GOVERNMENT OF KERALA
GROUNDWATER DEPARTMENT

GROUNDWATER LEVEL MONITORING REPORT – MAY 2022

Wateris 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 3107 mm;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.

The actual premonsoon rainfall (March-May) occurred in the state during 2021 is 750.9 mm, which is 108% large excess than that of the normal rainfall. All the districts got Large Excess rainfall during this period. Most of the locations in the state get recharged from the excess rainfall occurred during this season.

The actual premonsoon rainfall (March-May)occurred in the state during 2022 is 668.5mm which is 85% Large Excess than that of the normal rainfall(361.5mm).All the districts got Large Excess rainfall except Thiruvananthapuram,Malappuram, Kollamand Alappuzha districts which gotgot Excess rainfall. Eranakulam district got the highest rainfall 1007.6mm which is 152% large excess than the normal rainfall of the district in the season (400.6mm). Palakkd district got the lowest rainfall during the season, 396.8mm which is 63% large excess than the normal rainfall of the district and Malappuram district got 479.4mm rain fall which is 53% Excess than the normal rainfall of the district during the season.

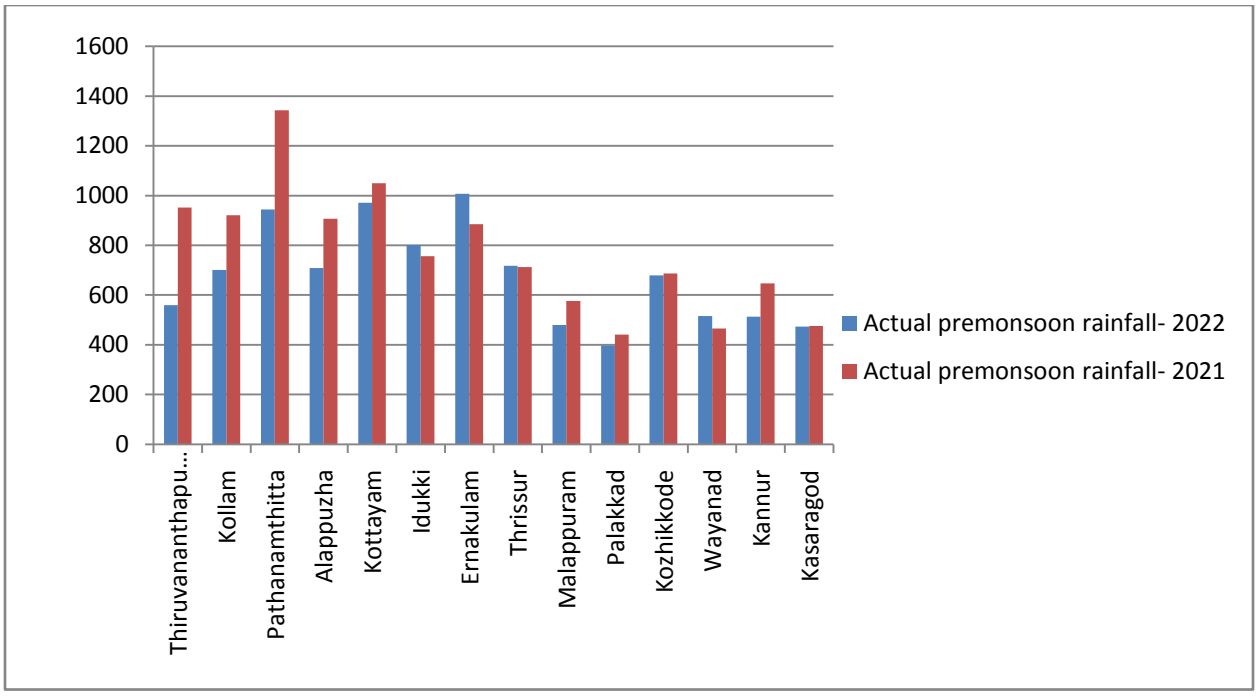

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Fig:1. Comparison of actual pre monsoonrainfalloccurred2022 wrtactual pre monsoon rainfall 2021

