

GOVERNMENT OF KERALA
GROUNDWATER DEPARTMENT

GROUNDWATER LEVEL MONITORING REPORT – APRIL 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). From pre-monsoon season 2020 (March-May) the state received normal rainfall (387.5 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. The pre-monsoon rainfall occurred in the state during 2021 is 750.9 mm which is 108% excess than that of the normal rainfall (361.5 mm). Since large excess rainfall occurred during pre-monsoon season, most of the observation wells got recharged during this season than that of the previous year (2020).

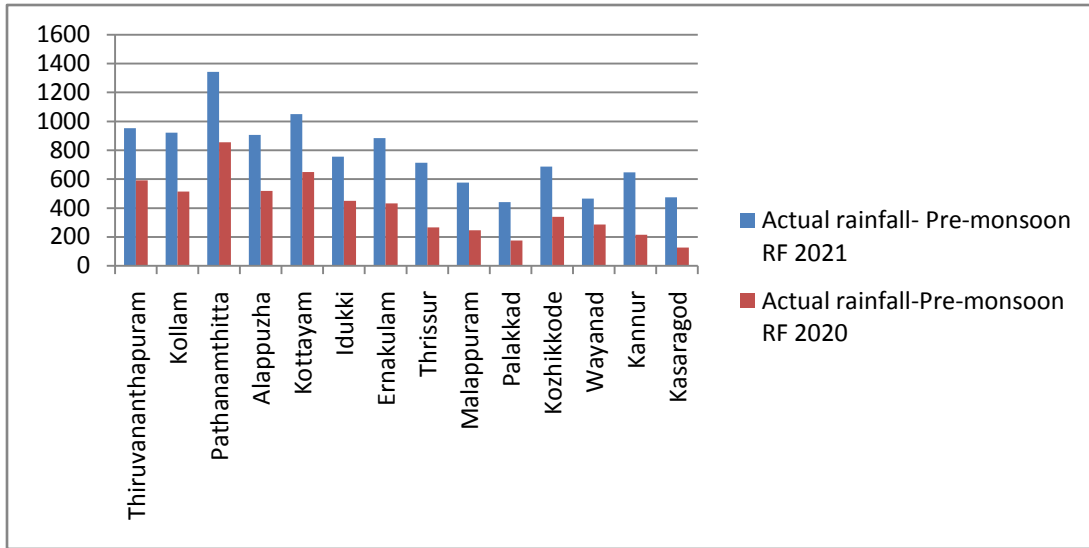


Fig:1. Comparison of actual Pre-monsoon rainfall occurred during 2021 wrt 2020

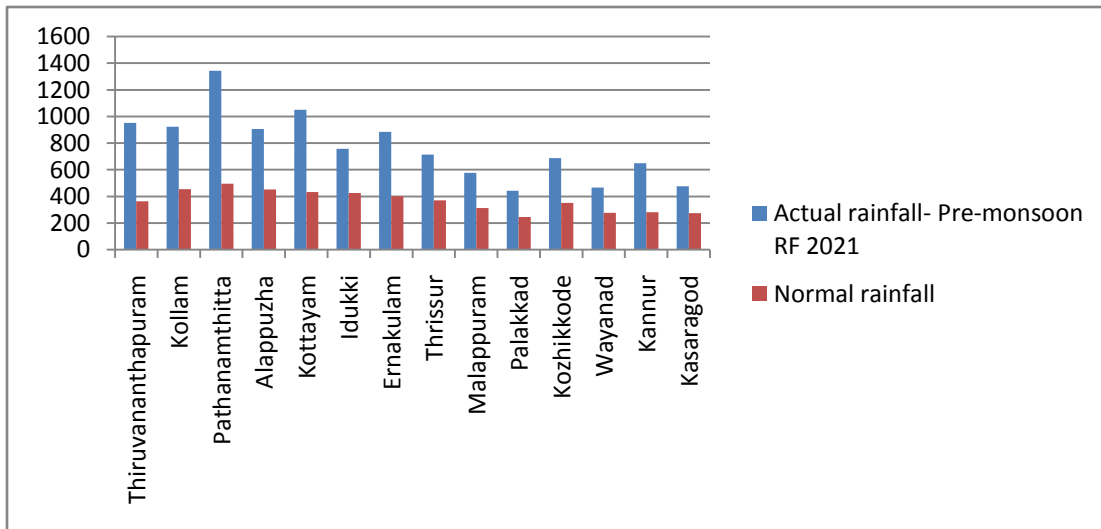


Fig:2. Comparison of actual Pre-monsoon rainfall occurred during 2021 wrt Normal Rainfall

Geology: Kerala, the southernmost state of Indian peninsula, is having a geographical area of 38863 km². 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.

