

**GOVERNMENT OF KERALA  
GROUNDWATER DEPARTMENT**

**GROUNDWATER LEVEL MONITORING REPORT – FEBRUARY 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.

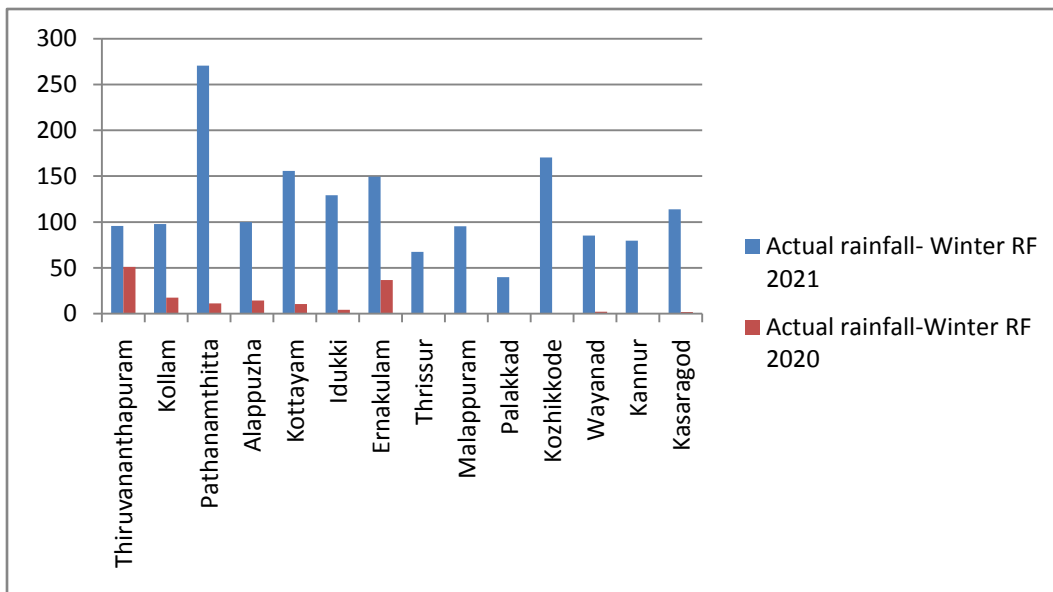


Fig:1. Comparison of actual winter rainfall occurred during 2021 wrt 2020

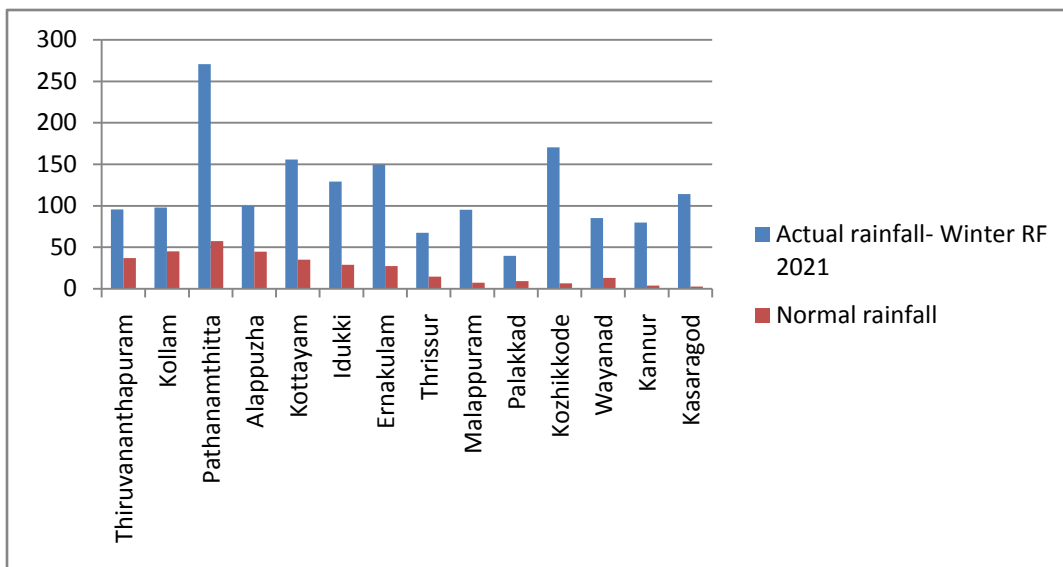