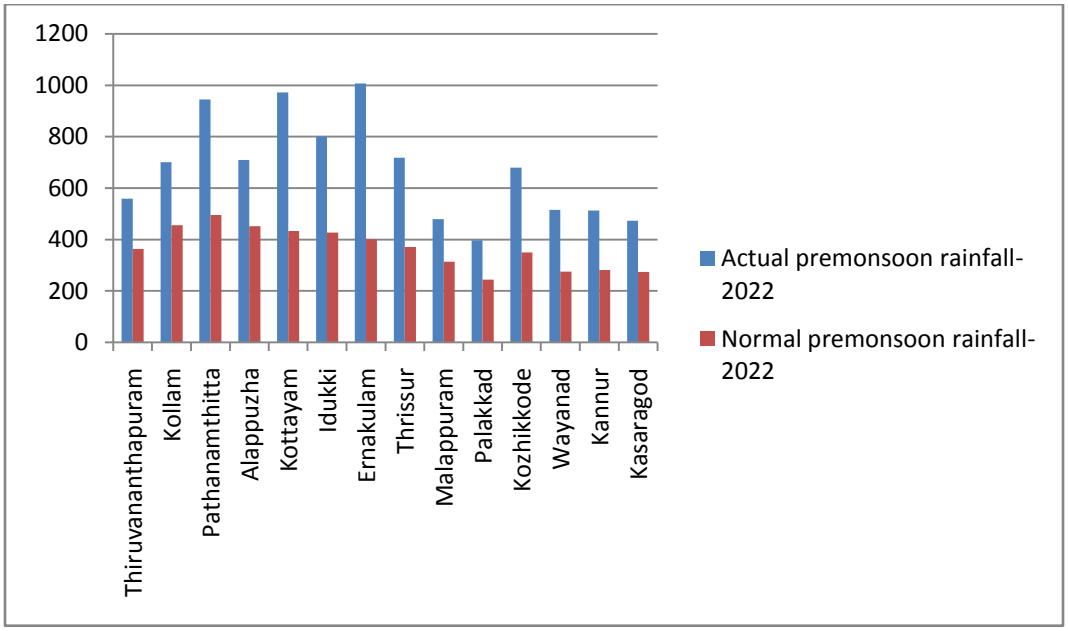


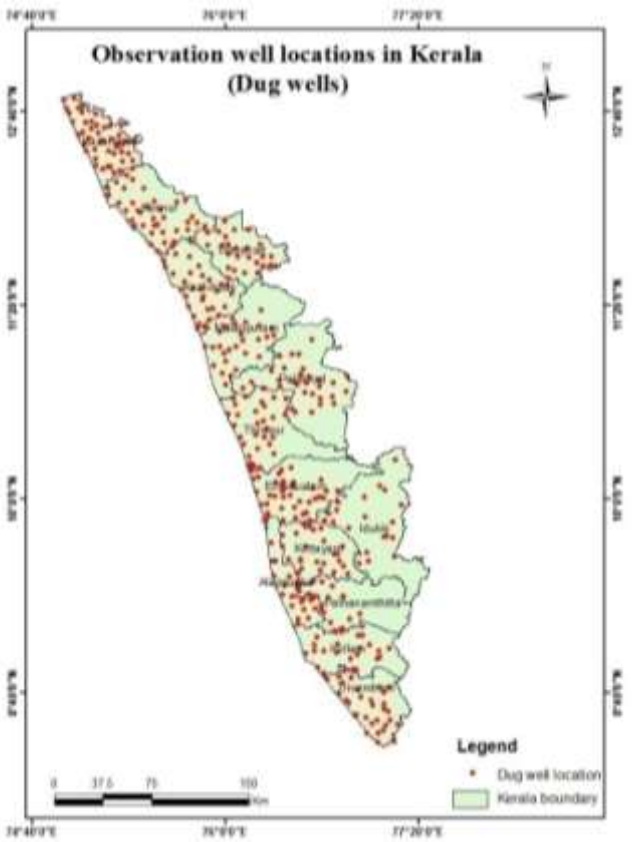
Fig:2. Comparison of actualpremonsoon rainfalloccurred 2022wrtNormal Rainfall 2022

Geology: Kerala, the southernmost state of Indian peninsula, is having a geographical area of 38863 km^2. The land area extends between latitude 8°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 hydro geological units. Observation wells includes dug wells (owned by public and private) and purpose built piezometer (bore wells and tube wells). Water level data has been collected monthly and water samples collected and analysis done periodically.