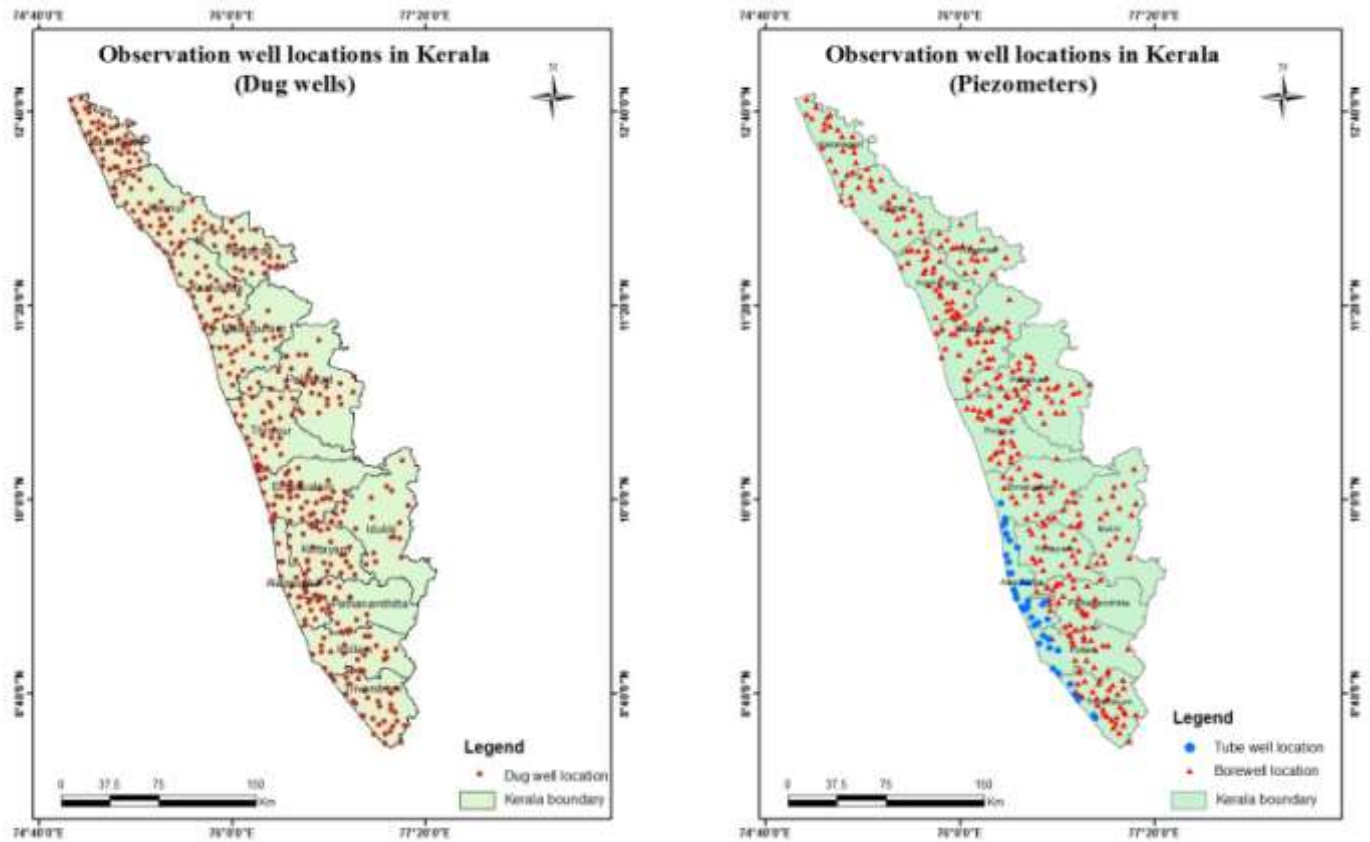


Fig:3. Location map of observation dug wells and piezometers (bore wells & tube wells)

Analysis of Groundwater level data – April 2021

During the month of April 2021, groundwater level in 391 dug wells and 384 purpose built piezometers (bore wells- 348 and tube wells – 36) has been monitored. The data collected

from the observation wells during the month of April 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 April 2021

Dug wells- The depth to groundwater level in the observation dug wells during the month of April 2021 ranges from a minimum of -0.65 m to a maximum of 17.75 mbgl. Out of 391 dug wells monitored water level in 12% of dug wells shows a depth to water level ranges from 0-2 m, 31% ranges between 2-5 m, 41% ranges between 5-10 m and 15% dug wells recorded depth to water level ranges between 10-20 mbgl. None of the wells show water level above 20m. Table showing well frequency during April 2021 is appended. (Annexure-I)