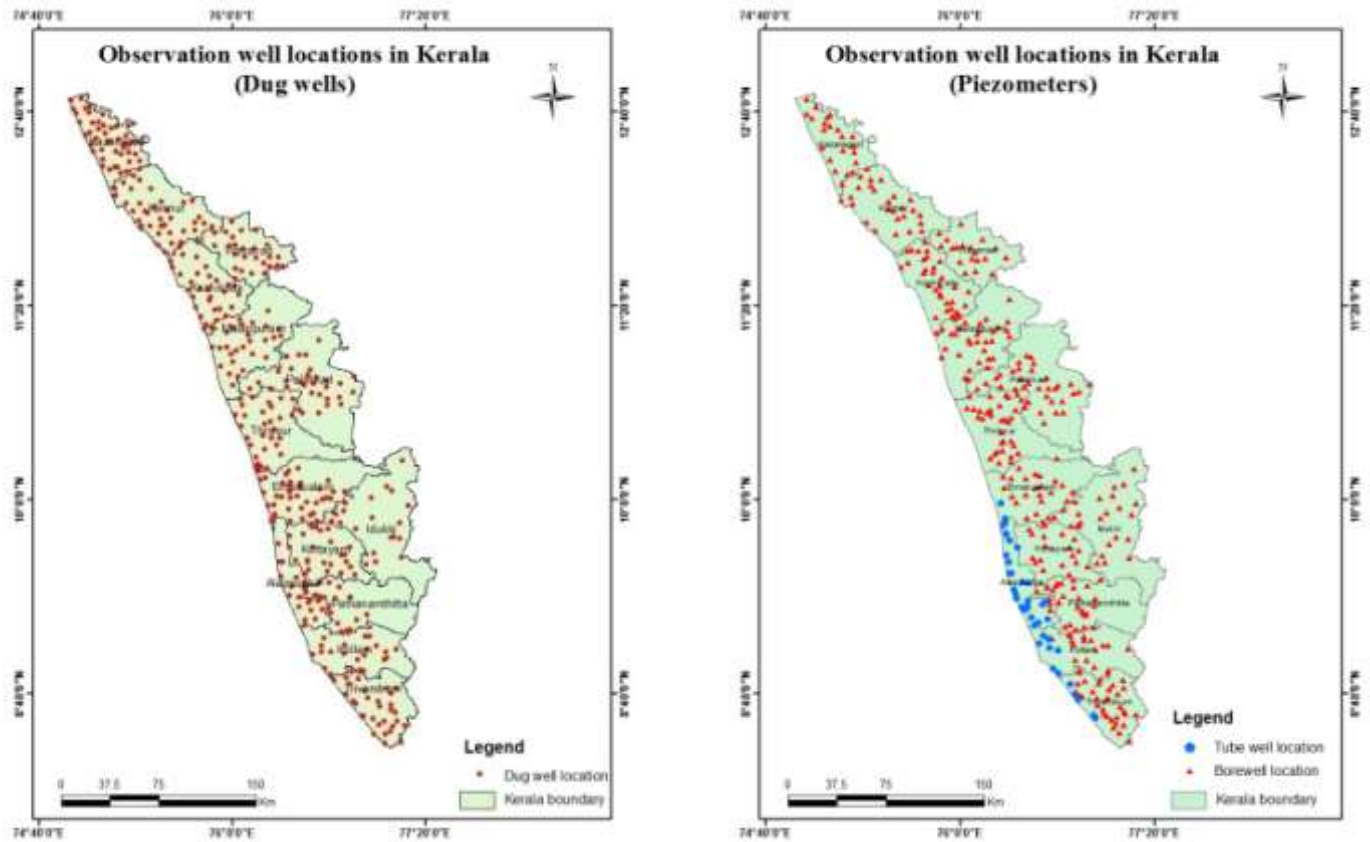
Fig:2. Comparison of actual winter rainfall occurred during 2021 wrt Normal Rainfall

**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)**

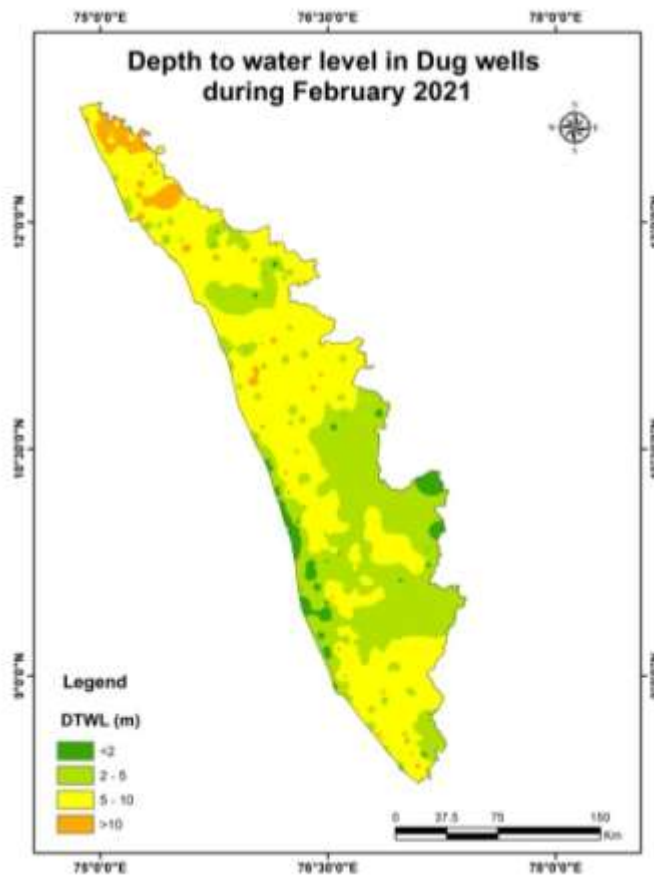
### **Analysis of Groundwater level data – February 2021**

