GOVERNMENT OF KERALA
GROUNDWATER DEPARTMENT

GROUNDWATER LEVEL MONITORING REPORT – JUNE 2022

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.

Rainfallis 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 3107mm;some 7,030 crore m^3 of water. 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.

Actual Rain fall received in the state during June2021 (1June to 01July) is 409.7mm which is -39% deficient from the Normal rainfall during the period which is 671.7mm. All the districts received less rain fall than the normal rain fall and in Deficient category except Kottayam district (547.4mm) which is Normal (-

15 % departure). Thiruvananthapuram district received the least actual rain fall,140.8mm (-56% departure).

Actual Rain fall received in the state during June2022 (1June to 29June) is 291.9mm which is -53% deficient from the Normal rainfall during the period. All the districts received less rain fall than the normal rain fall during the season.Idukki, Palakkad and Wayanad received Large Deficient and all other districts received Deficient rain fall during the season.

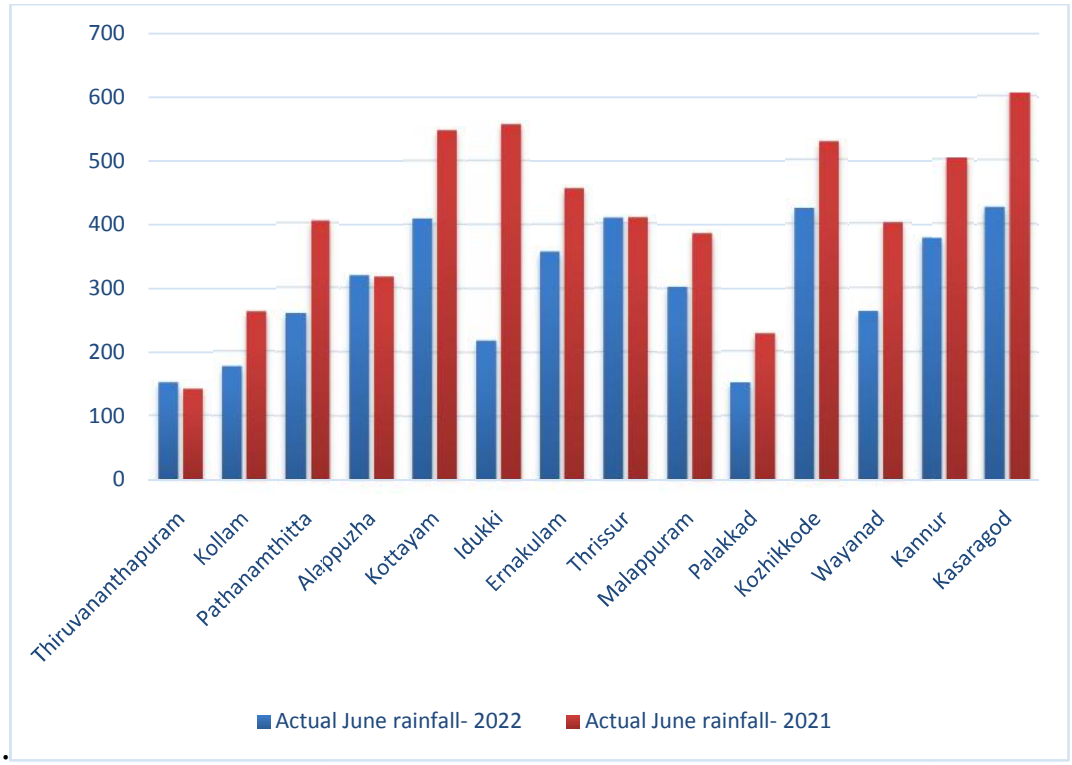


Fig:1. Comparison of actual Junerainfalloccurred2022 wrt ActualJune rainfall 2021

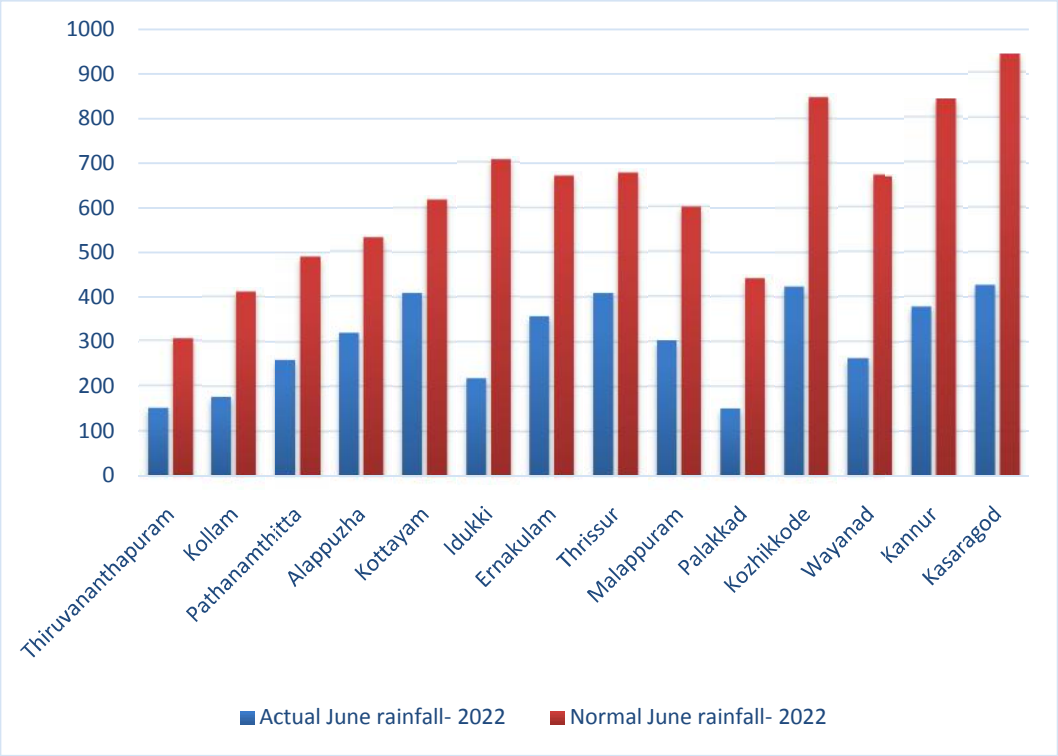


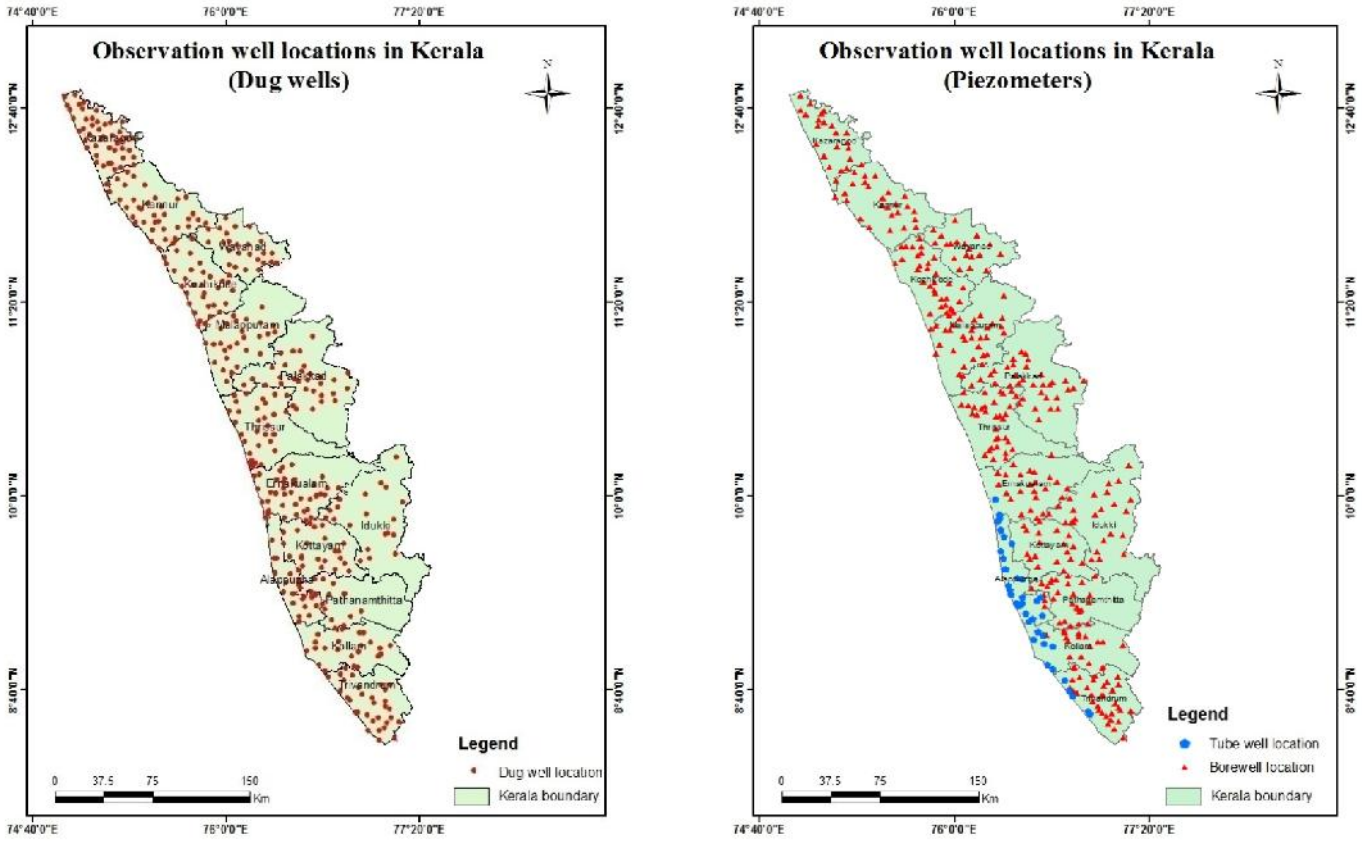
Fig:2. Comparison of actual rainfalloccurred in June 2022wrtNormal Rainfall in June 2022