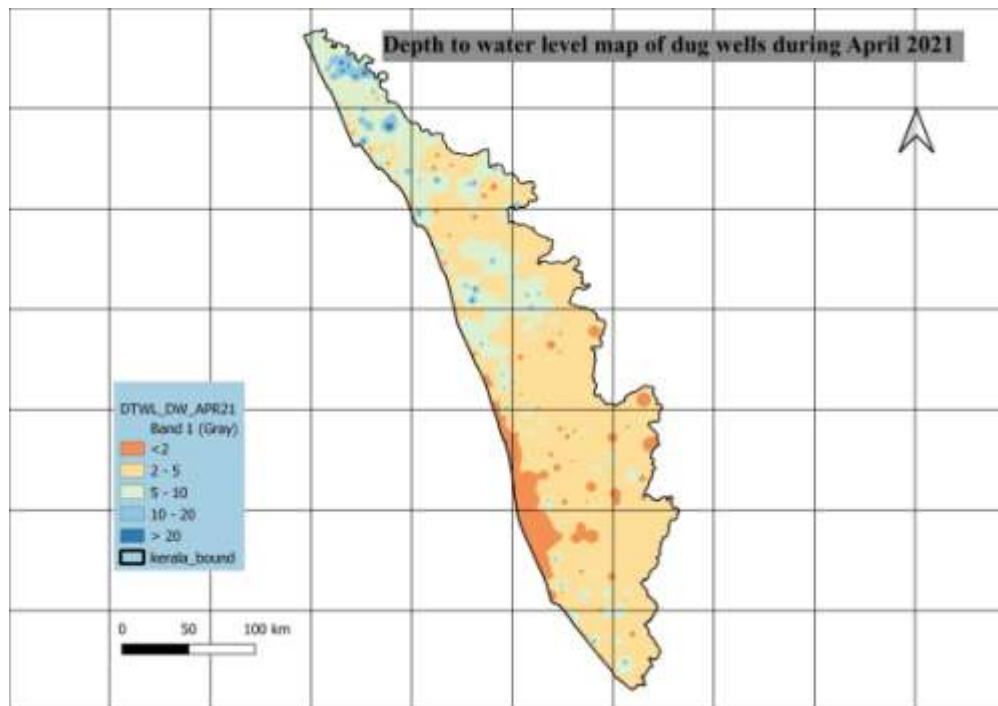


Fig:4. Depth to water level in Dug wells during April 2021

Borewells (hardrock terrain):-The depth to groundwater level in the observation bore wells during the month of April 2021 ranges from a minimum of -0.6m to a maximum of 48.86 mbgl. Out of 348 borewells monitored, water level in 6% of bore wells shows a depth to water level range from 0-2 m, 19 % ranges between 2-5 m, 36% ranges between 5-10 m, 29% of borewells ranges between 10-20 m, and 10% ranges more than 20 m . Table showing well frequency during April 2021 is appended. (Annexure-I)

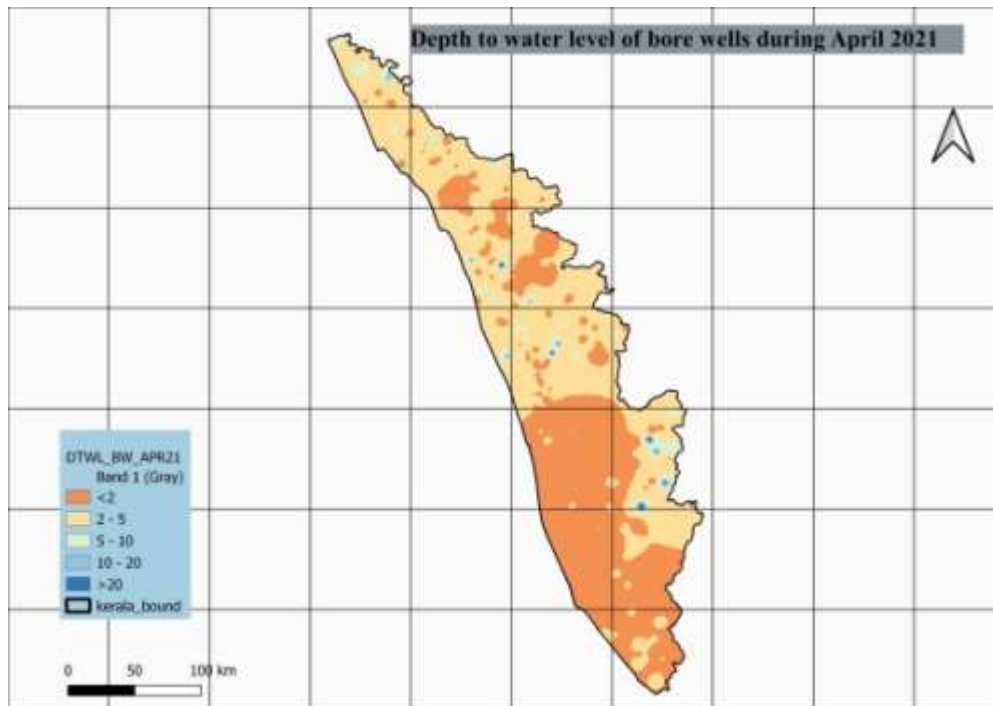


Fig:5. Depth to water level in Bore wells during April 2021

Tubewells (coastal sedimentary terrain) - The depth to groundwater level in the observation tubewells during the month of April 2021 ranges from a minimum of 0.601 m to a maximum of 32.65 mbgl . Out of 36 tube wells monitored in the state, water level in 19 % of tube wells shows a depth to water level range from 0-2m, 36% of tube wells ranges between 2-5m, 22 % of tube wells ranges between 5-10 m, 17% ranges between 10-20 m and 6% ranges more than 20m. Table showing tube well frequency is appended. (Annexure-I)

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

Comparison of the groundwater level in April 2021 with respect to the corresponding month in the previous year, indicates that 37 % of observation dug wells show a fall in water level and 63 % of the wells shows no remarkable change /marginal rise in water level. Out of 37% of the dugwells shows a falling trend, 65% recorded fall in water level less than 0.5m, 21 % of dug wells show fall in the range between 0.5-1m, 7 % of dug wells show fall in the range between 1-1.5 m, 4% 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 April 2021 with respect to April 2020 is appended. (Annexure-II).

