GOVERNMENT OF KERALA
GROUNDWATER DEPARTMENT

GROUNDWATER LEVEL MONITORING REPORT – NOVEMBER 2020

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 2019 is 13.1 mm, which is 46% deficient than that of the normal Rainfall (24.4 mm). The state received 169.1mm pre-monsoon rainfall during 2019, which is 55.5% deficient with that of the normal rainfall (379.70mm). During SW monsoon season 2019, the state received 2309.8 mm rainfall (normal rainfall 2049.2 mm). During NE monsoon season 2019, the state received 27% excess rainfall (626.8 mm) than that of the normal rainfall (491.6mm).

While the winter rainfall occurred in the state during 2020 (January - February) is 9.6mm, which is 57% deficient than that of the normal rainfall. But the pre-monsoon rainfall occurred in the state during 2020 is 387.5mm, which is 7% more than that of the normal rainfall in this season. During SW monsoon season 2020, the state received normal rainfall (2227.9 mm). During NE monsoon season 2020, the state received 26% deficient rainfall (365.3mm) than that

of the normal rainfall. Most of the locations in the state show a decline in water level due to the deficiency in rainfall occurred during this season.

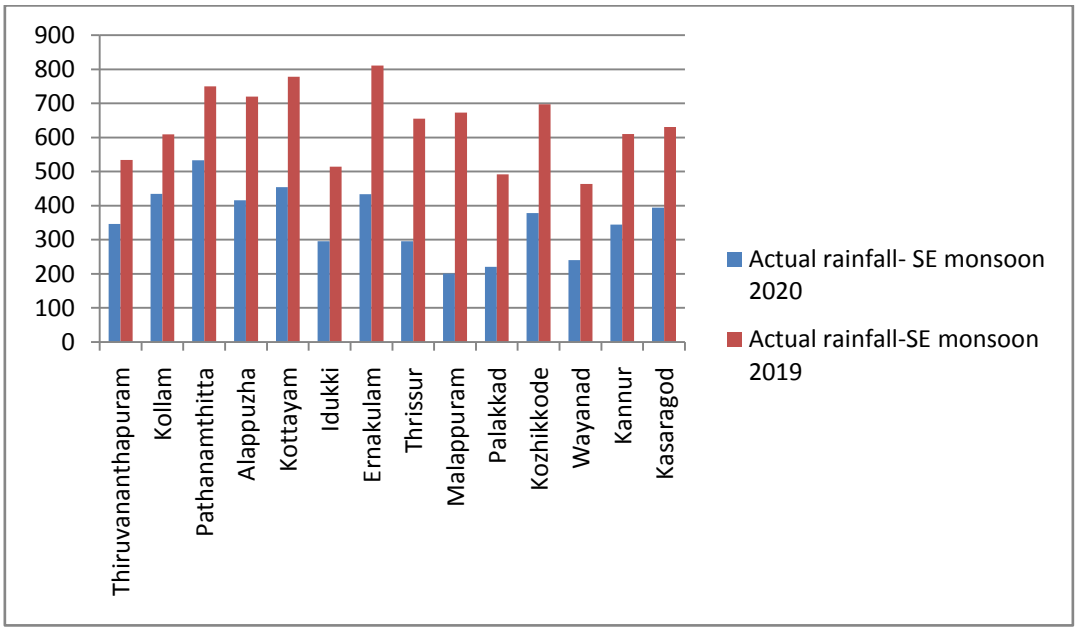


Fig:1. Comparison of actual rainfall occurred during NE monsoon 2020 wrt 2019

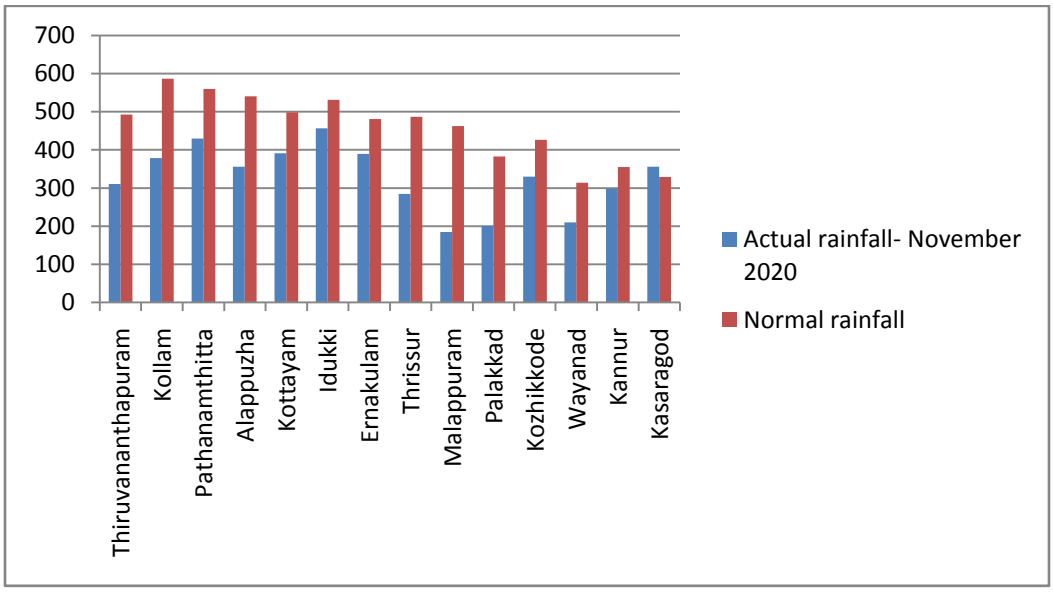


Fig:2. Comparison of actual rainfall occurred during November 2020 wrt Normal Rainfall