Geology: Kerala, the southernmost state of Indian peninsula, is having a geographical area of 38863 km^2. The land area extends between latitude $8^o17'30"$ and $12^o27'40"$ 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: Shortterm 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 hydro geological units. Observation wells includes dug wells (owned by public and private) and purpose built piezometer**Fig:**



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

(bore wells and tube wells). Water level data has been collected monthly and water samples collected and analysis done periodically.

Analysis of Groundwater level data –June 2022

During the month of June2022**,** groundwater level in 451 dug wells and 383 purpose built piezometers (bore wells- 342 and tube wells – 41) has been monitored. The data collected from the observation wells during the month of June 2022 has been compared with previous year's corresponding month data and also with respect to decadal mean data of the corresponding month to assess the groundwater scenario in the state.

I. Depth to Groundwater level during June 2022

Dug wells:-The depth to groundwater level in the observation dug wells during the month of June 2022 ranges from a minimum of -0.237mbgl inOW-24Kidangara,Veliyanad , Alappuzhadistrictto a maximum of 16.43mbglin KNR-POW-C8, Chapparappadavu,Kannur district. Out of 451dug wells monitored water level in 19.29% of dug wells shows a depth to water level ranges from <=2 m, 36.36% ranges between 2-5 m, 36.81% ranges between 5-10 m and 7.54% dug wells recorded depth to water level ranges between 10-20 mbgl. Dug wells inKollam, Kottayam, Idukki and Ernakulam Districts show water level less than 10m.None of the wells in the state show water level above 20m.Table showing well frequency during June2022 is appended as (Annexure-I)

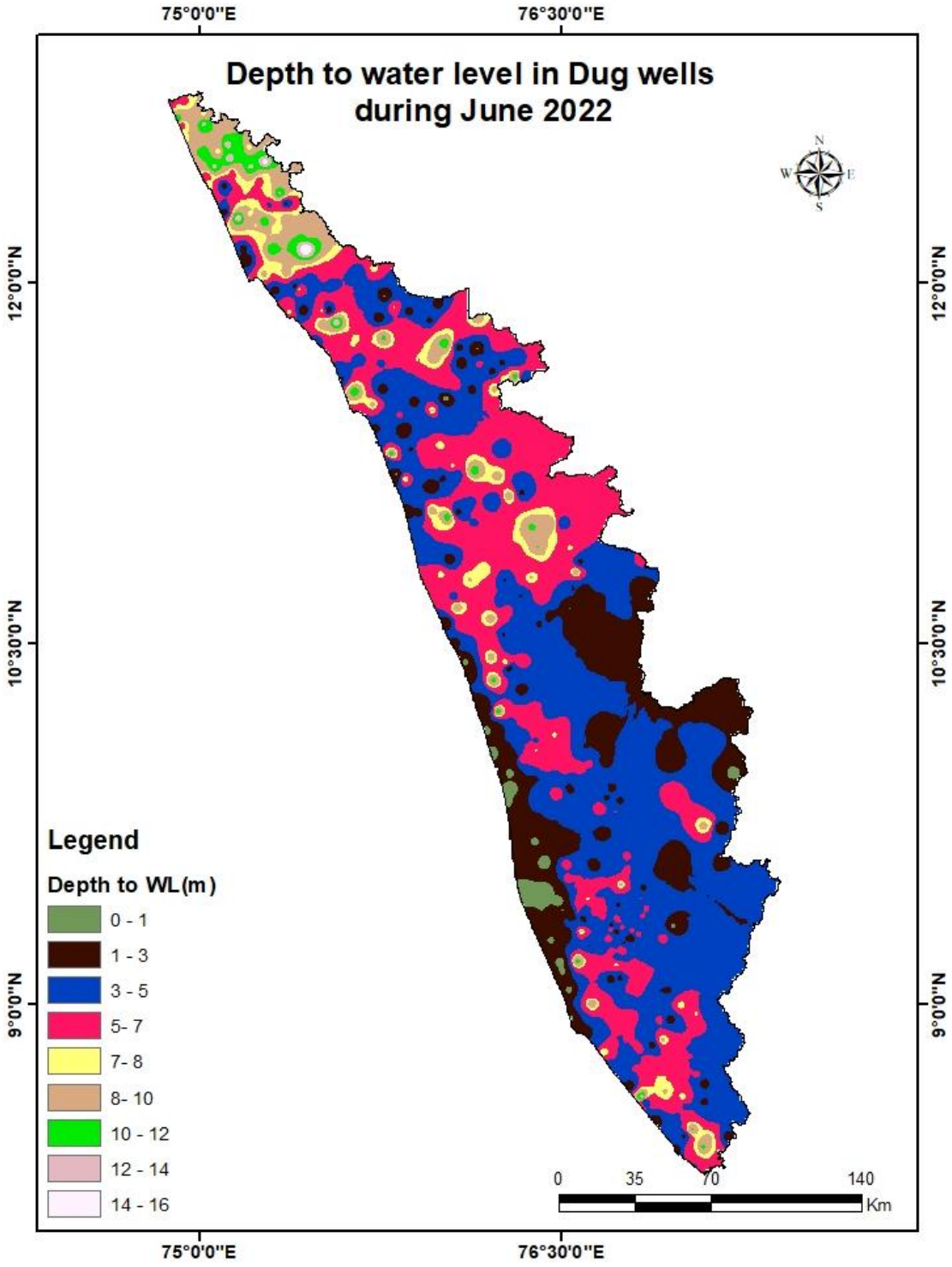


Fig: 4. Depth to water level in Dug wells during June2022

Bore wells (hard rock terrain):-The depth to groundwater level in the observation bore wells during the month of June2022 ranges from a minimum of -0.75m in10, Vellanad, Thiruvananthapuram to a maximum of 47.41mbgl in MPM174, Areekkod in Malappuram district. Out of 342bore wells monitored, water level in 10.53% of bore wells shows a depth to water level range from 0-2 m, 23.98 % ranges between 2-5 m, 36.55% ranges between 5-10 m, 23.10% of bore wells ranges between 10-20 m, and 5.85% ranges more than 20 m .Bore wellsinThiruvananthapuram, KollamPathanamthitta, AlappuzhaKottayamandErnakulamdistricts show water level below20 mbgl. Table showing well frequency during June2022 is appended. (Annexure-I)