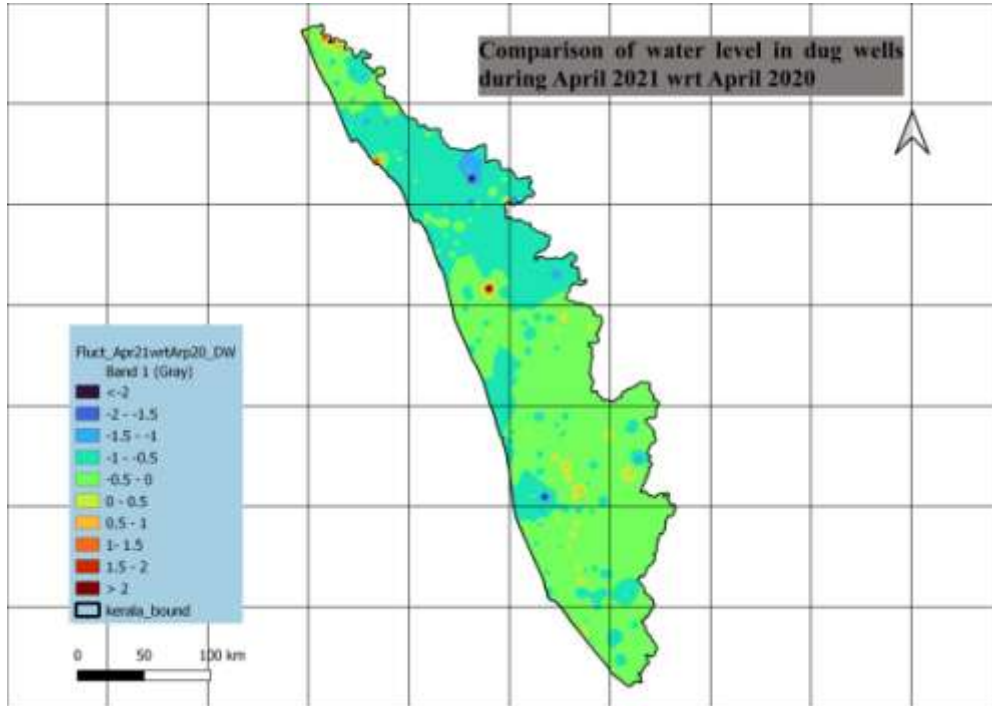


Fig:6. Comparison of water level in Dug wells during April 2021 wrt April 2020

Comparison of the water level in observation bore wells (hard rock terrain in midland and high land areas) in April 2021 with that of the previous year, it has been noticed that 39% of bore wells show fall in water level and 61% of the wells shows no remarkable change/marginal rise in water level. Out of 39% of the borewells shows a falling trend, 59% of the bore wells recorded fall in water level less than 0.5m, 17% show fall in the range between 0.5 - 1m, 9% 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, 12% of bore wells show a fall in water level more than 2m. Table showing water level comparison of bore wells during April 2021 with respect to April 2020 is appended. (Annexure-II)