Geology: Kerala, the southernmost state of Indian peninsula, is having a geographical area of 38863 km^2. 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.

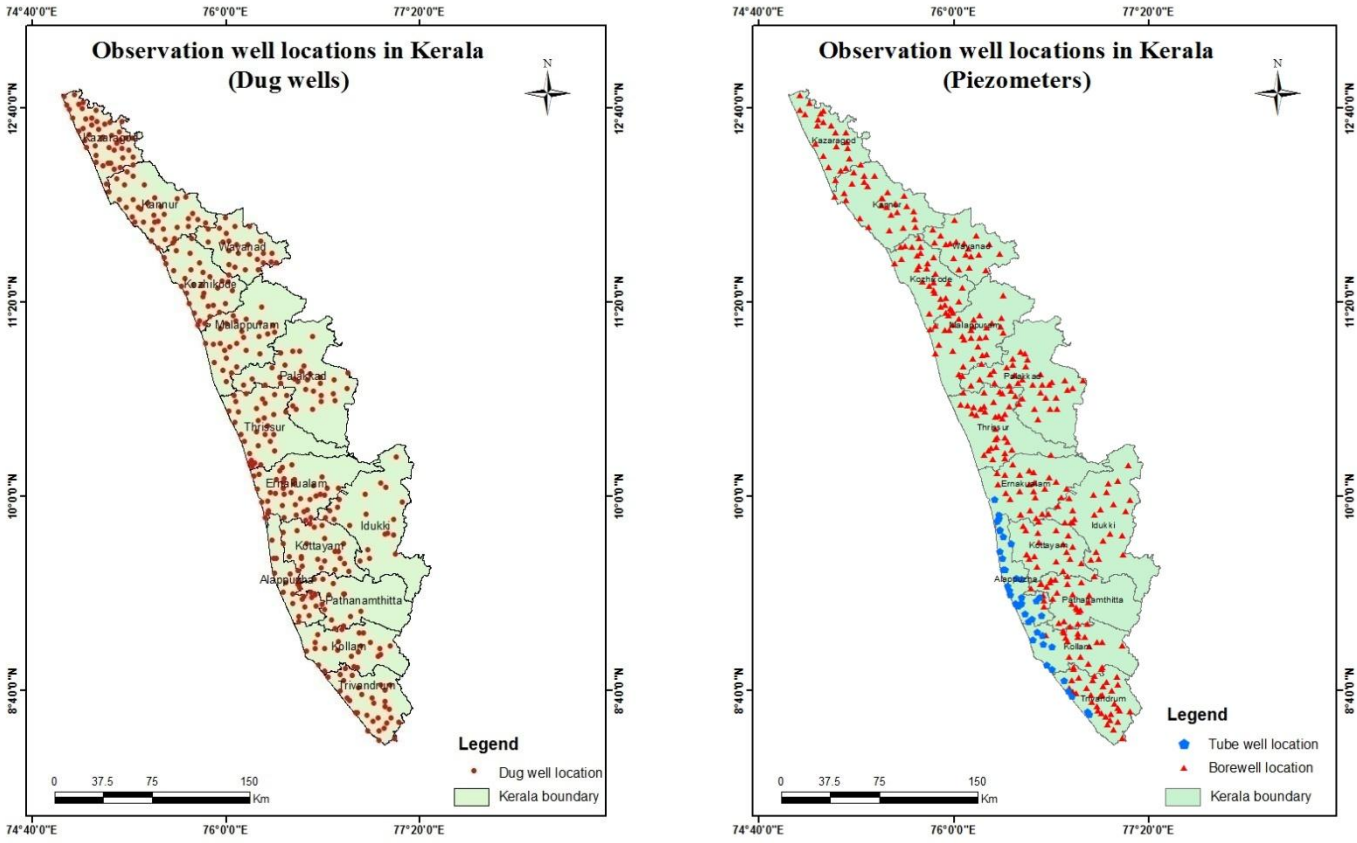


Fig:3. Location map of observation dug wells and piezometers (bore wells & tube wells)

Analysis of Groundwater level data – November 2020

During the month of November 2020, groundwater level in 397 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 November 2020 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 November 2020

Dug wells- The depth to groundwater level in the observation dug wells during the month of November 2020 ranges from a minimum of -0.96 m to a maximum of 15.92 mbgl. Out of 397 dug wells monitored water level in 20% of dug wells shows a depth to water level ranges from 0-2 m, 36% ranges between 2-5 m, 37% ranges between 5-10 m and 7% dug wells recorded depth to water level ranges between 10-20 mbgl. Table showing well frequency during November 2020 is appended. (Annexure-I)