During the month of February 2021, groundwater level in 394 dug wells and 394 purpose built piezometers (bore wells- 351 and tube wells – 43) has been monitored. The data collected

from the observation wells during the month of February 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 February 2021**

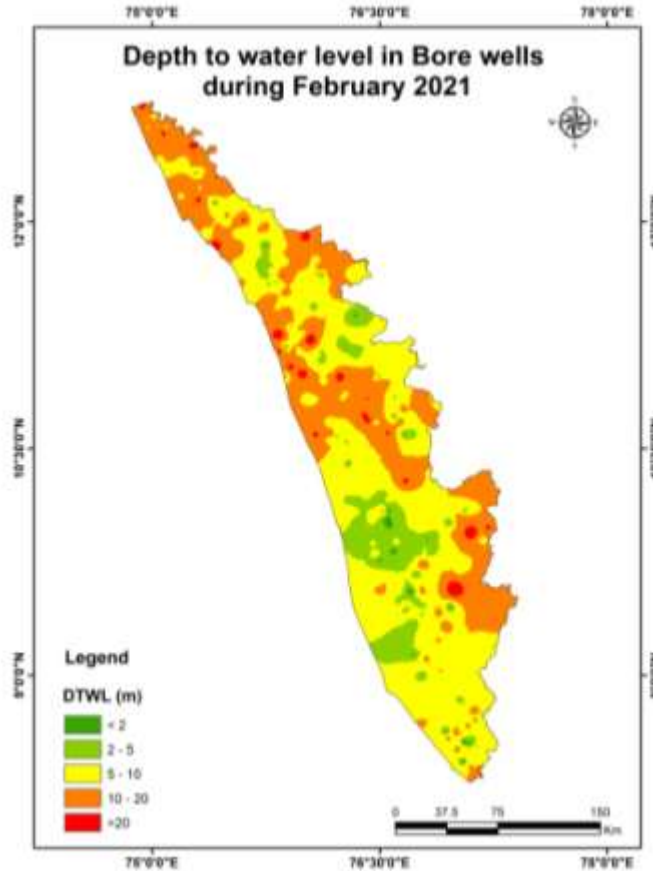
Dug wells- The depth to groundwater level in the observation dug wells during the month of February 2021 ranges from a minimum of -0.6 m to a maximum of 17.57 mbgl. Out of 394 dug wells monitored water level in 14% of dug wells shows a depth to water level ranges from 0-2 m, 31% ranges between 2-5 m, 43% ranges between 5-10 m and 12% dug wells recorded depth to water level ranges between 10-20 mbgl. Table showing well frequency during February 2021 is appended. (Annexure-I)



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

Borewells (hardrock terrain):- The depth to groundwater level in the observation bore wells during the month of February 2021 ranges from a minimum of -0.75 m to a maximum of 44.05 mbgl. Out of 351 bore wells monitored, water level in 8% of bore wells shows a depth to

water level range from 0-2 m, 19 % ranges between 2-5 m, 39% ranges between 5-10 m, 26% of bore wells ranges between 10-20 m, and 8% ranges more than 20 m . Table showing well frequency during February 2021 is appended. (Annexure-I)