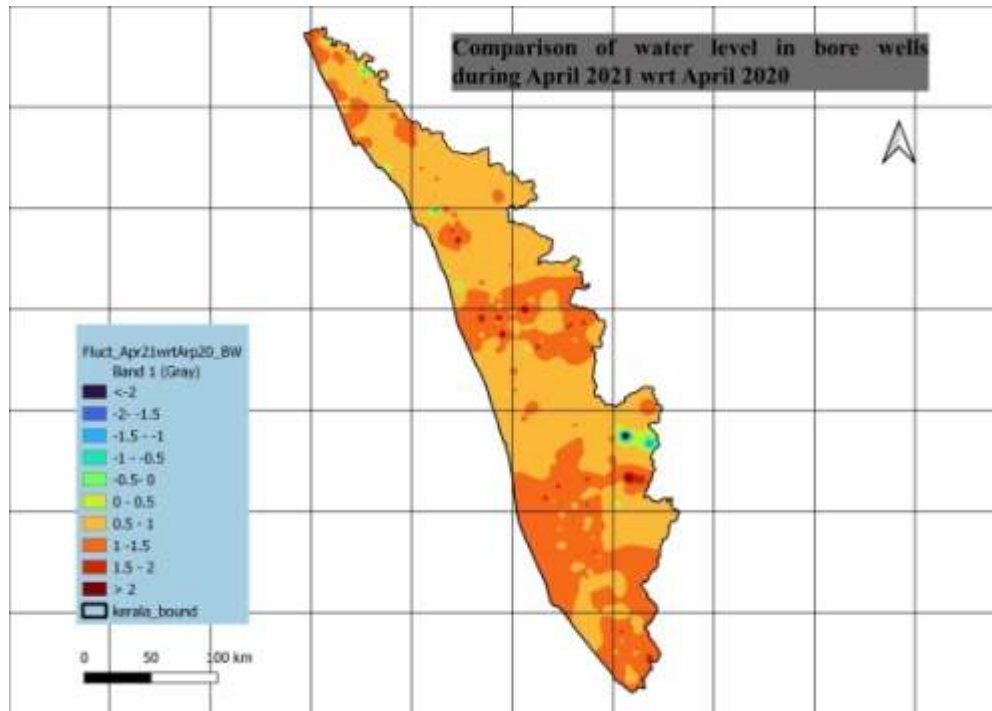


Fig:7. Comparison of water level in Bore wells during April 2021 wrt April 2020

Comparison of the water level in observation tube wells (in the coastal sedimentary areas) during April 2021 with that of the previous year reveals that 20 % of tube wells recorded a falling trend and 80 % of the wells shows no remarkable change /marginal rise of water level. Out of 20% of the tube wells showing a falling trend, 75% wells recorded fall in water level less than 0.5m, 25% wells show a fall in range between 0.5 to 1m and no wells show a fall in water level above 1m. Table showing comparison of water level during April 2021 with respect to April 2020 is appended. (Annexure-II)

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

Comparison of the water level in April 2021 with respect to the decadal mean, it has been noticed that 26 % of observation dug wells recorded a fall in water level and 74% of the wells shows marginal rise /no remarkable change in water level. Out of 26% of the dug wells show a falling trend, 59% of the dug wells recorded fall in water level less than 0.5m, 27% show fall in the range between 0.5-1m, 7% of dug wells show fall in the range between 1-1.5m, 5 % 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 April 2021 with respect to

decadal mean is appended. (Annexure-III)

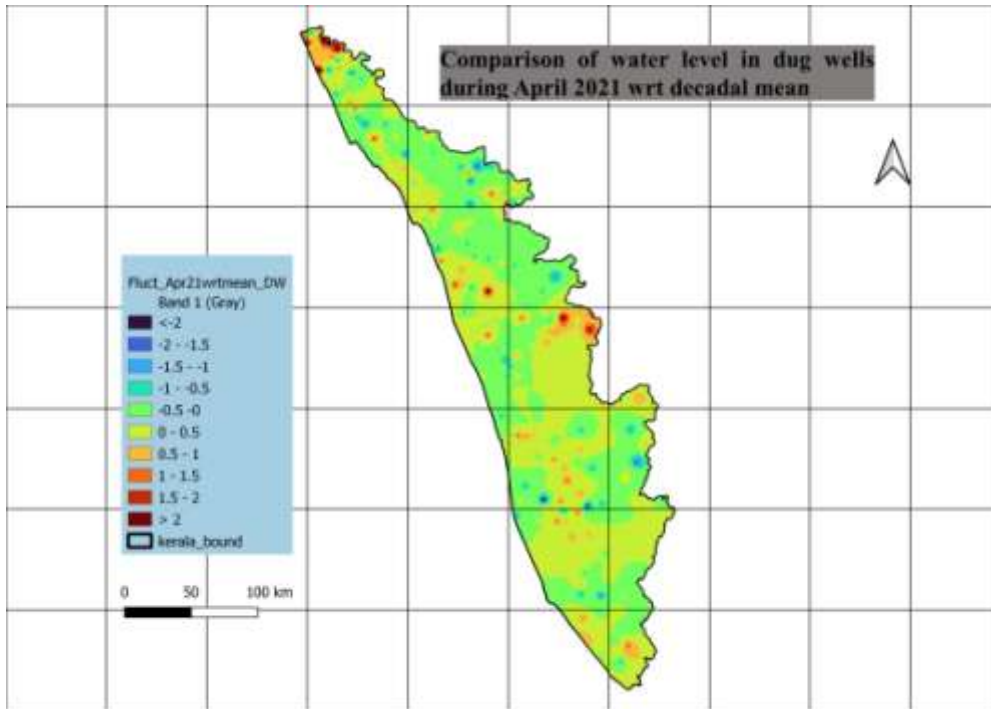


Fig:7. Comparison of water level in Dug wells during April 2021 wrt Decadal mean

Compared water level in the observation bore wells during April 2021 with that of the decadal mean. It has been noticed that 43% of bore wells show fall in water level, and 57% of the wells shows marginal rise, no remarkable change in water level. Out of 43% of the bore wells shows a falling trend, 42% shows a fall in water level less than 0.5m, 17% show fall in the range between 0.5 - 1m, 8% show fall in the range between 1-1.5 m, 7% of wells show a fall in range between 1.5 - 2m, 26% show a fall in water level more than 2 m. Table showing water level comparison of bore wells during April 2021 with respect to decadal mean is appended. (Annexure-III)