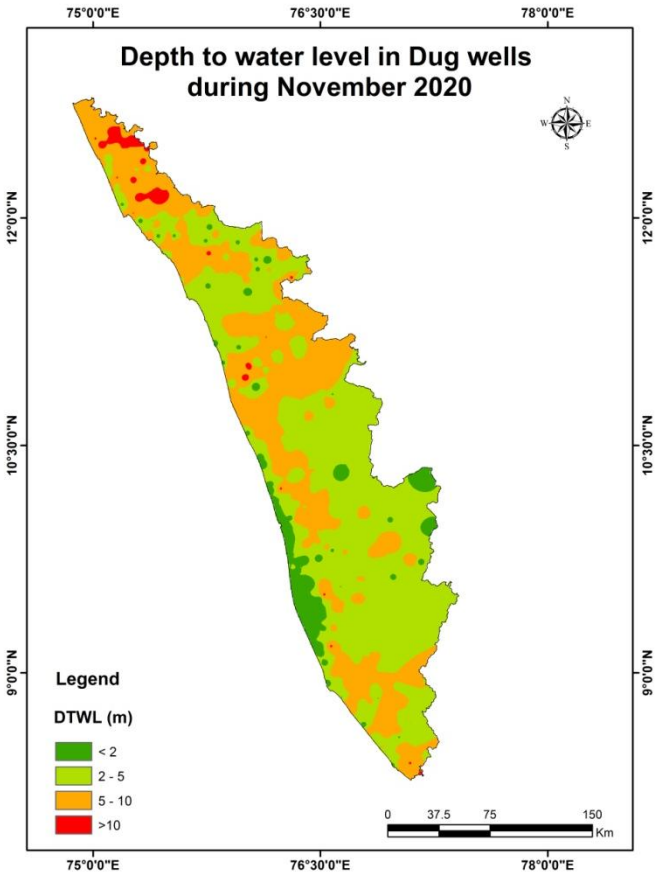


Fig:4. Depth to water level in Dug wells during November 2020

Borewells (hardrock terrain):- The depth to groundwater level in the observation bore wells

during the month of November 2020 ranges from a minimum of -0.6 m to a maximum of 41.97 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, 25 % ranges between 2-5 m, 40% ranges between 5-10 m, 23% of bore wells ranges between 10-20 m, and 4% ranges more than 20 m . Table showing well frequency during November 2020 is appended. (Annexure-I)

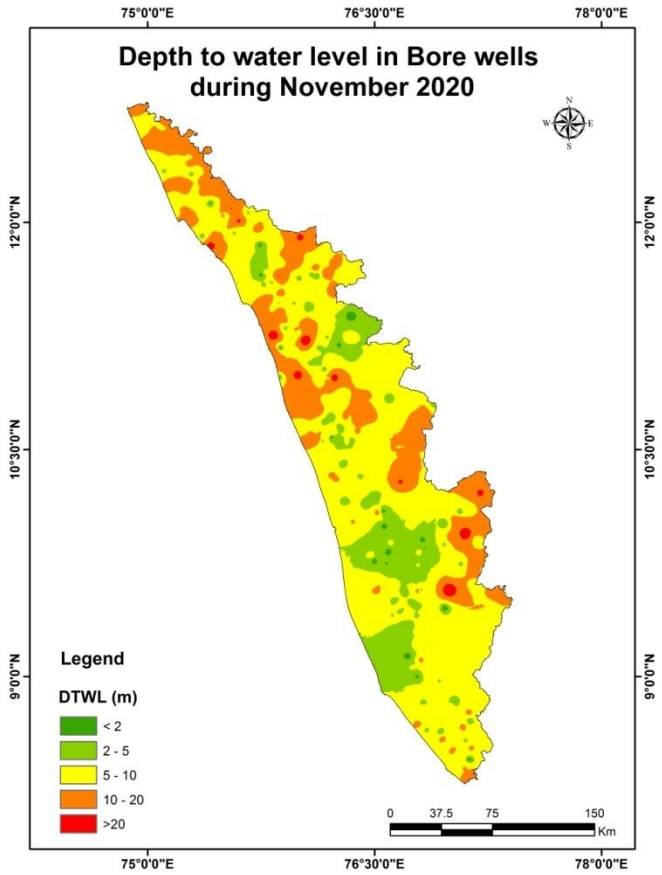


Fig:5. Depth to water level in Bore wells during November 2020

Tube wells (coastal sedimentary terrain) - The depth to groundwater level in the observation tube wells during the month of November 2020 range from a minimum of 0.46 m to a maximum of 33.7 mbgl . Out of 38 tube wells monitored in the state, water level in 34 % of tube wells shows a depth to water level range from 0-2m, 24% 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 November 2020 with respect to November 2019

Comparison of the groundwater level in November 2020 with respect to the corresponding month in the previous year, indicates that 81 % of observation dug wells show a fall in water level and 19 % of the wells shows no remarkable change /marginal rise in water level. Out of 81% of the dug wells shows a falling trend, 39% recorded fall in water level less than 0.5m , 25 % of dug wells show fall in the range between 0.5-1m, 17 % 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 6% dug wells show a fall in water level more than 2m. Table showing water level comparison of dug wells during November 2020 with respect to November 2019 is appended. (Annexure-II).