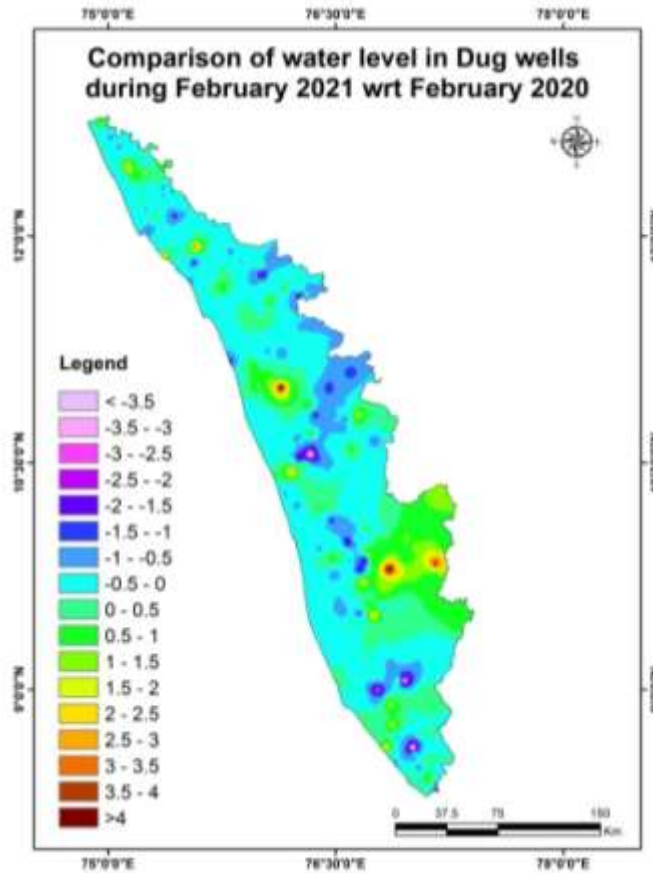


**Fig:5. Depth to water level in Bore wells during February 2021**

Tube wells (coastal sedimentary terrain) - The depth to groundwater level in the observation tube wells during the month of February 2021 range from a minimum of 0.7 m to a maximum of 34.57 m. Out of 43 tube wells monitored in the state, water level in 16 % of tube wells shows a depth to water level range from 0-2m, 35% of tube wells ranges between 2-5 m, 21 % of tube wells ranges between 5-10 m , 7% ranges between 10-20 m and 21% ranges more than 20m. Table showing well frequency is appended.(Annexure-I)

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

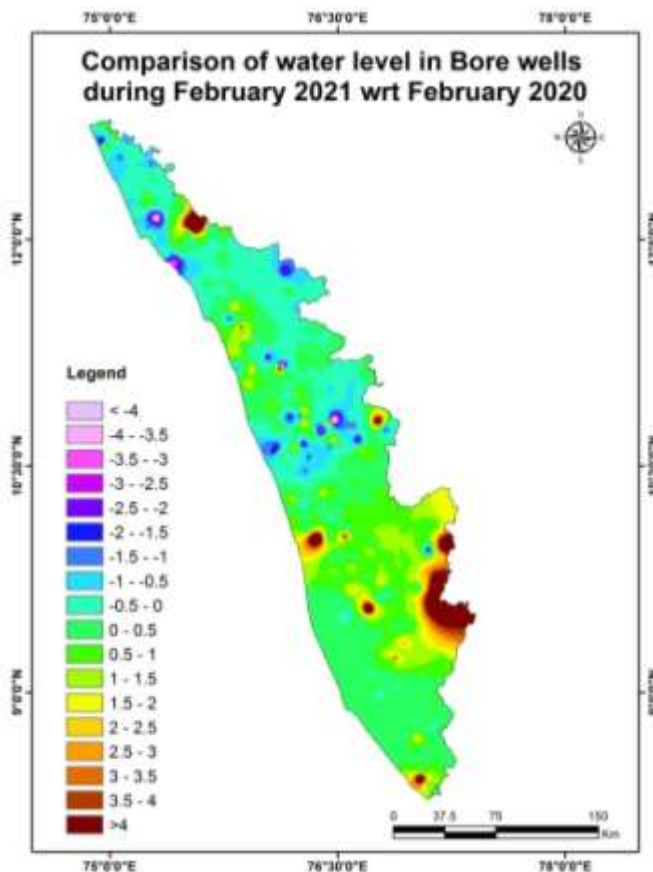
Comparison of the groundwater level in February 2021 with respect to the corresponding month in the previous year, indicates that 33 % of observation dug wells show a fall in water level and 67 % of the wells shows no remarkable change /marginal rise in water level. Out of 33% of the dug wells shows a falling trend, 73% recorded fall in water level less than 0.5m , 17 % of dug wells show fall in the range between 0.5-1m, 3 % of dug wells show fall in the range between 1-1.5 m, 2% of dug wells show a fall in the range between 1.5 -2m and 5% dug wells show a fall in water level more than 2m. Table showing water level comparison of dug wells during February 2021 with respect to February 2020 is appended. (Annexure-II).