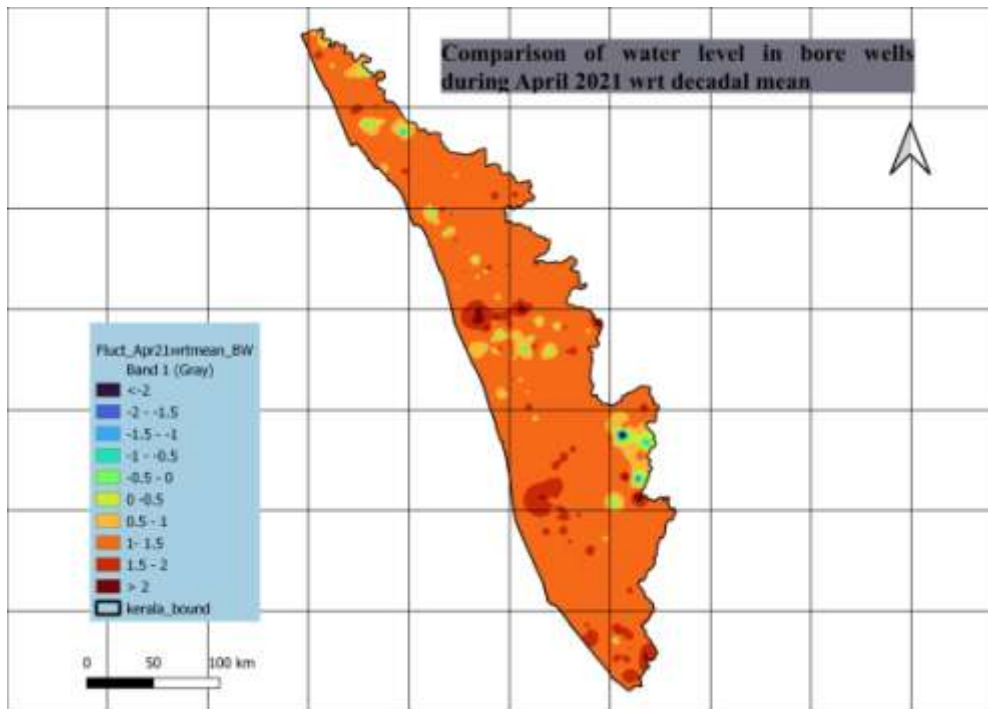


Fig:8. Comparison of water level in Bore wells during April 2021 wrt Decadal mean

Comparison of the water level in the observation tube wells during April 2021 with that of the decadal mean reveals that 31 % of tube wells recorded a falling trend and 69 % of the tube wells show marginal rise/no remarkable change in water level. Out of 31 % of the tube wells shows a falling trend, 84% of the tube wells show fall in water level less than 0.5m and 8% show fall in the range between 0.5-1m. Table showing water level comparison of tube wells during April 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.
- The rainfall during the pre-monsoon (March-May 2020) occurred in the state is 387.5 mm, which is normal rainfall.
- The pre-monsoon rainfall occurred in the state during 2021 is 750.9 mm which is 108% large excess than that of the normal rainfall (361.5 mm)

Groundwater level

- The depth to groundwater level in the observation dug wells during the month of April 2021 range from a minimum of -0.65 m to a maximum of 17.75 mbgl, in bore wells -0.6 m to a maximum of 48.86 mbgl and in the tubewells 0.601m to a maximum of 32.65 mbgl.
- Comparison of the water level in April 2021 with respect to the previous year, reveals that 37 % of observation dug wells, 39% of bore wells and 20% of tube wells recorded a falling trend. 62.4% of the observation wells with falling trend show decline in water level less than 0.5 m.
- Comparison of groundwater level in April 2021 with respect to the decadal mean reveals that 26 % of observation dug wells, 43 % of bore wells and 31% of tube wells recorded a falling trend. 50% of the observation wells with falling trend 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 large excess rainfall occurred during the pre-monsoon season (March-May 2021) than that of the pre-monsoon season in the previous year (March-May 2020).

Districtwise Observation well Frequency on April 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	-0.65	14	Poojappura	Veiloor-Murukkumpuzha	3	10	13	5	0
	Bore well	33	-0.60	20	Aryanad	Anad	3	10	13	7	0
	Tube well	4	4.14	10	Azhoor	Sarkara-Chirayinkeezhu	0	1	2	1	0
Kollam	Dug well	23	0.76	12	Karavoor	Muntrothuruth	4	7	8	4	0
	Bore well	16	0.96	11	Kottarakkara	Vilakudy	1	0	13	2	0
	Tube well	8	3.33	33	Panmana	Kureepuzha	0	2	2	2	2
Pathanamthitta	Dug well	13	1.19	8	Pathanamthitta	Kunnamthanam	4	7	2	0	0
	Bore well	24	0.27	17	Kalanjoor	Athumbukulam	3	7	8	6	0
Alappuzha	Dug well	18	0.14	12	Pulinkunnu	Kattanam	8	9	0	1	0
	Bore well	2	3.84	4	Punthala	Pennukkara	0	2	0	0	0
	Tube well	23	0.60	18	Thrikkunnappuzha	Chunakkara,Charu moodu	7	10	4	2	0
Kottayam	Dug well	20	0.59	11	Poonjar	Kodimatha	5	8	5	2	0
	Bore well	24	-0.10	23	Veliyannoor	Kanjirappally	6	8	6	3	1
Idukki	Dug well	20	0.63	10	Santhanpara	Ayyappancoil	4	8	7	1	0
	Bore well	23	2.08	42	Udumbannoor	Peerumedu	0	8	7	3	5
Ernakulam	Dug well	38	0.31	10	Chellanam	Pookkattupady	9	13	16	0	0
	Bore well	25	1.02	11	Odakkali	Kakkanad	3	7	14	1	0
	Tube well	1	11.22	11	Cochin	Cochin	0	0	0	1	0
Thrissur	Dug well	31	1.48	13	Pattikkadu	Poyya	4	10	12	5	0
	Bore well	37	1.39	40	Chengallur	Pazhayannur	1	3	14	12	7
Malappuram	Dug well	26	3.33	15	Kottappady	Othukkungal	0	8	13	5	0
	Bore well	30	2.39	49	Vazhikkadavu	Areekode	0	6	14	6	4