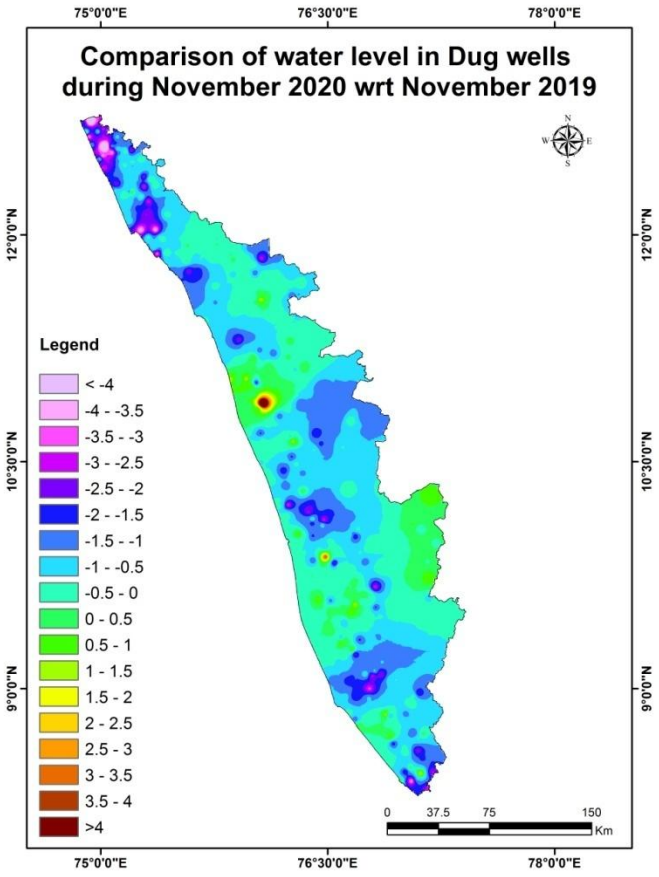


Fig:6. Comparison of water level in Dug wells during November 2020 wrt November 2019

Comparison of the water level in observation bore wells (hard rock terrain in midland and high land areas) in November 2020 with that of the previous year, it has been noticed that 84% of bore wells show fall in water level and 16% of the wells shows no remarkable change /

marginal rise in water level. Out of 84 % of the bore wells shows a falling trend , 27 % of the bore wells recorded fall in water level less than 0.5m, 25 % show fall in the range between 0.5 - 1m, 17 % of bore wells show fall in the range between 1 - 1.5m, 10 % of bore wells show a fall in range between, 1.5-2m, 21% of bore wells show a fall in water level more than 2m. Table showing water level comparison of bore wells during November 2020 with respect to November 2019 is appended. (Annexure-II)

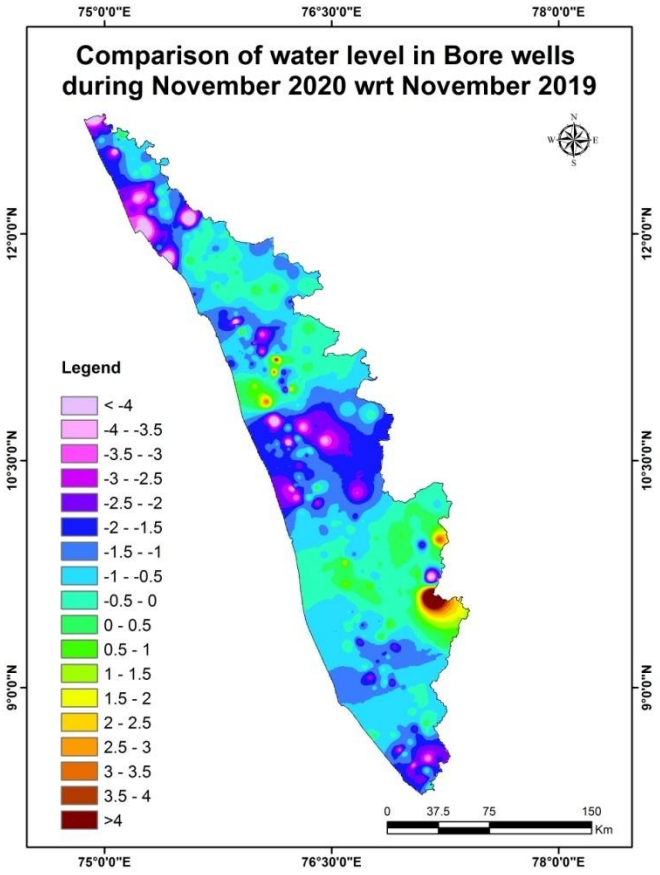


Fig:7. Comparison of water level in Bore wells during November 2020 wrt November 2019