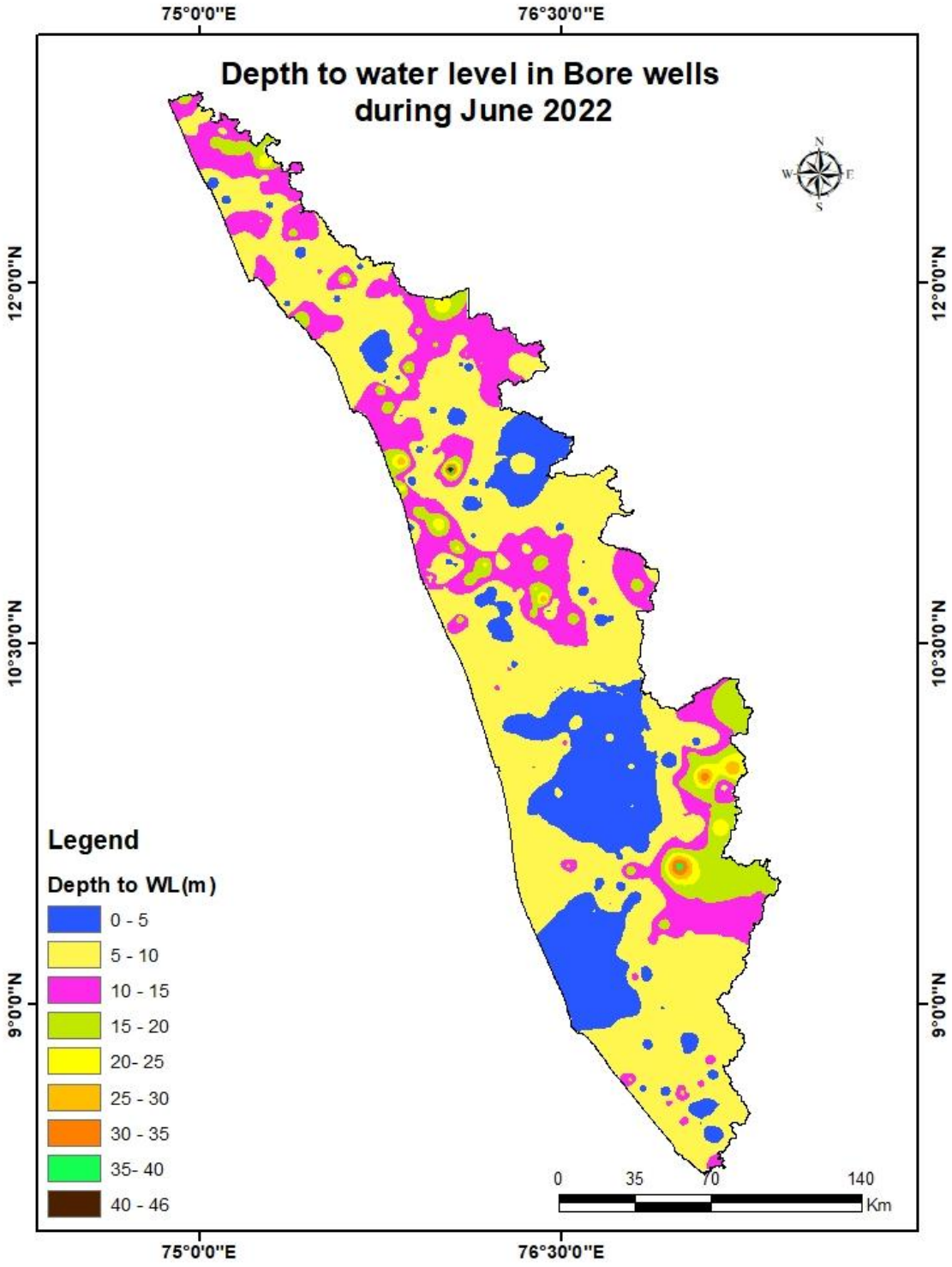


Fig:5. Depth to water level in Bore wells during June 2022

Tubewells (coastal sedimentary terrain):-The depth to groundwater level in the observation tubewells during the month of June2022 ranges from a minimum of 0.12m in tube well no 33 Aroor, Alappuzha to a maximum of 33.7mbgl, in KLM/29,Sasthamkotta,Kollam. Out of 41tube wells monitored in the state, water level in 29.27 % of tube wells ranges between 0-2m, 31.71% of tube wells ranges between 2-5 m,19.51% ranges between 5-10 m and12.2%ranges between10-20 and 7.32%(only 3 tube wells in Kollam district) ranges more than 20m.Table showing district wisetube well frequency is appended.(Annexure-I)

II.Comparison of Groundwater level June 2022with respect to June 2021

Comparison of the groundwater level in 451 observation **dug wells** during June**2022**with respect to the corresponding month in the previous year indicates that 72 % of observation dug wells show a fall in water level and 28 % of the dug wells show no remarkable change /marginal rise in water level. Increased number of falling water level may be due to the shortage of rainfall during the season.Out of 72% of the dugwells showing falling trend, 38% recorded fall in water level less than 0.5m, 23 % of dug wells show fall in the range between 0.5-1m,14% of dug wells show fall in the range between 1-1.5 m, 7% of dug wells show a fall in the range between 1.5 -2m and 18% of the dug wells show a fall in water level more than 2m.List of open wells showing more than 2m fluctuation is appended in annexure IV. Table showing water level comparison of dug wells during June 2022 with respect to June 2021is appended. (Annexure-II).

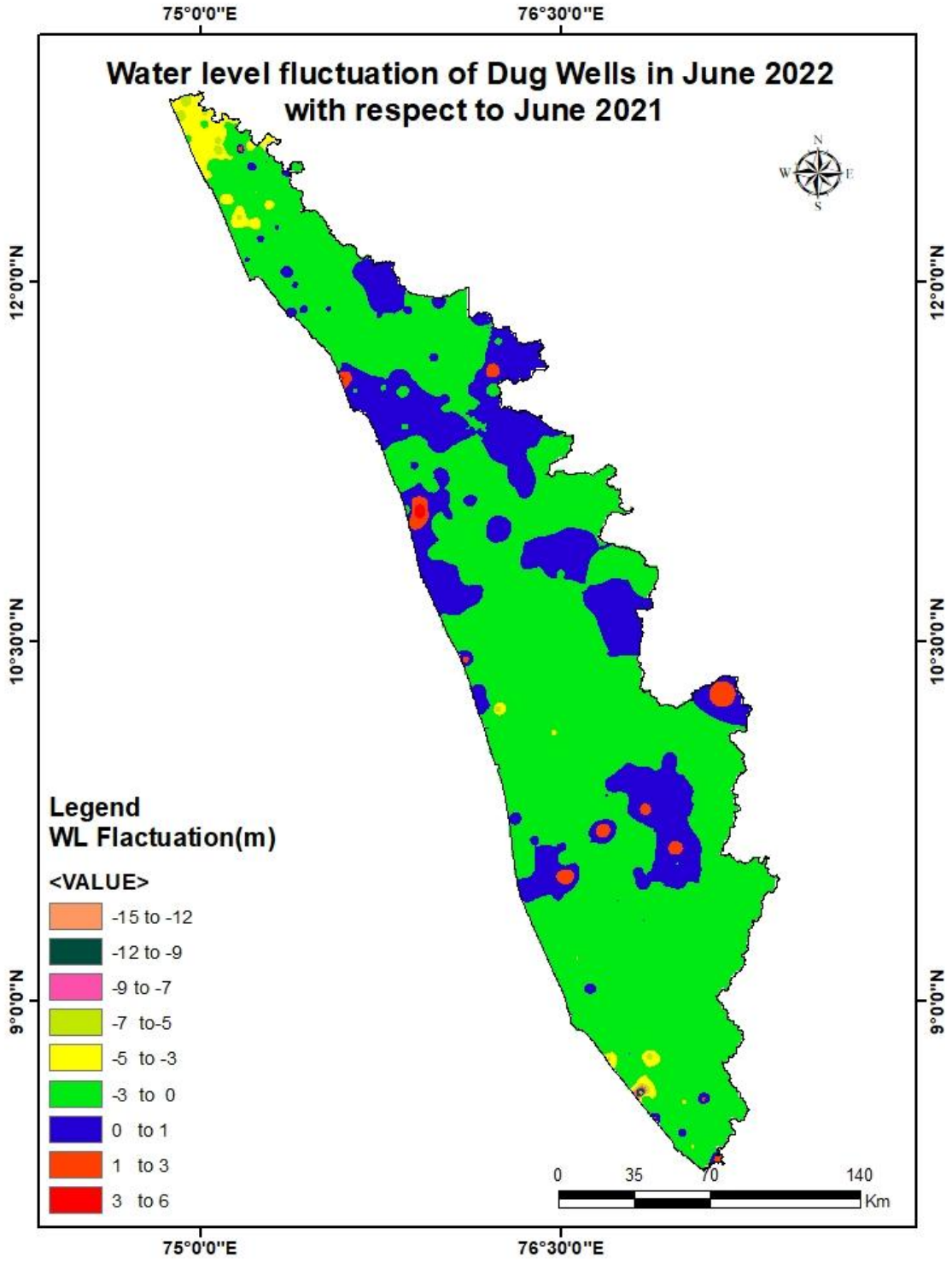


Fig: 6. Comparison of water level in Dug wells during June2022with June 2021

On comparison of the water level in 339observation **bore wells** (hard rock terrain in midland and high land areas) in June**2022** with that of the previous year, it has been noticed that65% of bore wells show fall in water level and 35% of the wells shows no remarkable change/marginal rise in water level. Out of 65 % of the bore wells showing falling trend, 35% of the bore wells recorded fall in water level less than 0.5m, 23% show fall in the range between 0.5 - 1m, 13% of bore wells show fall in the range between 1 - 1.5m, 7% of bore wells show a fall in range between1.5-2m, 22% of bore wells show a fall inwater level more than 2m.

Table showing water level comparison of bore wells during June 2022 with respect to June 2021(Annexure-II)isappended.

