%	2%	3%	13%
		Fall	181	96	45	18	10	12
		%	53%	53%	25%	9%	6%	7%
Tube well	41	Rise	22	21	1	0	0	0
		%	54%	95%	5%	0%	0%	0%
		Fall	19	8	7	2	1	1
		%	46%	42%	37%	11%	5%	5%

**Comparison of Water level January 2021 with respect to 10 yrs mean Abstract III**

Well type	No. of WL Measured	Water level	Total	0 - 0.5 m	0.5 - 1 m	1 - 1.5 m	1.5 - 2 m	>2 m
Dug well	376	Rise	276	174	62	19	12	9
		%	73%	63%	22%	7%	4%	3%
		Fall	100	71	17	7	3	2
		%	27%	71%	17%	7%	3%	2%
Bore well	343	Rise	206	127	33	18	8	20
		%	60%	62%	16%	9%	4%	9%

		Fall	137	65	23	15	12	22
		%	40%	47%	17%	11%	9%	16%
Tube well	41	Rise	29	22	5	0	0	2
		%	71%	76%	17%	0%	0%	7%
		Fall	12	8	3	1	0	0
		%	29%	67%	25%	8%	0%	0%