Comparison of the water level in observation tube wells (in the coastal sedimentary areas) during November 2020 with that of the previous year reveals that 72 % of tube wells recorded a falling trend and 28 % of the wells shows no remarkable change /marginal rise of water level. Out of 72% of the tube wells showing a falling trend, 61% wells recorded fall in water level less than 0.5m, 17% wells show a fall in range between 0.5 to 1m. and 11% wells show a fall in range between 1 to 1.5m, 7 % of tube wells show a fall in range between 1.5-2m and 4% of tube wells

show a fall in water level more than 2m. Table showing comparison of water level during November 2020 with respect to November 2019 is appended. (Annexure-II)

III. Comparison of Groundwater level in November 2020 with respect to Decadal mean (2010- 19)

Comparison of the water level in November 2020 with respect to the decadal mean, it has been noticed that 52 % of observation dug wells recorded a fall in water level and 48% of the wells shows marginal rise /no remarkable change in water level. Out of 52% of the dug wells show a falling trend, 70% of the dug wells recorded fall in water level less than 0.5m, 19% show fall in the range between 0.5-1m, 7% of dug wells show fall in the range between 1-1.5m, 1 % of dug wells show a fall in range between 1.5-2m and 3% of dug wells show a fall in range more than 2m. Table showing water level comparison of dug wells during November 2020 with respect to decadal mean is appended. (Annexure-III)

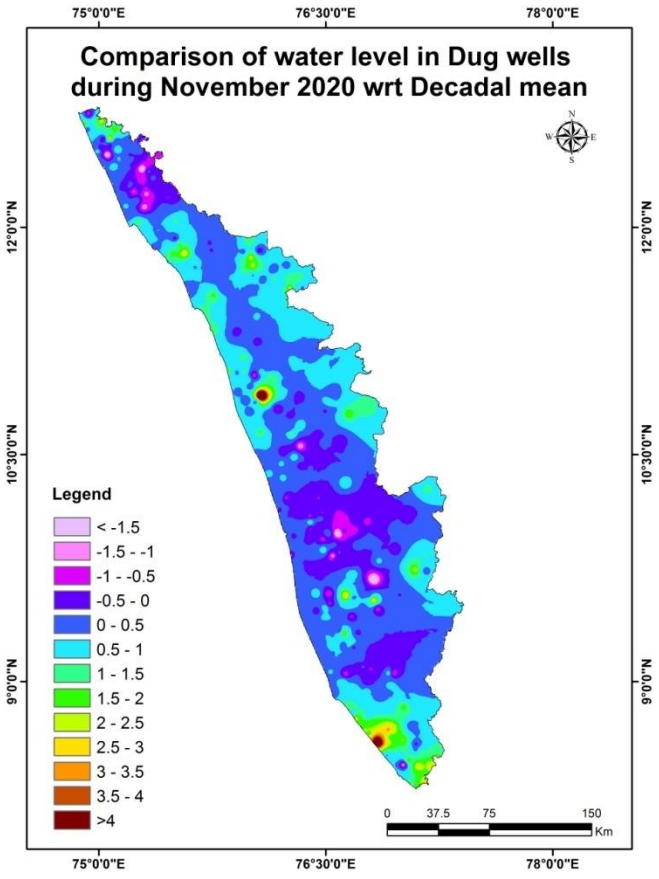


Fig:7. Comparison of water level in Dug wells during November 2020 wrt Decadal mean

Comparison of the water level in the observation bore wells during November 2020 with that of the decadal mean. It has been noticed that 62% of bore wells show fall in water level, and 38% of the wells shows marginal rise, no remarkable change in water level. Out of 62 % of the bore wells shows a falling trend , 49 % shows a fall in water level less than 0.5m, 21 % show fall in the range between 0.5 - 1m, 10% show fall in the range between 1-1.5 m, 7% of wells show a fall in range between 1.5 - 2m, 13% show a fall in water level more than 2 m. Table showing water level comparison of bore wells during November 2020 with respect to decadal mean is appended. (Annexure-III)