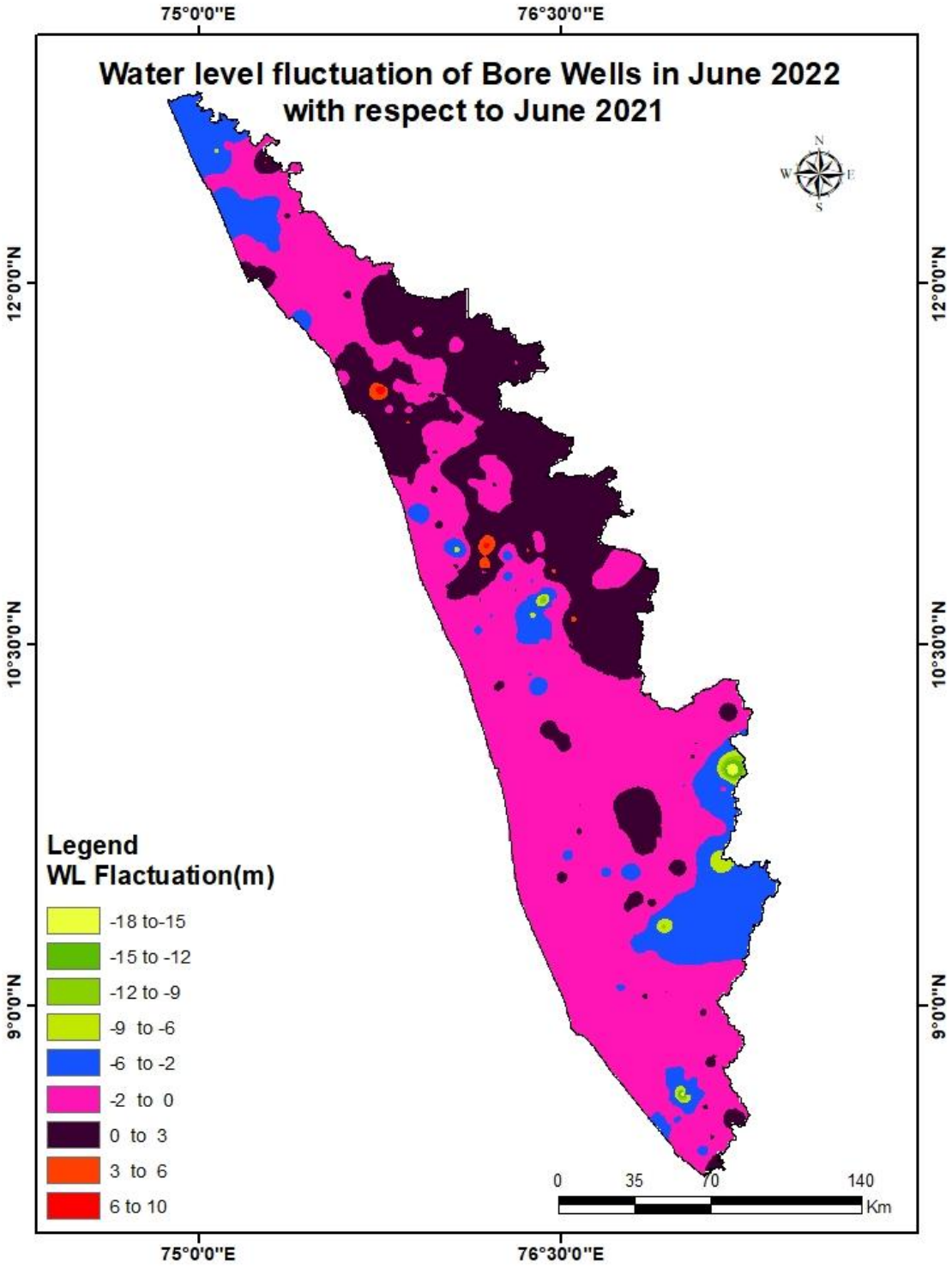
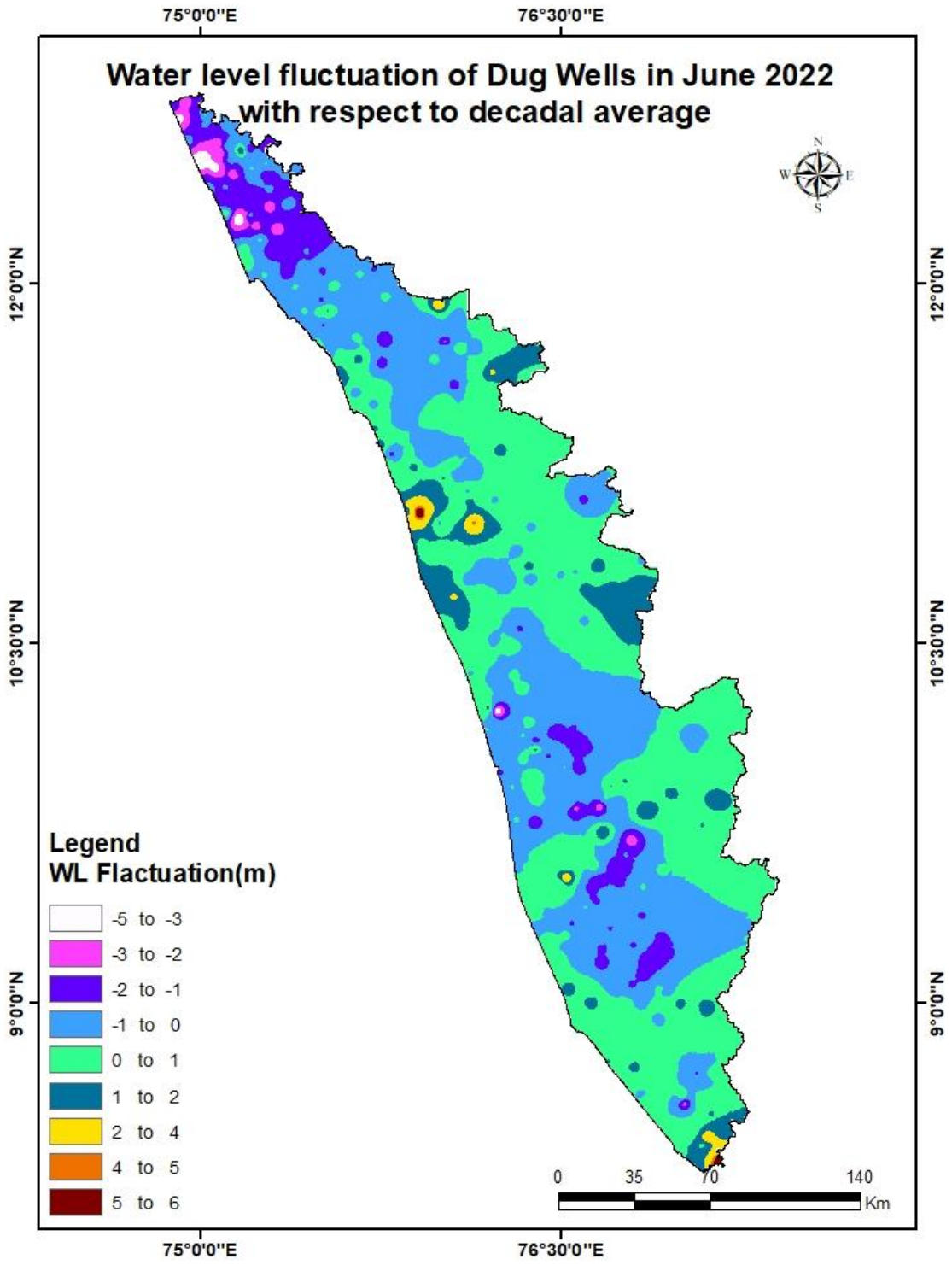


Fig:7. Comparison of water level in Bore wells during June2022wrtJune 2021

Comparison of the water level in 40 observation tube wells (in the coastal sedimentary areas)during June2022 with that of the previous year reveals that 58 % of tube wellsrecorded a falling trend and 42 % of the wells show no remarkable change /marginal rise of water level.Out of 58% of the tube wells showing a falling trend,52% of wells recorded fall in range between 0- 0.5m . 26% of the tube wells between0.5-1m 17% of the tube wells between 1 – 1.5m and 4% of the tube wells (only 1 well in Kollam district) show a fall in water level range between 1.5 - 2m and no tube well in the state show more than 2m fluctuation.Table showing comparison of water level during June 2022 with June 2021is appended. (Annexure-II)

III.Comparison of Groundwater level in June 2022with respect to Decadal mean(2012- 21)

On comparison of the water level inJune 2022 with the decadal mean, it has been noticed that out of 390nos of observation dug wells 21% of wells (185nos) recorded a fall in water level and 79% of the wells (205nos)shows marginal rise /no remarkable change in water level.Out of 21% of the dugwells show a falling trend, 39% of the dug wells recorded fall in water level less than 0.5m, 28% show fall in the range between 0.5-1m, 12% of dug wells show fall in the range between1-1.5m, 7% of dug wells show a fall in range between 1.5-2m and15% of dug wells(1 well each in Thiruvananthapuram, Thrissur, Wayanad districts, 4 wells in Kottayam district, 2 well in Ernakulam district, 3 wells in Kannur and 15 wells in Kasaragod district) show a fall in range more than 2m.List of open wells showing more than 2m fluctuation is appended in annexure IV. Table showing water level comparison of dug wells during June 2022 with respect to decadal mean is appended. (Annexure - III)