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

Comparison of the water level in observation bore wells (hard rock terrain in midland and high land areas) in February 2021 with that of the previous year, it has been noticed that 32% of bore wells show fall in water level and 68% of the wells shows no remarkable change / marginal rise in water level. Out of 32 % of the bore wells shows a falling trend , 68 % of the

bore wells recorded fall in water level less than 0.5m, 14 % show fall in the range between 0.5 - 1m, 8 % of bore wells show fall in the range between 1 - 1.5m, 3 % 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 February 2021 with respect to February 2020 is appended. (Annexure-II)



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

Comparison of the water level in observation tube wells (in the coastal sedimentary areas) during February 2021 with that of the previous year reveals that 21 % of tube wells recorded a falling trend and 79 % of the wells shows no remarkable change /marginal rise of water level. Out of 21% of the tube wells showing a falling trend, 50% wells recorded fall in water level less than 0.5m, 38% wells show a fall in range between 0.5 to 1m and 12% wells show a fall in range between 1 to 1.5m. Table showing comparison of water level during February 2021 with respect to February 2020 is appended. (Annexure-II)

### III. Comparison of Groundwater level in February 2021 with respect to Decadal mean (2011- 20)

Comparison of the water level in February 2021 with respect to the decadal mean, it has been noticed that 23 % of observation dug wells recorded a fall in water level and 77% of the wells shows marginal rise /no remarkable change in water level. Out of 23% of the dug wells show a falling trend, 68% of the dug wells recorded fall in water level less than 0.5m, 19% show fall in the range between 0.5-1m, 5% 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 5% of dug wells show a fall in range more than 2m. Table showing water level comparison of dug wells during February 2021 with respect to decadal mean is appended. (Annexure-III)

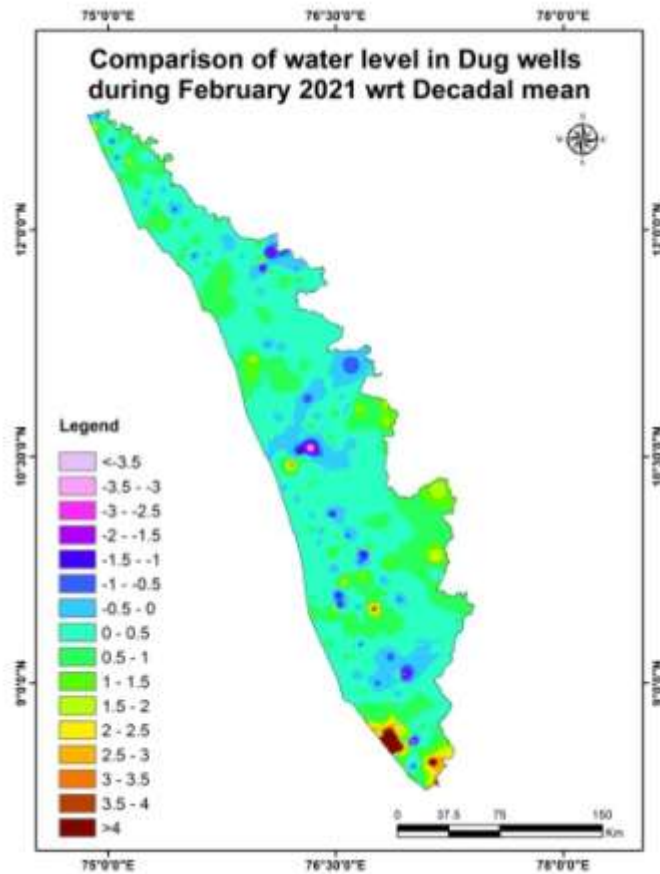
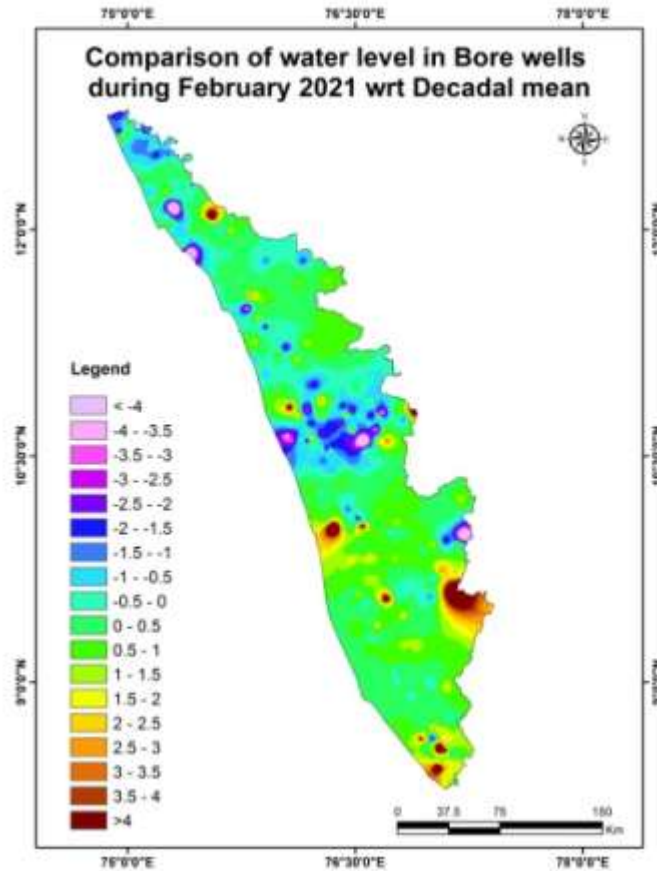