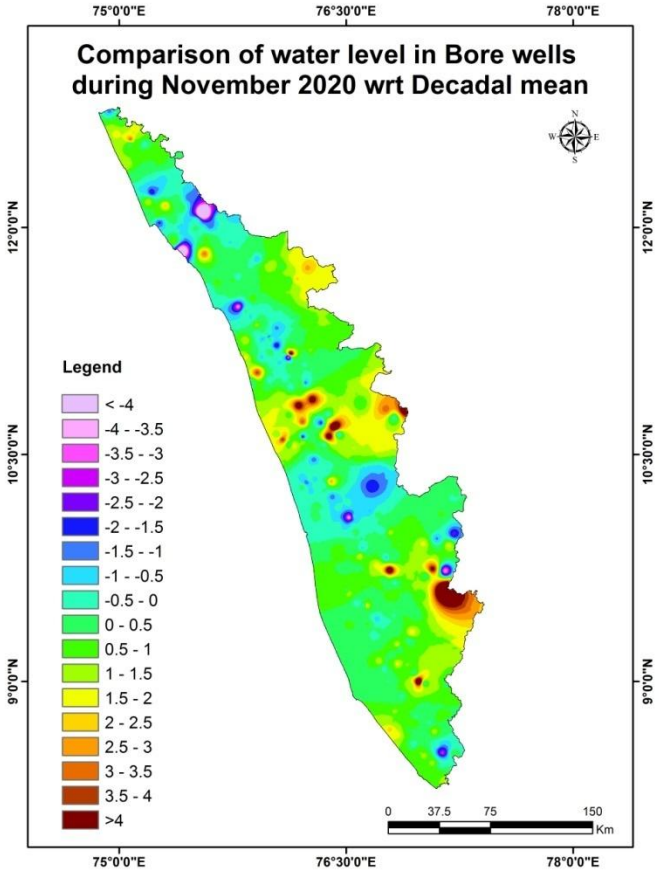


Fig:8. Comparison of water level in Bore wells during November 2020 wrt Decadal mean

Comparison of the water level in the observation tube wells during November 2020 with that of the decadal mean reveals that 45 % of tube wells recorded a falling trend and 55 % of the tube wells show marginal rise/no remarkable change in water level. Out of 45 % of the tube wells shows a falling trend, 72% of the tube wells show fall in water level less than 0.5m and 16% of

tube wells show fall in the range between 0.5 - 1m, 6% show fall in the range between 1-1.5 m and 6% of wells show a fall in range between 1.5 - 2m. Table showing water level comparison of tube wells during November 2020 with respect to decadal mean is appended. (Annexure-III)

Summary

Rainfall

- The state received 169.1mm pre-monsoon rainfall during 2019, which is 55.5% deficient with that of the normal rainfall (379.70mm).
- The pre-monsoon rainfall occurred in the state during 2020 is 387.5mm, which is 7% more than that of the normal rainfall in this season.
- During NE monsoon season 2019, the state received 27% excess rainfall than that of the normal rainfall (491.6mm).
- During NE monsoon season 2020, the state received 26% deficient rainfall than that of the normal rainfall.

Groundwater level

- The depth to groundwater level in the observation dug wells during the month of November 2020 range from a minimum of -0.96 m to a maximum of 15.92 mbgl, in bore wells -0.6 m to a maximum of 41.97 mbgl and in the tube wells 0.46 m to a maximum of 33.7 mbgl.
- Comparison of the water level in November 2020 with respect to the previous year, reveals that 81 % of observation dug wells, 84 % of bore wells and 72% of tube wells recorded a falling trend.
- Comparison of groundwater level in November 2020 with respect to the decadal mean reveals that 52 % of observation dug wells, 62 % of bore wells and 45% of tube wells recorded a falling trend. Majority of the observation dug wells and tube 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 observation wells in the state show a decline in water level during November 2020 than that of the previous year (November 2019) due to the deficiency in rainfall occurred during NE monsoon season

Districtwise Observation well Frequency on November 2020 **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	0.76	10.52	Kuruvikkad	Parassala	5	11	12	3	0
	Bore well	30	0.43	17.32	Vamanapuram	Parassala	2	4	15	9	0
	Tube well	4	4.57	7.17	Azhoor	Sarkara-Chirayinkeezhu	0	1	3	0	0
Kollam	Dug well	25	0.99	10.03	Neendakara	Manrothuruth	7	5	12	1	0
	Bore well	16	0.89	9.50	Kottarakkara	Vilakudy	1	3	12	0	0
	Tube well	9	1.99	33.70	Mayanad	Mynagappally	1	1	2	2	3
Pathanamthitta	Dug well	14	1.42	8.29	Peringara	Kunnamthanam	3	9	2	0	0
	Bore well	25	-0.60	13.30	Erathu	Ezhamkulam	2	7	13	3	0
Alappuzha	Dug well	21	-0.16	10.83	Nedumudi	Kattanam	12	7	1	1	0
	Bore well	2	2.77	3.97	Venmony	Mulakkuzha	0	2	0	0	0
	Tube well	24	0.46	17.20	Aroor	Charummoodu	12	7	3	2	0
Kottayam	Dug well	20	0.11	10.91	Kumarakom	Panachikkad	5	9	5	1	0
	Bore well	24	-0.06	16.81	Veliyannoor	Muttampalam	6	10	6	2	0
Idukki	Dug well	20	0.45	7.50	Udumbanchola	Vazhathope	5	11	4	0	0