Fig;8 Comparison of water level in Dug wells during June 2022 with Decadal mean

Compared water level in the 340observation bore wells during June 2022 with that of the decadal mean. It has been noticed that 44% of bore wells show fall in water level, and 56 of the wells shows marginal rise,no remarkable change in water level.Out of 40% of the bore wells shows a falling trend,40% shows a fall in water level less than 0.5m, 27 % show fall in the range between 0.5 - 1m, 8% show fall in the range between 1-1.5,7% of wells show a fall in range between 1.5 - 2m, 18% show a fall in water level more than 2 m.Table showing water level comparison of bore wells duringJune 2022 with respect to decadal mean is appended. (Annexure-III)

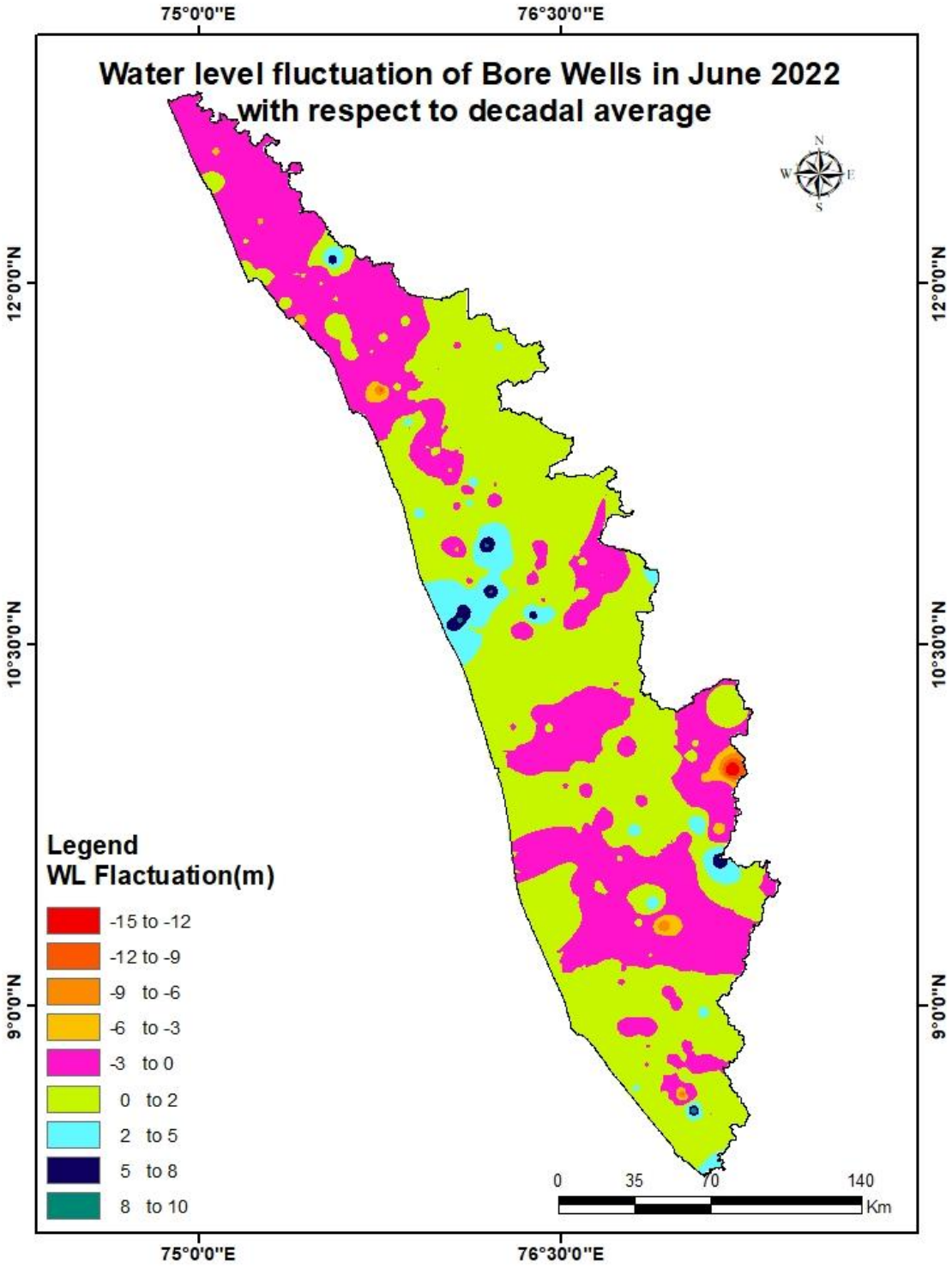


Fig:9. Comparison of water level in Bore wells during May **2022 with Decadal mean**

Comparison of the water level in the 40observation tube wells during June 2022 with that of the decadal mean reveals that 30 % of tube wells recorded a falling trend and70 % of the tube wells show marginal rise/no remarkable change in water level.Out of 30% of the tube wells shows a falling trend, 76% of the tube wells show fall in water level less than 0.5m and8% of wells show fall in the range0.5-1 m and 8 % of wells show fall in the range 1 – 1.5m m and 8 % of wells show fall in the water level more than 2m.Table showing water level comparison of tube wells during June 2022 with respect to decadal mean is appended. (Annexure-III)

IV. Groundwater Draught Index

Prepareddistrict wise and well wise groundwater draught index of the state during June 2022. District wise analysis suggests that Groundwater Drought Index of all the districts in the state are in Normal category. Well wise analysis suggests that outof 449 observation dug wells, 356 wells comes under the normal category, 64 wells comes under the mild category, 15 wells comes under the moderate category , 5 wells fall in severe category, and 9 wells fall in extreme category. Table showing GWDI other than normal category is appended as Annexure V

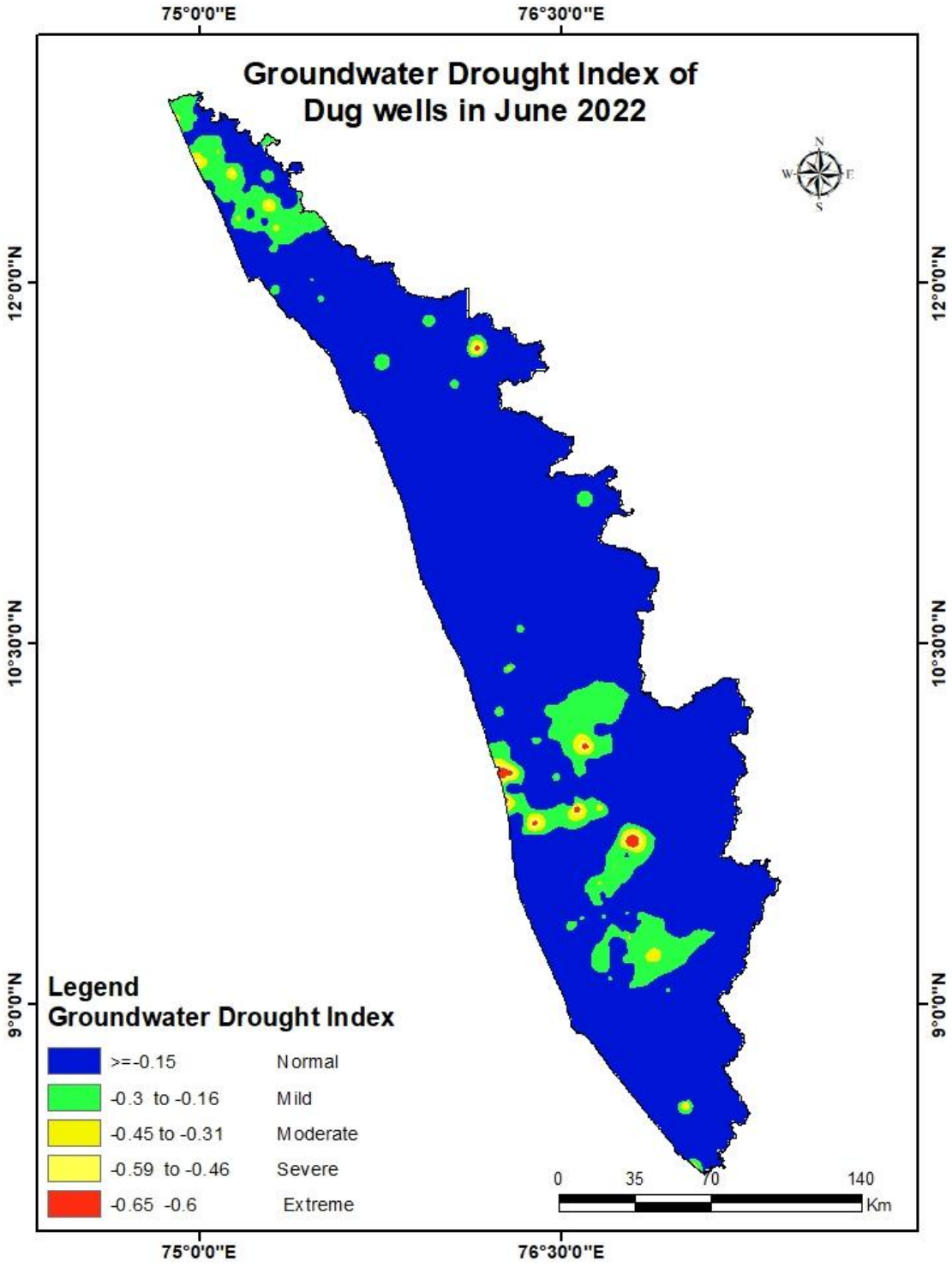


Fig-10 Groundwater drought index of dug well during June2022

Summary

Rainfall

- Actual Rain fall received in the state during June2021 (1June to 01July) is 409.7mm which is -39% deficient from the Normal rainfall during the period
- Actual Rain fall received in the state during June2022 (1June to 29June) is 291.9mm which is -53% deficient from the Normal rainfall during the period