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Palakkad	Dug well	31	0.91	11	Alathur	Sreekrishnapuram	2	12	14	3	0
	Bore well	34	2.21	25	Kuzhalmannam	Pattambi	0	6	6	16	6
Kozhikkode	Dug well	33	1.52	14	Njeliumparamu	Parappupara, Thuneri	2	8	19	4	0
	Bore well	33	1.43	31	Ramanattukara	Nellikodu	2	7	11	8	5
Wayanad	Dug well	26	0.24	14	Kenichira	Cheeral	3	7	12	4	0
	Bore well	19	2.19	23	Muttil	Thirunelli	0	2	6	10	1
Kannur	Dug well	36	1.58	18	Vekkalam	Kooveri, Oduvallithattu	2	9	15	10	0
	Bore well	27	1.81	27	Kooveri, Chapparappadavu	Eruvassy	1	0	10	12	4
Kasaragod	Dug well	45	2.55	16	Chittarikkal	Bandadka	0	5	24	16	0
	Bore well	21	3.56	30	Beemanady	Bandadka	0	1	4	13	3

Comparison of Water level April 2021 with respect to April 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	30	Rise	23	13	5	3	0	2
			Fall	7	4	0	3	0	0
	Bore well	30	Rise	25	13	7	2	1	2
			Fall	5	4	1	0	0	0
	Tube well	4	Rise	3	2	1	0	0	0
			Fall	1	0	1	0	0	0
Kollam	Dug well	23	Rise	14	11	0	2	0	1
			Fall	9	7	1	1	0	0
	Bore well	16	Rise	12	8	1	3	0	0
			Fall	4	4	0	0	0	0
	Tube well	8	Rise	7	5	2	0	0	0
			Fall	1	1	0	0	0	0

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Pathanamthitta	Dug well	14	Rise	12	2	4	1	5	0
			Fall	2	2	0	0	0	0
	Bore well	25	Rise	22	8	8	2	3	1
			Fall	3	3	0	0	0	0
Alappuzha	Dug well	21	Rise	16	12	4	0	0	0
			Fall	5	2	2	1	0	0
	Bore well	2	Rise	1	0	1	0	0	0
			Fall	1	1	0	0	0	0
	Tube well	27	Rise	22	22	0	0	0	0
			Fall	5	5	0	0	0	0
Kottayam	Dug well	20	Rise	12	6	1	0	2	3
			Fall	8	5	2	0	0	1
	Bore well	24	Rise	18	7	5	1	1	4
			Fall	6	4	0	2	0	0
Idukki	Dug well	20	Rise	16	3	6	5	1	1
			Fall	4	1	2	0	1	0
	Bore well	23	Rise	10	2	1	1	3	3
			Fall	13	7	2	1	0	3
Ernakulam	Dug well	36	Rise	26	13	8	4	0	1
			Fall	10	7	3	0	0	0
	Bore well	22	Rise	12	6	5	0	0	1
			Fall	10	8	2	0	0	0
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	1	0	0	0
Thrissur	Dug well	31	Rise	15	11	2	1	1	0
			Fall	16	12	3	1	0	0
	Bore well	37	Rise	15	5	4	4	0	2
			Fall	22	9	7	4	0	2
Malappuram	Dug well	25	Rise	13	7	4	1	0	1
			Fall	12	9	3	0	0	0

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	Bore well	27	Rise	13	6	4	1	1	1
			Fall	14	9	3	1	0	1
Palakkad	Dug well	31	Rise	21	14	2	3	1	1
			Fall	10	7	2	0	1	0
	Bore well	33	Rise	22	5	4	3	1	9
			Fall	11	6	1	1	1	2
Kozhikkode	Dug well	33	Rise	20	19	1	0	0	0
			Fall	13	8	5	0	0	0
	Bore well	32	Rise	21	11	7	0	1	2
			Fall	11	6	2	1	0	2
Wayanad	Dug well	26	Rise	5	2	1	1	0	1
			Fall	21	13	2	2	1	3
	Bore well	19	Rise	4	3	0	0	0	1
			Fall	15	12	0	1	2	0
Kannur	Dug well	36	Rise	20	18	1	0	0	1
			Fall	16	9	4	2	1	0
	Bore well	28	Rise	21	13	3	2	1	2
			Fall	7	2	2	0	0	3
Kasaragod	Dug well	43	Rise	34	20	5	3	3	3
			Fall	9	6	1	0	2	0
	Bore well	21	Rise	13	2	5	0	3	3
			Fall	8	2	2	1	1	2