	Bore well	23	1.16	30.11	Udumbannoor	Rajakkad	2	9	5	4	3
	Dug well	38	0.37	7.97	Chellanam	Thrikkakkara	8	14	16	0	0
	Bore well	22	0.24	13.48	Assamannoor	Rayamangalam	3	6	11	2	0
Ernakulam	Tube well	1	10.49	10.49	Cochin	Cochin	0	0	0	1	0
	Dug well	31	0.38	11.20	Valappad	Poyya	7	11	12	1	0
Thrissur	Bore well	37	0.57	20.81	Kolazhy	Pariyaram	2	10	13	10	2
	Dug well	27	-0.96	13.30	Kattipparuthi	Othukkungal	4	10	10	3	0
Malappuram	Bore well	29	0.89	41.97	Wandoor	Areekode	3	9	11	3	3
	Dug well	31	0.56	9.40	Kozhinjampara	Sreekrishnapuram	5	15	11	0	0
Palakkad	Bore well	33	1.40	19.09	Elavancherry	Ambalappara	3	5	17	8	0
	Dug well	32	1.45	11.00	Nallalam	Vanimel	5	16	8	3	0
Kozhikkode	Bore well	33	0.49	28.76	Ramanattukara	Nellikode	2	11	9	9	2
	Dug well	26	0.21	11.61	Poothadi	Cheeral	5	9	11	1	0
Wayanad	Bore well	19	1.53	21.54	Muttil North	Thirunelly	1	3	6	8	1
	Dug well	35	0.27	15.92	Mangattidam	Kooveri	9	6	17	3	0
Kannur	Bore well	28	0.80	23.18	Vekkalam	Edakkad	2	3	12	8	3
	Dug well	46	1.86	15.15	Kanhangad	Bandadka	1	8	25	12	0
Kasaragod	Bore well	21	3.13	19.74	Beemanady	Bandadka	0	3	6	12	0

Comparison of Water level November 2020 with respect to November 2019 **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	9	7	1	0	1	0
	Dug well		Fall	21	10	2	1	3	5
	Bore well	33	Rise	6	6	0	0	0	0
	Bore well		Fall	27	7	6	4	3	7
	Tube well	4	Rise	0	0	0	0	0	0
	Tube well		Fall	4	1	0	1	1	1
Kollam	Dug well	25	Rise	1	0	0	1	0	0
	Dug well		Fall	24	6	8	4	2	4
	Bore well	15	Rise	0	0	0	0	0	0
			Fall	15	3	8	1	1	2
	Tube well	8	Rise	1	1	0	0	0	0
			Fall	7	3	2	1	1	0
Pathanamthitta	Dug well	14	Rise	1	1	0	0	0	0
			Fall	13	4	4	3	1	1
	Bore well	25	Rise	4	2	2	0	0	0
			Fall	21	7	3	5	3	3
Alappuzha	Dug well	22	Rise	10	8	1	1	0	0
			Fall	12	8	4	0	0	0
	Bore well	2	Rise	0	0	0	0	0	0
			Fall	2	2	0	0	0	0
	Tube well	26	Rise	10	10	0	0	0	0
			Fall	16	12	3	1	0	0
Kottayam	Dug well	21	Rise	9	6	1	2	0	0
			Fall	12	9	0	1	1	1
	Bore well	24	Rise	7	4	1	1	1	0

			Fall	17	7	8	1	1	0
Idukki	Dug well	20	Rise	6	3	2	1	0	0
			Fall	14	11	2	1	0	0
	Bore well	22	Rise	10	6	2	0	0	2
			Fall	12	7	2	1	0	2
Ernakulam	Dug well	38	Rise	2	0	1	0	0	1
			Fall	36	14	8	6	3	5
	Bore well	22	Rise	0	0	0	0	0	0
			Fall	22	9	7	4	1	1
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	1	0	0	0	0
Thrissur	Dug well	31	Rise	2	1	0	1	0	0
			Fall	29	12	10	2	4	1
	Bore well	37	Rise	2	1	1	0	0	0
			Fall	35	3	5	6	9	12
Malappuram	Dug well	26	Rise	18	13	2	2	0	1
			Fall	8	3	2	2	1	0
	Bore well	29	Rise	12	5	2	1	0	4
			Fall	17	4	3	5	1	4
Palakkad	Dug well	31	Rise	1	1	0	0	0	0
			Fall	30	6	7	16	1	0
	Bore well	33	Rise	0	0	0	0	0	0
			Fall	33	5	6	8	4	10
Kozhikkode	Dug well	17	Rise	1	1	0	0	0	0
			Fall	16	4	7	3	1	1
	Bore well	33	Rise	3	2	0	0	1	0
			Fall	30	5	15	4	2	4
Wayanad	Dug well	26	Rise	4	3	0	1	0	0
			Fall	22	12	4	4	1	1
	Bore well	19	Rise	4	3	1	0	0	0

			Fall	15	7	4	3	1	0
Kannur	Dug well	35	Rise	4	4	0	0	0	0
			Fall	31	14	7	1	3	6
	Bore well	28	Rise	5	5	0	0	0	0
			Fall	23	6	4	4	2	7
Kasaragod	Dug well	45	Rise	4	3	1	0	0	0
			Fall	41	8	11	7	2	13
	Bore well	21	Rise	2	1	1	0	0	0
			Fall	19	5	2	2	2	8