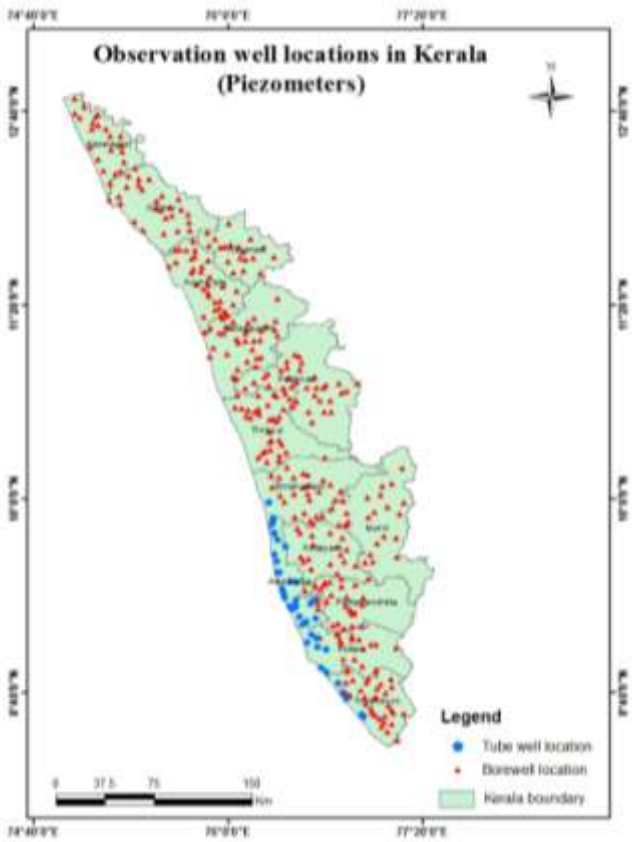


Fig: 3. Location map of observation dug wells and piezometers (bore wells & tube wells)

Analysis of Groundwater level data –May2022

During the month of **May2022,** groundwater level in 445 dug wells and 385 purpose built piezometers (bore wells- 343 and tube wells – 42) has been monitored. The data collected from the observation wells during the month of May 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 May 2022

Dug wells:-The depth to groundwater level in the observation dug wells during the month of May 2022 ranges from a minimum of -0.30mbgl inKTM-OW-5in Kumarakam,, Kottayam district to a maximum of 16.12mbglin KNR-POW-C8, Chapparappadavu,Kannur district. Out of 445dug wells monitored water level in 15% of dug wells shows a depth to water level ranges from <=2 m, 36% ranges between 2-5 m, 38% ranges between 5-10 m and 11% dug wells recorded depth to water level ranges between 10-20 mbgl. Dug wells inKottayam, 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 May2022 is appended as (Annexure-I)