Comparison of Water level April 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	25	4	9	6	2	4
			Fall	6	4	2	0	0	
	Bore well	33	Rise	21	8	5	4	1	3
			Fall	12	8	3	0	0	1
	Tube well	4	Rise	2	2	0	0	0	0
			Fall	2	2	0	0	0	0
Kollam	Dug well	23	Rise	14	9	4	1	0	0
			Fall	9	7	1	1	0	0
	Bore well	16	Rise	4	3	0	1	0	0
			Fall	12	7	4	1	0	0
	Tube well	8	Rise	4	1	1	0	1	1
			Fall	4	4	0	0	0	0
Pathanamthitta	Dug well	14	Rise	13	4	6	1	2	0
			Fall	1	1	0	0	0	0
	Bore well	25	Rise	20	9	7	3	0	1
			Fall	5	1	2	0	0	2
Alappuzha	Dug well	19	Rise	15	11	4	0	0	0
			Fall	4	2	2	0	0	0
	Bore well	2	Rise	1	1	0	0	0	0
			Fall	1	1	0	0	0	0
	Tube well	26	Rise	21	18	3	0	0	0
			Fall	5	4	0	0	0	1
Kottayam	Dug well	20	Rise	14	6	3	2	3	0
			Fall	6	3	1	0	0	2
	Bore well	24	Rise	15	4	6	0	2	3
			Fall	9	4	3	2	0	0

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Idukki	Dug well	20	Rise	14	8	4	2	0	0
			Fall	6	2	3	0	1	0
	Bore well	23	Rise	13	6	1	2	2	2
			Fall	10	1	2	2	0	5
Ernakulam	Dug well	38	Rise	31	18	10	1	2	0
			Fall	7	5	2	0	0	0
	Bore well	23	Rise	16	11	3	1	0	1
			Fall	7	4	2	0	0	1
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	1	0	0	0
Thrissur	Dug well	31	Rise	18	13	3	1	1	0
			Fall	13	11	1	1	0	0
	Bore well	37	Rise	8	5	1	1	0	1
			Fall	29	6	3	5	3	12
Malappuram	Dug well	31	Rise	19	10	5	2	0	2
			Fall	7	4	3	0	0	0
	Bore well	30	Rise	17	9	4	1	1	2
			Fall	13	5	2	1	1	4
Palakkad	Dug well	26	Rise	24	11	6	2	3	2
			Fall	7	4	2	1	0	0
	Bore well	33	Rise	22	5	6	0	4	7
			Fall	11	5	0	1	1	4
Kozhikkode	Dug well	33	Rise	25	17	4	2	2	0
			Fall	8	6	1	1	0	0
	Bore well	33	Rise	19	11	5	2	0	1
			Fall	14	7	2	0	2	3
Wayanad	Dug well	26	Rise	18	14	1	0	3	0
			Fall	8	2	2	1	3	0
	Bore well	19	Rise	14	12	1	0	1	0
			Fall	5	4	0	0	1	0

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Kannur	Dug well	36	Rise	24	14	7	2	0	1
			Fall	12	8	2	2	0	0
	Bore well	28	Rise	19	16	2	1	0	0
			Fall	9	4	1	0	0	4
Kasaragod	Dug well	42	Rise	35	20	3	4	4	4
			Fall	7	1	5	0	1	0
	Bore well	21	Rise	8	2	3	0	1	2
			Fall	13	6	1	0	3	3

Observation well frequency on April 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	391	-0.65	17.75	Poojappura (Thiruvananthapuram)	Kooveri (Kannur)	50	121	160	60	0
						12%	31%	41%	15%	0%
Bore well	348	-0.6	48.86	Aryanad (Thiruvananthapuram)	Areekode (Malappuram)	20	67	126	99	36
						6%	19%	36%	29%	10%
Tube well	36	0.601	32.65	Thrikkunnappuzha (Alappuzha)	Kureepuzha (Kollam)	7	13	8	6	2
						19%	36%	22%	17%	6%

Comparison of Water level April 2021 with respect to April 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	389	Rise	247	151	44	24	13	15
		%	63%	61%	18%	10%	5%	6%
		Fall	142	92	30	10	6	4
		%	37%	65%	21%	7%	4%	3%
Bore well	339	Rise	209	89	55	19	15	31
		%	61%	43%	26%	9%	7%	15%
		Fall	130	77	22	12	4	15
		%	39%	59%	17%	9%	3%	12%
Tube well	40	Rise	32	29	3	0	0	0
		%	80%	91%	9%	0%	0%	0%
		Fall	8	6	2	0	0	0
		%	20%	75%	25%	0%	0%	0%

Comparison of Water level April 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	390	Rise	289	159	69	26	22	13
		%	74%	55%	24%	9%	8%	4%
		Fall	101	60	27	7	5	2
		%	26%	59%	27%	7%	5%	2%
Bore well	347	Rise	197	102	44	16	12	23
		%	57%	52%	22%	8%	6%	12%
		Fall	150	63	25	12	11	39
		%	43%	42%	17%	8%	7%	26%
Tube well	39	Rise	27	21	4	0	1	1
		%	69%	77%	15%	0%	4%	4%
		Fall	12	10	1	0	0	1
		%	31%	84%	8%	0%	0%	8%