Fig:7. Comparison of water level in Dug wells during February 2021 wrt Decadal mean

Comparison of the water level in the observation bore wells during February 2021 with that of the decadal mean. It has been noticed that 37% of bore wells show fall in water level, and 63% of the wells shows marginal rise, no remarkable change in water level. Out of 37 % of the



bore wells shows a falling trend , 47 % shows a fall in water level less than 0.5m, 14 % show fall in the range between 0.5 - 1m, 10% show fall in the range between 1-1.5 m, 6% of wells show a fall in range between 1.5 - 2m, 23% show a fall in water level more than 2 m. Table showing water level comparison of bore wells during February 2021 with respect to decadal mean is appended. (Annexure-III)



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

Comparison of the water level in the observation tube wells during February 2021 with that of the decadal mean reveals that 20 % of tube wells recorded a falling trend and 80 % of the tube wells show marginal rise/no remarkable change in water level. Out of 20 % of the tube wells shows a falling trend, 74% of the tube wells show fall in water level less than 0.5m, 13% show fall in the range between 1-1.5m and 13% show fall in the range between more than 2 m. Table showing water level comparison of tube wells during February 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 February 2021 range from a minimum of -0.6 m to a maximum of 17.57 mbgl, in bore wells -0.76 m to a maximum of 44.05 mbgl and in the tube wells 0.7 m to a maximum of 34.57 mbgl.
- Comparison of the water level in February 2021 with respect to the previous year, reveals that 33 % of observation dug wells, 32 % of bore wells and 21% of tube wells recorded a falling trend. Majority of the observation wells show decline in water level less than 0.5 m.
- Comparison of groundwater level in February 2021 with respect to the decadal mean reveals that 23 % of observation dug wells, 37 % of bore wells and 20% of tube wells recorded a falling trend. Majority of the observation wells 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 winter season (January-February 2021) than that of the winter season in the previous year (January-February 2020).

District wise Observation well Frequency on February 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	31	-0.60	12.82	Karumam	Veiloor-Murukkumpuzha	2	12	13	4	0
	Bore well	37	-0.75	18.42	Vellanad	Anad	5	4	18	10	0
	Tube well	4	3.56	9.43	Azhoor	Sarkara-Chirayinkeezhu	0	1	3	0	0
Kollam	Dug well	25	1.05	11.04	Ochira	Manrothuruth	4	6	14	1	0
	Bore well	16	1.40	10.61	Kottarakkara	Vilakudy	1	1	13	1	0
	Tube well	9	2.56	34.57	Panmana	Mynagappally	0	0	0	0	9
Pathanamthitta	Dug well	14	1.90	8.69	Peringara	Kunnamthanam	1	10	3	0	0
	Bore well	25	0.93	14.55	Erathu	Ezhamkulam	3	6	12	4	0
Alappuzha	Dug well	21	0.22	11.52	Chambakulam	Kattanam	9	8	2	2	0
	Bore well	2	2.37	4.47	Punthala	Pennukkara	0	2	0	0	0
	Tube well	29	0.70	18.18	Chingoly	Charumoodu	7	14	6	2	0
Kottayam	Dug well	20	1.00	11.45	Kumarakom	Panachikkad	4	6	8	2	0
	Bore well	24	-0.47	21.57	Vellavoor	Kanjirappally	5	6	9	3	1
Idukki	Dug well	20	0.44	8.45	Udumbanchola	Ayyappancoil	5	8	7	0	0
	Bore well	22	1.70	33.24	Udumbannoor	Peerumade	2	5	7	5	3
Ernakulam	Dug well	37	0.33	9.75	Chellanam	Perumbavoor	9	11	17	0	0
	Bore well	25	-0.40	11.98	Muvattupuzha	Rayamangalam	4	8	12	1	0
	Tube well	1	11.06	11.06	Cochin	Cochin	0	0	0	1	0