Comparison of Water level November 2020 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	24	10	7	4	1	2
			Fall	7	2	2	2	0	1
	Bore well	33	Rise	14	10	3	1	0	0
			Fall	19	10	4	3	0	2
	Tube well	4	Rise	1	0	0	1	0	0
			Fall	3	2	0	0	1	0
Kollam	Dug well	25	Rise	13	11	2	0	0	0
			Fall	12	9	3	0	0	0
	Bore well	16	Rise	4	4	0	0	0	0
			Fall	12	8	3	1	0	0
	Tube well	9	Rise	4	0	2	0	0	2
			Fall	5	3	1	1	0	0

	Dug well	14	Rise	2	2	0	0	0	0
			Fall	12	3	8	1	0	0
	Bore well	25	Rise	3	2	1	0	0	0
Pathanamthitta			Fall	22	9	5	4	4	0
	Dug well	19	Rise	12	8	3	0	0	1
			Fall	7	7	0	0	0	0
	Bore well	2	Rise	0	0	0	0	0	0
			Fall	2	2	0	0	0	0
	Tube well	26	Rise	17	15	2	0	0	0
Alappuzha			Fall	9	8	1	0	0	0
	Dug well	21	Rise	4	2	2	0	0	0
			Fall	17	9	2	4	1	1
	Bore well	24	Rise	6	3	1	0	1	1
Kottayam			Fall	18	8	5	4	1	0
	Dug well	20	Rise	10	9	0	1	0	0
			Fall	10	9	0	1	0	0
	Bore well	23	Rise	12	6	3	1	1	1
Idukki			Fall	11	5	3	0	1	2
	Dug well	38	Rise	6	5	0	1	0	0
			Fall	32	21	9	0	0	2
	Bore well	22	Rise	6	6	0	0	0	0
			Fall	16	10	4	1	0	1
	Tube well	1	Rise	0	0	0	0	0	0
Ernakulam			Fall	1	0	1	0	0	0
	Dug well	31	Rise	6	3	3	0	0	0
			Fall	25	21	1	2	1	0
	Bore well	37	Rise	9	5	4	0	0	0
Thrissur			Fall	28	8	7	5	3	5
	Dug well	27	Rise	20	17	2	0	0	1
Malappuram			Fall	7	5	0	2	0	0

	Bore well	29	Rise	10	6	2	0	0	2
			Fall	19	9	3	0	2	5
	Dug well	31	Rise	9	4	3	1	1	0
			Fall	22	16	6	0	0	0
Palakkad	Bore well	34	Rise	14	6	1	2	4	1
			Fall	20	10	1	2	2	5
	Dug well	17	Rise	11	10	0	1	0	0
			Fall	6	6	0	0	0	0
Kozhikkode	Bore well	33	Rise	13	11	0	1	0	1
			Fall	20	12	3	1	1	3
	Dug well	26	Rise	19	11	5	2	1	0
			Fall	7	5	1	1	0	0
Wayanad	Bore well	19	Rise	17	9	6	2	0	0
			Fall	2	1	1	0	0	0
	Dug well	35	Rise	23	15	6	1	0	1
			Fall	12	10	1	1	0	0
Kannur	Bore well	27	Rise	15	11	3	0	0	1
			Fall	12	7	0	1	1	3
	Dug well	45	Rise	24	16	3	3	2	0
			Fall	21	14	4	2	0	1
Kasaragod	Bore well	21	Rise	9	5	1	2	1	0
			Fall	12	5	5	0	0	2

Observation well frequency on November 2020 **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	397	-0.96	15.92	Kattipparuthi (Malappuram)	Kooveri (Wayanad)	81	141	146	29	0
						20%	36%	37%	7%	0%
Bore well	342	-0.6	41.97	Erathu (Pathanamthitta)	Areekode (Malappuram)	29	85	136	78	14
						8%	25%	40%	23%	4%
Tube well	38	0.46	33.7	Aroor (Alappuzha)	Mynagappally (Kollam)	13	9	8	5	3
						34%	24%	21%	13%	8%

Comparison of Water level November 2020 with respect to November 2019 **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	381	Rise	72	51	9	9	1	2
		%	19%	71%	13%	13%	1%	2%
		Fall	309	121	76	51	23	38
		%	81%	39%	25%	17%	7%	12%
Bore well	343	Rise	55	35	10	2	2	6
		%	16%	64%	18%	4%	4%	11%
		Fall	288	77	73	48	30	60
		%	84%	27%	25%	17%	10%	21%
Tube well	39	Rise	11	11	0	0	0	0
		%	28%	100%	0%	0%	0%	0%
		Fall	28	17	5	3	2	1
		%	72%	61%	17%	11%	7%	4%

Comparison of Water level November 2020 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	380	Rise	183	123	36	14	5	5
		%	48%	67%	20%	7%	3%	3%
		Fall	197	137	37	16	2	5
		%	52%	70%	19%	7%	1%	3%
Bore well	345	Rise	132	84	25	9	7	7
		%	38%	64%	19%	7%	5%	5%
		Fall	213	104	44	22	15	28
		%	62%	49%	21%	10%	7%	13%
Tube well	40	Rise	22	15	4	1	0	2
		%	55%	68%	18%	5%	0%	9%
		Fall	18	13	3	1	1	0
		%	45%	72%	16%	6%	6%	0%