Groundwater level

- The depth to groundwater level in the observation dug wells during the month of June2022 range from a minimum of -0.237mbgl to a maximum of 16.43mbgl, in bore wells -0.75 m to a maximum of 47.41mbgl and in the tubewells 0.12 to a maximum of 33.7mbgl. Details are given in Abstract I
- Comparison of groundwater level in June 2022 with respect to the previous year reveals that 72% of observation dug wells (324 out of 451) ,65 % of bore wells (221 out of 339) and 58% of tube wells (23out of 40) recorded a falling trend. 68% of total observation wells (568 out of 830) show falling trend.38%of the observation wells with falling trend (212 out of 568) show decline in water level less than 0.5 m. Details are given in Abstract II.

- Comparison of the water level inJune 2022 with the, decadal mean reveals that 47 % of observation dug wells (185out of 390), 44% of bore wells (149out of 340) and 30% of tube wells(12 out of 40)

recorded a falling trend. 45%of all the observation wells(364out of 770) show decline in water level.38% of the observation wells (140 out of 364) with falling trend show decline in water level less than 0.5 m. Details are given in Abstract III

- Dug wells showing decline of water level more than 2 m during long term analysis will be monitored closely. 55nos of open wells show more than 2m fluctuation on comparison of water level during the month with the previous year's same month data and 24nos open wells show more than 2m fluctuation on comparison of water level during the month with the decadal mean water level.18 nos of wells show more than 2m fluctuation on comparison with 2 seasons.Suitable recharging measures may be taken to enhance the water level and to avoid further fall of water level. List of open wells showing more than 2m fluctuation is appended in annexure IV
- Ground water Drought Index of 80% of observation dug wells during June 2022 are in Normal and 14% Mild categories.3% in moderate and 1% fall in Severe and 2% in Extreme categories. Details are given in annexure V.

Districtwise Observation well Frequency on June2022 **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	30	1.090	13.610	TVM OW01, Athiyannur	TVM OW28,Kazhakkoottam.	4	12	11	3	0
	Bore well	35	-0.75	19.75	10, Vellanad	13, Nedumangad	6	6	16	7	0
	Tube well	4	2.91	8.48	36,Chirayinkeezhu,Thiruvananthapuram	37,Chirayinkeezhu,Thiruvananthapuram	0	2	2	0	0
Kollam	Dug well	23	0.580	9.520	KLM OW 23, Oachira	KLM OW 24,Munroethuruthu,KOLLAM	5	9	9	0	0
	Bore well	15	0.34	10.02	KLM/6,Kottarakkara Municipality,KOLLAM	KLM/10, Vilakkudy	1	4	9	1	0
	Tube well	8	3.14	33.70	KLM/17, Mayyanad	KLM/29, Sasthamkotta	0	1	2	2	3
Pathanamthitta	Dug well	75	0.600	10.700	10 Seethathode,PATHANAMTHITTA	20 Civil Station,Adoor Municipality,PATHANAMTHITTA	11	35	28	1	0
	Bore well	25	0.30	18.60	PTA/19, Erath	PTA/15,Chittar,PATHANAMTHITTA	3	8	10	4	0
Alappuzha	Dug well	20	-0.237	10.963	OW-06 Pulinkunnu	OW-02 Kattanam,Mavelikara,Alappuzha	14	4	1	1	0
	Bore well	2	2.55	4.33	36 Punthala,Chengannoor,Alappuzha	35 Pennukkara,Chengannoor,Alappuzha	0	2	0	0	0

	Tube well	28	0.12	17.42	33 Aroor	04 Charumoodu,Bharanikavu,Alappuzha	12	10	4	2	0
Kottayam	Dug well	18	0.140	8.490	KTM-OW-5,Kumarakom,Kottayam	KTM-OW-17	3	7	8	0	0
	Bore well	19	-0.13	19.80	10, Veliyannur, Uzhavur	03,Kanjirappally,Kottayam	4	6	7	2	0
Idukki	Dug well	20	0.550	9.150	73, Santhanpara, Devikulam	71,Kattappana Municipality,Idukki	5	12	3	0	0
	Bore well	23	1.00	36.95	SO415,Udumbannoor,Idukki	SO428,Peermade,IDUKKI	2	6	7	4	4
Ernakulam	Dug well	38	0.260	7.280	E88, Chellanam	GWE-01, Kizhakkambalam	12	13	13	0	0
	Bore well	26	0.06	11.56	BW 112, Muvattupuzha Municipality	BW 100, Rayamangalam	5	12	7	2	0
	Tube well	1	10.41	10.41	TW 01,Kochi Corporation,ERNAKULAM.	TW 01,Kochi Corporation,ERNAKULAM.	0	0	0	1	0
Thrissur	Dug well	31	0.590	11.850	TSROW15, Nattika	TSROW21, Poyya, Thrissur	9	10	10	2	0
	Bore well	37	1.03	30.78	TSR126, Pudukad	TSR122,Pazhayannur,Thrissur	4	7	15	8	3
Malappuram	Dug well	25	0.900	11.830	MPM.OW.18,Kondotty,Malappuram	MPM OW23,Vengara	3	12	8	2	0
	Bore well	26	1.30	47.41	MPM168, Nilambur	MPM174,Areekode,Malappuram	4	7	11	1	3
Palakkad	Dug well	31	0.940	10.470	PKD S-2, Alathur	PKD S-5, Mannarkad	3	15	10	3	0
	Bore well	33	1.43	21.35	160 PKD-12, Kuzhalmannam	136, Pattambi	2	6	9	14	2
Kozhikkode	Dug well	33	0.590	11.500	QKKDO49, Kozhikkode	QKKDO60, Thodannur	4	18	8	3	0
	Bore	34	0.0	28.89	KKDPZ 197,Ramanattukara	KKDPZ 210 Kozhikode	3	10	10	7	4

	well		1		Municipality	(corporation)					
Wayanad	Dug well	26	0.200	11.900	SOW-1, Vythiri	SOW-4,Nenmeni,WAYANAD	4	7	12	3	0
	Bore well	19	1.55	23.30	WYD216,Muttil,WAYANAD	WYD223,Thirunelly,WAYANAD	1	2	6	9	1
Kannur	Dug well	36	0.450	16.430	KNR-POW-C23, Vengad	KNR-POW-C8,Chapparappadavu,Kannur	8	6	19	3	0
	Bore well	27	1.54	22.84	KNRPz239,Chapparappadavu, Taliparamba,Kannur	KNR-Pz228, Padiyoor	1	3	12	10	1
Kasaragod	Dug well	45	1.720	15.050	216, Kanhangad	200,Karadka,Kasaragod	2	4	26	13	0
	Bore well	21	3.42	24.850	PZKGD241,Parappa,Kasaragod	PZKGD242,Karadka,Kasaragod	0	3	6	10	2