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Thrissur	Dug well	32	1.09	13.04	Eriad	Poyya	6	10	12	4	0
	Bore well	36	2.84	28.00	Madakkathara	Kandanassery	0	7	14	11	4
Malappuram	Dug well	26	1.72	13.95	Kondotty	Othukkungal	1	9	12	4	0
	Bore well	30	1.66	44.05	Wandoor	Areekode	2	7	12	5	4
Palakkad	Dug well	31	0.92	10.66	Alathur	Mannarkad	3	13	12	3	0
	Bore well	33	1.56	21.72	Elavancherry	Melarcodes	2	4	9	14	4
Kozhikkode	Dug well	33	2.23	11.89	Perambra	Vanimel	2	13	15	3	0
	Bore well	33	0.65	29.71	Ramanattukara	Nellikode	1	11	10	7	4
Wayanad	Dug well	26	0.23	11.99	Poothadi	Anchukunnu	5	5	12	4	0
	Bore well	19	2	23.04	Muttill North	Thirunelly	0	3	6	9	1
Kannur	Dug well	36	1.36	17.57	Vekkalam	Kooveri	5	6	19	6	0
	Bore well	28	1	25.84	Vekkalam	Edakkad	2	1	12	10	3
Kasaragod	Dug well	42	2.96	15.50	Chittarikkal	Bandadka	0	6	22	14	0
	Bore well	21	3.54	23.75	Balal	Bandadka	0	1	6	11	3

## Comparison of Water level February 2021 with respect to February 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	22	11	8	0	1	2
			Fall	9	5	3	0	0	1
	Bore well	33	Rise	26	17	6	1	0	2
			Fall	7	6	1	0	0	0
	Tube well	4	Rise	4	4	0	0	0	0
			Fall	0	0	0	0	0	0
Kollam	Dug well	25	Rise	19	10	7	1	0	1
			Fall	6	2	2	0	0	2
	Bore well	15	Rise	11	9	2	0	0	0
			Fall	4	4	0	0	0	0
	Tube well	9	Rise	9	0	0	0	0	0
			Fall	0	0	0	0	0	0
Pathanamthitta	Dug well	14	Rise	12	7	5	0	0	0
			Fall	2	2	0	0	0	0
	Bore well	25	Rise	22	15	4	0	1	2
			Fall	3	3	0	0	0	0
Alappuzha	Dug well	23	Rise	17	15	2	0	0	0
			Fall	6	5	1	0	0	0
	Bore well	2	Rise	1	1	0	0	0	0
			Fall	1	1	0	0	0	0
	Tube well	26	Rise	18	18	0	0	0	0
			Fall	8	4	3	1	0	0
Kottayam	Dug well	21	Rise	14	7	2	1	2	2
			Fall	7	3	3	0	1	0
	Bore well	24	Rise	18	7	4	2	2	3
			Fall	6	4	2	0	0	0

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Idukki	Dug well	20	Rise	19	1	9	5	1	3
			Fall	1	0	0	0	0	1
	Bore well	22	Rise	20	1	7	5	2	5
			Fall	2	1	0	0	1	0
Ernakulam	Dug well	38	Rise	25	20	3	1	1	0
			Fall	13	11	0	1	0	1
	Bore well	23	Rise	16	9	3	2	0	2
			Fall	7	7	0	0	0	0
	Tube well		Rise						
			Fall						
Thrissur	Dug well	31	Rise	21	16	3	1	0	1
			Fall	10	7	1	0	1	1
	Bore well	35	Rise	15	8	2	2	2	1
			Fall	20	8	3	4	1	4
Malappuram	Dug well	26	Rise	17	10	1	4	1	1
			Fall	9	8	1	0	0	0
	Bore well	30	Rise	30	30	0	0	0	0
			Fall	0	0	0	0	0	0
Palakkad	Dug well	31	Rise	15	10	2	2	0	1
			Fall	16	8	6	2	0	0
	Bore well	33	Rise	33	33	0	0	0	0
			Fall	0	0	0	0	0	0
Kozhikkode	Dug well	33	Rise	33	33	0	0	0	0
			Fall	0	0	0	0	0	0
	Bore well	32	Rise	18	12	2	0	1	3
			Fall	14	11	1	1	1	0
Wayanad	Dug well	25	Rise	9	6	2	0	1	0
			Fall	16	12	2	0	1	1
	Bore well	19	Rise	2	1	1	0	0	0
			Fall	17	14	2	0	0	1

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Kannur	Dug well	36	Rise	17	13	2	0	0	2
			Fall	19	16	2	1	0	0
	Bore well	28	Rise	12	9	2	0	0	1
			Fall	16	11	2	1	0	2
Kasaragod	Dug well	42	Rise	25	16	4	2	1	2
			Fall	17	16	1	0	0	0
	Bore well	21	Rise	10	6	3	1	0	0
			Fall	11	3	4	3	0	1

**Comparison of Water level February 2021 with respect to 10 yrs mea**

**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	28	8	8	4	2	6
			Fall	3	1	1	0	0	1
	Bore well	34	Rise	26	15	5	2	0	4
			Fall	8	5	1	0	1	1
	Tube well	4	Rise	2	2	0	0	0	0
			Fall	2	2	0	0	0	0
Kollam	Dug well	25	Rise	18	9	8	1	0	0
			Fall	7	5	1	0	0	1
	Bore well	16	Rise	8	6	1	0	1	0
			Fall	8	8	0	0	0	0
	Tube well	9	Rise	7	4	1	0	1	1
			Fall	2	2	0	0	0	0

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Pathanamthitta	Dug well	14	Rise	12	8	3	1	0	0
			Fall	2	1	1	0	0	0
	Bore well	25	Rise	20	9	6	1	3	1
			Fall	5	5	0	0	0	0
Alappuzha	Dug well	17	Rise	16	9	6	1	0	0
			Fall	1	1	0	0	0	0
	Bore well	2	Rise	1	0	0	1	0	0
			Fall	1	0	1	0	0	0
	Tube well	27	Rise	24	17	6	1	0	0
			Fall	3	2	0	0	0	1
Kottayam	Dug well	21	Rise	13	6	3	1	2	1
			Fall	8	3	3	2	0	0
	Bore well	24	Rise	15	6	3	1	2	3
			Fall	9	4	5	0	0	0
Idukki	Dug well	20	Rise	18	9	5	2	1	1
			Fall	2	0	1	0	1	0
	Bore well	22	Rise	16	3	6	5	0	2
			Fall	6	2	1	1	1	1
Ernakulam	Dug well	38	Rise	32	24	7	1	0	0
			Fall	6	4	1	1	0	0
	Bore well	23	Rise	17	9	4	2	0	2
			Fall	6	4	0	1	0	1
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	0	1	0	0
Thrissur	Dug well	31	Rise	20	15	3	1	0	1
			Fall	11	9	0	0	1	1
	Bore well	35	Rise	13	9	1	2	0	1
			Fall	22	8	1	3	1	9
Malappuram	Dug well	26	Rise	23	11	6	4	2	0
			Fall	3	2	1	0	0	0



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	Bore well	30	Rise	17	8	6	2	0	1
			Fall	13	6	3	1	1	2
Palakkad	Dug well	31	Rise	17	7	5	2	3	0
			Fall	14	12	1	1	0	0
	Bore well	33	Rise	18	5	1	5	2	5
			Fall	15	3	2	1	1	8
Kozhikkode	Dug well	17	Rise	16	9	4	3	0	0
			Fall	1	1	0	0	0	0
	Bore well	33	Rise	23	15	4	2	0	2
			Fall	10	5	2	1	0	2
Wayanad	Dug well	26	Rise	15	9	4	0	2	0
			Fall	11	7	2	0	1	1
	Bore well	19	Rise	14	12	0	2	0	0
			Fall	5	3	0	1	1	0
Kannur	Dug well	36	Rise	27	18	7	1	1	0
			Fall	9	7	2	0	0	0
	Bore well	28	Rise	22	18	2	0	1	1
			Fall	6	3	0	1	0	2
Kasaragod	Dug well	41	Rise	32	16	7	6	1	2
			Fall	9	6	3	0	0	0
	Bore well	21	Rise	8	6	0	1	1	0
			Fall	13	4	1	3	2	3

## Observation well frequency on February 2021

## Abstract I

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	394	-0.6	17.57	Karumam (Thiruvananthapuram)	Kooveri (Kannur)	56	123	168	47	0
						14%	31%	43%	12%	0%
Bore well	351	-0.75	44.05	Vellanad (Thiruvananthapuram)	Areekode (Malappuram)	27	66	140	91	27
						8%	19%	39%	26%	8%
Tube well	43	0.7	34.57	Chingoly (Alappuzha)	Mynagappally (Kollam)	7	15	9	3	9
						16%	35%	21%	7%	21%

## Comparison of Water level February 2021 with respect to February 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	396	Rise	265	175	50	17	8	15
		%	67%	66%	19%	6%	3%	6%
		Fall	131	95	22	4	3	7
		%	33%	73%	17%	3%	2%	5%
Bore well	342	Rise	234	158	36	13	8	19
		%	68%	68%	15%	6%	3%	8%
		Fall	108	73	15	9	3	8
		%	32%	68%	14%	8%	3%	7%
Tube well	39	Rise	31	31	0	0	0	0
		%	79%	100%	0%	0%	0%	0%
		Fall	8	4	3	1	0	0
		%	21%	50%	38%	12%	0%	0%

**Comparison of Water level February 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	374	Rise	287	158	76	28	14	11
		%	77%	55%	26%	10%	5%	4%
		Fall	87	59	17	4	3	4
		%	23%	68%	19%	5%	3%	5%
Bore well	345	Rise	218	121	39	26	10	22
		%	63%	56%	18%	12%	4%	10%
		Fall	127	60	17	13	8	29
		%	37%	47%	14%	10%	6%	23%
Tube well	41	Rise	33	23	7	1	1	1
		%	80%	70%	21%	3%	3%	3%
		Fall	8	6	0	1	0	1
		%	20%	74%	0%	13%	0%	13%