Comparison of Water level June 2022 with respect to June 2021 **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	8	4	1	2	1	0
			Fall	23	4	6	4	1	8
	Bore well	33	Rise	8	5	2	0	0	1
			Fall	25	6	4	7	3	5
	Tube well	4	Rise	1	0	1	0	0	0
			Fall	3	2	0	1	0	0
Kollam	Dug well	21	Rise	2	1	1	0	0	0
			Fall	19	8	2	2	4	3
	Bore well	15	Rise	3	3	0	0	0	0
			Fall	12	2	6	2	0	2
	Tube well	7	Rise	2	0	1	0	0	1
			Fall	5	1	2	1	1	0
Pathanamthitta	Dug well	75	Rise	6	6	0	0	0	0
			Fall	69	25	20	16	4	4
	Bore well	25	Rise	4	3	1	0	0	0
			Fall	21	8	4	3	1	5
Alappuzha	Dug well	20	Rise	10	10	0	0	0	0
			Fall	10	4	3	1	1	1
	Bore well	2	Rise	0	0	0	0	0	0
			Fall	2	1	0	1	0	0
	Tube well	28	Rise	14	14	0	0	0	0
			Fall	14	9	3	2	0	0
Kottayam	Dug well	20	Rise	9	7	0	0	0	2
			Fall	11	4	0	3	1	3
	Bore	21	Rise	7	6	0	0	1	0

	well		Fall	14	8	2	0	1	3
Idukki	Dug well	20	Rise	11	6	2	2	1	0
			Fall	9	7	1	0	0	1
	Bore well	23	Rise	11	8	2	1	0	0
			Fall	12	3	1	1	3	4
Ernakulam	Dug well	38	Rise	3	3	0	0	0	0
			Fall	35	9	7	6	7	6
	Bore well	24	Rise	4	2	0	2	0	0
			Fall	20	7	8	1	3	1
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	1	0	0	0
Thrissur	Dug well	31	Rise	9	4	4	1	0	0
			Fall	22	4	10	2	1	5
	Bore well	37	Rise	5	3	2	0	0	0
			Fall	32	8	8	5	2	9
Malappuram	Dug well	25	Rise	11	4	6	0	0	1
			Fall	14	5	7	2	0	0
	Bore well	26	Rise	13	7	4	1	0	1
			Fall	13	6	4	1	0	2
Palakkad	Dug well	31	Rise	11	6	5	0	0	0
			Fall	20	15	4	0	0	1
	Bore well	33	Rise	23	10	4	2	3	4
			Fall	10	2	3	1	2	2
Kozhikkode	Dug well	33	Rise	15	11	3	0	0	1
			Fall	18	13	4	1	0	0
	Bore well	33	Rise	17	13	2	0	0	2
			Fall	16	12	2	1	1	0
Wayanad	Dug well	26	Rise	11	7	3	0	0	1
			Fall	15	7	3	2	1	2
	Bore	19	Rise	15	12	0	1	2	0

	well		Fall	4	4	0	0	0	0
Kannur	Dug well	36	Rise	15	14	1	0	0	0
			Fall	21	11	5	4	1	0
	Bore well	27	Rise	7	5	2	0	0	0
			Fall	20	9	7	1	0	3
Kasaragod	Dug well	44	Rise	6	3	2	0	0	1
			Fall	38	6	4	1	2	25
	Bore well	21	Rise	1	0	0	0	0	1
			Fall	20	2	1	4	0	13

Comparison of Water level June 2022 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	26	12	6	5	1	2
			Fall	5	2	1	1	0	1
	Bore well	32	Rise	24	7	8	5	1	3
			Fall	8	5	2	0	0	1
	Tube well	4	Rise	4	2	1	1	0	0
			Fall	0	0	0	0	0	0
Kollam	Dug well	23	Rise	19	13	2	2	2	0
			Fall	4	1	2	1	0	0
	Bore well	15	Rise	10	7	2	0	0	1
			Fall	5	4	1	0	0	0
	Tube well	8	Rise	6	2	2	0	0	2
			Fall	2	2	0	0	0	0

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

	Bore well	26	Rise	19	5	4	4	2	4
			Fall	7	2	2	0	0	3
Palakkad	Dug well	31	Rise	20	6	7	1	6	0
			Fall	11	7	3	1	0	0
	Bore well	34	Rise	26	7	8	4	2	5
			Fall	8	2	3	0	0	3
Kozhikkode	Dug well	33	Rise	19	9	2	7	1	0
			Fall	14	7	4	2	1	0
	Bore well	34	Rise	14	7	6	0	0	1
			Fall	20	10	4	3	1	2
Wayanad	Dug well	26	Rise	17	6	4	4	1	2
			Fall	9	2	5	0	1	1
	Bore well	19	Rise	15	10	3	1	0	1
			Fall	4	3	1	0	0	0
Kannur	Dug well	36	Rise	10	8	1	1	0	0
			Fall	26	6	11	5	1	3
	Bore well	27	Rise	6	4	1	0	0	1
			Fall	21	6	12	2	0	1
Kasaragod	Dug well	45	Rise	7	5	1	0	0	1
			Fall	38	6	7	5	5	15
	Bore well	21	Rise	2	1	0	0	0	1
			Fall	19	4	1	3	3	8

Annexure IV - Open wells showing more than 2m fall during June 2022

Water Level Data & Fluctuation															
SNo	District	Block	GP/Municipality/Corporation	WellNo	Well_Type	Latitude(°)	Longitude(°)	Jun-2022	Jun-2021	Jun-2020	Decadal Avg(2012-2021)		Fluctuation in Jun-2022 wrt.		
											WL	Yrs	Jun-2021	Jun-2020	Decadal Avg
1	Thiruvananthapuram	Nedumangad	Municipal area	TVM OW12	Dug Well	8.61278	77.01000	7.620	4.870	6.080	8.095	10	-2.750	-1.540	0.475
2	Thiruvananthapuram	Nedumangad	Nedumangad	TVM OW21	Dug Well	8.57667	77.02000	4.700	1.400	0.890	2.335	10	-3.300	-3.810	-2.365
3	Thiruvananthapuram	Neyyattinkara	Municipal area	TVM OW07	Dug Well	8.40500	77.09167	10.750	8.010	9.130	11.533	10	-2.740	-1.620	0.783
4	Thiruvananthapuram	Neyyattinkara	Nemom	TVM OW30	Dug Well	8.47861	77.04723	10.420	7.730	10.230	10.675	10	-2.690	-0.190	0.255
5	Thiruvananthapuram	Thiruvananthapuram	Athiyannur	TVM OW06	Dug Well	8.39000	77.05334	6.930	3.690		8.080	10	-3.240		1.150
6	KOLLAM	Anchal	Anchal	KLM OW 16	Dug Well	8.93218	76.91446	5.630	3.140	4.330	5.019	10	-2.490	-1.300	-0.611
7	KOLLAM	Anchal	Thenmala	OW-28	Dug Well	8.99367	76.99998	7.760	5.750	6.980	9.152	9	-2.010	-0.780	1.392

8	KOLLAM	Pathanapuram	Pattazhi	KLM OW 20	Dug Well	9.07711	76.79648	6.820	3.810	4.130	5.557	10	-3.010	-2.690	-1.263
9	PATHANAMTHITTA	Parakode	Enadimangalam	15 GHSS Maroor	Dug Well	9.10820	76.83147	6.600	4.580	5.750	5.165	2	-2.020	-0.850	-1.435
10	PATHANAMTHITTA	Parakode	Kalanjoor	14 VHSS Kalanjoor	Dug Well	9.12342	76.85121	5.500	2.430	5.490	3.960	2	-3.070	-0.010	-1.540
11	PATHANAMTHITTA	Parakode	Pallickal	19 GLPS Pazhakulam	Dug Well	9.16446	76.68430	7.050	4.000	5.970	4.985	2	-3.050	-1.080	-2.065
12	ALAPPUZHA	Bharanikkavu	Bharanikkavu	OW-02 Kattanam	Dug Well	9.17639	76.57111	10.963	7.823	10.377	10.761	10	-3.140	-0.586	-0.202
13	Kottayam	Erattupetta	Poonjar	KTM-OW-11	Dug Well	9.67236	76.79691	3.020	0.350	0.280	0.334	10	-2.670	-2.740	-2.686
14	Kottayam	Uzhavoor	Ramapuram	KTM-OW-22	Dug Well	9.81528	76.66383	7.050	4.260	4.100	4.383	10	-2.790	-2.950	-2.667
15	Kottayam	Uzhavoor	Uzhavoor	KTM-OW-23	Dug Well	9.81008	76.56675	3.000	0.980	0.220	0.646	10	-2.020	-2.780	-2.354
16	Kottayam	vazhoor	Nedumkunnam	Ktm-ow-3	Dug Well	9.50006	76.66155	6.120	4.130	3.950	4.051	10	-1.990	-2.170	-2.069
17	Idukki	Devikulam	Munnar	74	Dug Well	10.08750	77.06667	3.410	1.340	5.220	2.888	10	-2.070	-1.810	-0.522

18	ERNAKULAM	Koovappady	Perumbavoor Municipality	E95	Dug Well	10.11590	76.47304	7.260	3.870	7.270	5.146	10	-3.390	0.010	-2.115
19	ERNAKULAM	Koovappady	Rayamangalam	GWE-02	Dug Well	10.09583	76.39778	4.380	2.090	4.450	2.656	10	-2.290	0.070	-1.724
20	ERNAKULAM	Kothamangalam	Nellikkuzhi	GWE-14	Dug Well	10.06981	76.60320	2.890	0.415	2.110	0.859	10	-2.475	-0.780	-2.032
21	ERNAKULAM	Muvattupuzha	Valakom	GWE-03	Dug Well	9.97917	76.51667	6.080	3.922	6.660	6.154	9	-2.158	0.580	0.074
22	ERNAKULAM	Vadavukodu	Kunnathunadu	GWE-16	Dug Well	10.02617	76.44948	6.780	4.068	6.830	5.637	10	-2.712	0.050	-1.143
23	ERNAKULAM	Vazhakkulam	Kizhakkambalam	GWE-01	Dug Well	10.05278	76.39778	7.280	5.090	10.100	8.695	10	-2.190	2.820	1.415
24	THRISSUR	Irinjalakkuda	Irinjalakuda Municipality	TSROW7	Dug Well	10.34372	76.22050	10.980	8.610	10.110	10.629	10	-2.370	-0.870	-0.351
25	THRISSUR	Kodakara	Pudukad	TSROW4	Dug Well	10.41900	76.27169	8.100	5.650	8.860	7.956	10	-2.450	0.760	-0.144
26	THRISSUR	Mala	Poyya	TSROW21	Dug Well	10.21547	76.23869	11.850	5.310	7.140	7.646	10	-6.540	-4.710	-4.204
27	THRISSUR	Thrissur	Cherpu	TSROW22	Dug Well	10.44194	76.21056	9.100	6.470	10.520	9.166	10	-2.630	1.420	0.066
28	THRISSUR	Thrissur	Puzhakkal	TSROW2	Dug Well	10.53333	76.26222	2.750	0.580	4.270	2.763	10	-2.170	1.520	0.013
29	Palakkad	Mannarkad	Attappady	OW137	Dug Well	11.09472	76.59583	5.000	2.970	3.750	3.860	9	-2.030	-1.250	-1.140

30	WAYANAD	Mananthavady	Mananthavady Municipality	SOW-11	Dug Well	11.80226	76.00312	6.950	4.450	5.120	6.959	10	-2.500	-1.830	0.009
31	WAYANAD	Panamaram	Panamaram	167	Dug Well	11.74949	76.01769	11.740	8.680	8.950	8.958	10	-3.060	-2.790	-2.782
32	KANNUR	Payyannur	Peringome-Vayakkara	KNR-MOW 190	Dug Well	12.22419	75.31486	7.220	7.530	5.000	4.626	10	0.310	-2.220	-2.594
33	Kasaragod	Hosdurg	Kanhangad	194	Dug Well	12.44028	75.02639	5.640	1.560	2.580	3.941	10	-4.080	-3.060	-1.699
34	Kasaragod	Hosdurg	Kanhangad	195	Dug Well	12.33750	75.10555	4.950	0.320	1.240	3.182	10	-4.630	-3.710	-1.768
35	Kasaragod	Hosdurg	Nileshwar	192	Dug Well	12.23750	75.23333	7.830	3.200	4.560	5.291	10	-4.630	-3.270	-2.539
36	Kasaragod	Hosdurg	Nileshwar	217	Dug Well	12.26667	75.15972	14.390	8.700	8.670	9.304	10	-5.690	-5.720	-5.086
37	Kasaragod	Kasaragod	Karadka	213	Dug Well	12.56944	75.28472	8.020	2.500		5.848	9	-5.520		-2.172
38	Kasaragod	Kasaragod	Karadka	KSOW-06	Dug Well	12.55972	75.20084	7.220	2.300		5.624	9	-4.920		-1.596
39	Kasaragod	Kasaragod	Karadka	KSOW-08	Dug Well	12.51389	75.12417	13.610	10.250	13.750	13.088	10	-3.360	0.140	-0.522
40	Kasaragod	Kasaragod	Karadka	KSOW-10	Dug Well	12.45556	75.14083	5.120	2.530	0.400	1.889	10	-2.590	-4.720	-3.231
41	Kasaragod	Kasaragod	Kasaragod	203	Dug Well	12.58750	75.07361	8.930	3.150	4.550	6.552	10	-5.780	-4.380	-2.378
42	Kasaragod	Kasaragod	Kasaragod	212	Dug Well	12.54444	75.07500	7.030	0.180	7.580	4.005	10	-6.850	0.550	-3.025

43	Kasaragod	Kasaragod	Kasaragod	KSOW-01	Dug Well	12.50444	74.99611	8.520	3.830	3.150	3.973	10	-4.690	-5.370	-4.547
44	Kasaragod	Kasaragod	Kasaragod	KSOW-09	Dug Well	12.48000	75.05750	12.860	12.770	7.000	9.202	10	-0.090	-5.860	-3.658
45	Kasaragod	Kasaragod	Kasaragod	KSOW-25	Dug Well	12.52250	75.01334	12.010	7.740	5.060	8.435	10	-4.270	-6.950	-3.575
46	Kasaragod	Manjeshwaram	Kasaragod	KSOW-2A	Dug Well	12.59528	74.94278	7.760	5.240	5.550	7.663	7	-2.520	-2.210	-0.097
47	Kasaragod	Manjeshwaram	Manjeshwar	204	Dug Well	12.65083	74.92361	5.780	1.590	2.720	3.727	10	-4.190	-3.060	-2.053
48	Kasaragod	Manjeshwaram	Manjeshwar	205	Dug Well	12.67917	74.90556	11.690	4.460	7.020	7.313	10	-7.230	-4.670	-4.377
49	Kasaragod	Manjeshwaram	Manjeshwar	207	Dug Well	12.64722	75.10889	8.500	5.580	6.140	7.645	10	-2.920	-2.360	-0.855
50	Kasaragod	Manjeshwaram	Manjeshwar	208	Dug Well	12.75139	74.93333	6.400	0.750	1.170	4.165	10	-5.650	-5.230	-2.235
51	Kasaragod	Manjeshwaram	Manjeshwar	209	Dug Well	12.73333	74.88333	6.390	3.440	4.550	4.929	9	-2.950	-1.840	-1.461
52	Kasaragod	Manjeshwaram	Manjeshwar	210	Dug Well	12.69861	75.01389	7.590	2.060	3.840	7.774	10	-5.530	-3.750	0.184
53	Kasaragod	Manjeshwaram	Manjeshwar	KSOW-04	Dug Well	12.68361	74.98389	8.720	5.580	6.800	6.796	10	-3.140	-1.920	-1.924
54	Kasaragod	Manjeshwaram	Manjeshwar	KSOW-05	Dug Well	12.65778	75.01444	12.720	10.490	12.080	11.878	10	-2.230	-0.640	-0.843
55	Kasaragod	Vellarikkundu	Parappa	198	Dug Well	12.31944	75.28750	4.350	0.420	0.560	1.655	10	-3.930	-3.790	-2.695
56	Kasaragod	Vellarikkundu	Parappa	215	Dug Well	12.44167	75.27222	7.380	6.860	4.980	5.341	10	-0.520	-2.400	-2.039
57	Kasaragod	Vellarikkundu	Parappa	218	Dug Well	12.28333	75.20277	7.380	5.290	6.730	7.223	9	-2.090	-0.650	-0.157

58	Kasaragod	Vellarikkundu	Parappa	KSOW 19A	Dug Well	12.37361	75.23111	5.440	2.280	2.600	3.960	8	-3.160	-2.840	-1.480
59	Kasaragod	Vellarikkundu	Parappa	KSOW -20	Dug Well	12.36944	75.33056	12.720	10.380	11.890	11.192	10	-2.340	-0.830	-1.528
60	Kasaragod	Vellarikkundu	Parappa	KSOW -24	Dug Well	12.28611	75.19167	8.840		3.950	6.352	9		-4.890	-2.488

Observation well frequency on June 2022 **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	451	-0.237	16.43	OW-24Kidangara Veliyanad , Alappuzha	KNR-POW-C8,Chapparappadavu,KANNUR	87	164	166	34	0
						19.29%	36.36%	36.81%	7.54%	0.00%
Bore well	342	-0.75	47.41	10, Vellanad, Thiruvananthapuram	MPM174, Areekkod, Malappuram	36	82	125	79	20
						10.53%	23.98%	36.55%	23.10%	5.85%
Tube well	41	0.12	33.7	33 Aroor, Alappuzha	KLM/29 Sasthamkotta, Kollam	12	13	8	5	3
						29.27%	31.71%	19.51%	12.20%	7.32%

Comparison of Water level June 2022 with respect to June 2021 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	451	Rise	127	86	28	5	2	6
		%	28%	68%	22%	4%	2%	5%
		Fall	324	122	76	44	23	59
		%	72%	38%	23%	14%	7%	18%
Bore well	339	Rise	118	77	19	7	6	9
		%	35%	65%	16%	6%	5%	8%
		Fall	221	78	50	28	16	49
		%	65%	35%	23%	13%	7%	22%
Tube well	40	Rise	17	14	2	0	0	1
		%	42%	82%	12%	0%	0%	6%
		Fall	23	12	6	4	1	0
		%	58%	52%	26%	17%	4%	0%

Comparison of Water level June 2022 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	205	107	39	31	16	12
		%	53%	52%	19%	15%	8%	6%
		Fall	185	72	51	22	13	27
		%	47%	39%	28%	12%	7%	15%
Bore well	340	Rise	191	77	43	23	15	33
		%	56%	40%	23%	12%	8%	17%
		Fall	149	59	40	12	11	27
		%	44%	40%	27%	8%	7%	18%
Tube well	40	Rise	28	15	10	1	0	2
		%	70%	54%	36%	4%	0%	7%
		Fall	12	9	1	1	0	1
		%	30%	76%	8%	8%	0%	8%