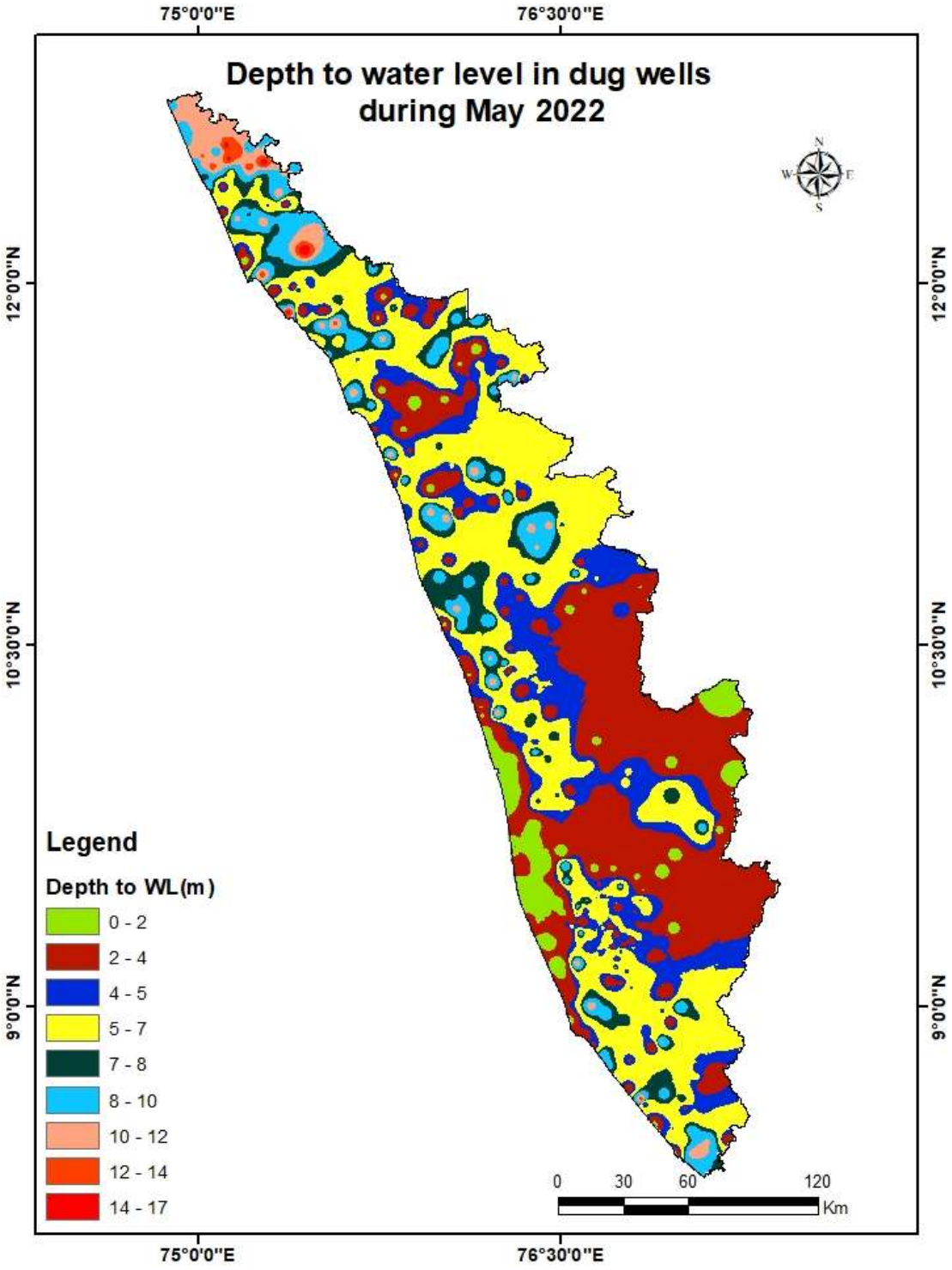


Fig: 4. Depth to water level in Dug wells during May2022

Bore wells (hard rock terrain):-The depth to groundwater level in the observation bore wells during the month of May2022 ranges from a minimum of -0.79m in06,Nemom, Neyyattinkarto a maximum of 46.060mbg in MPM174, Areekkod in Malappuram district. Out of 343 bore wells monitored, water level in 8% of bore wells shows a depth to water level range from 0-2 m, 21 % ranges between 2-5 m, 38% ranges between 5-10 m, 25% of bore wells ranges between 10-20 m, and 8% ranges more than 20 m .Bore wells inThiruvananthapuram, Kollam Alappuzha and Kottayam districts show water level below20 mbgl. Table showing well frequency during May2022 is appended. (Annexure-I)

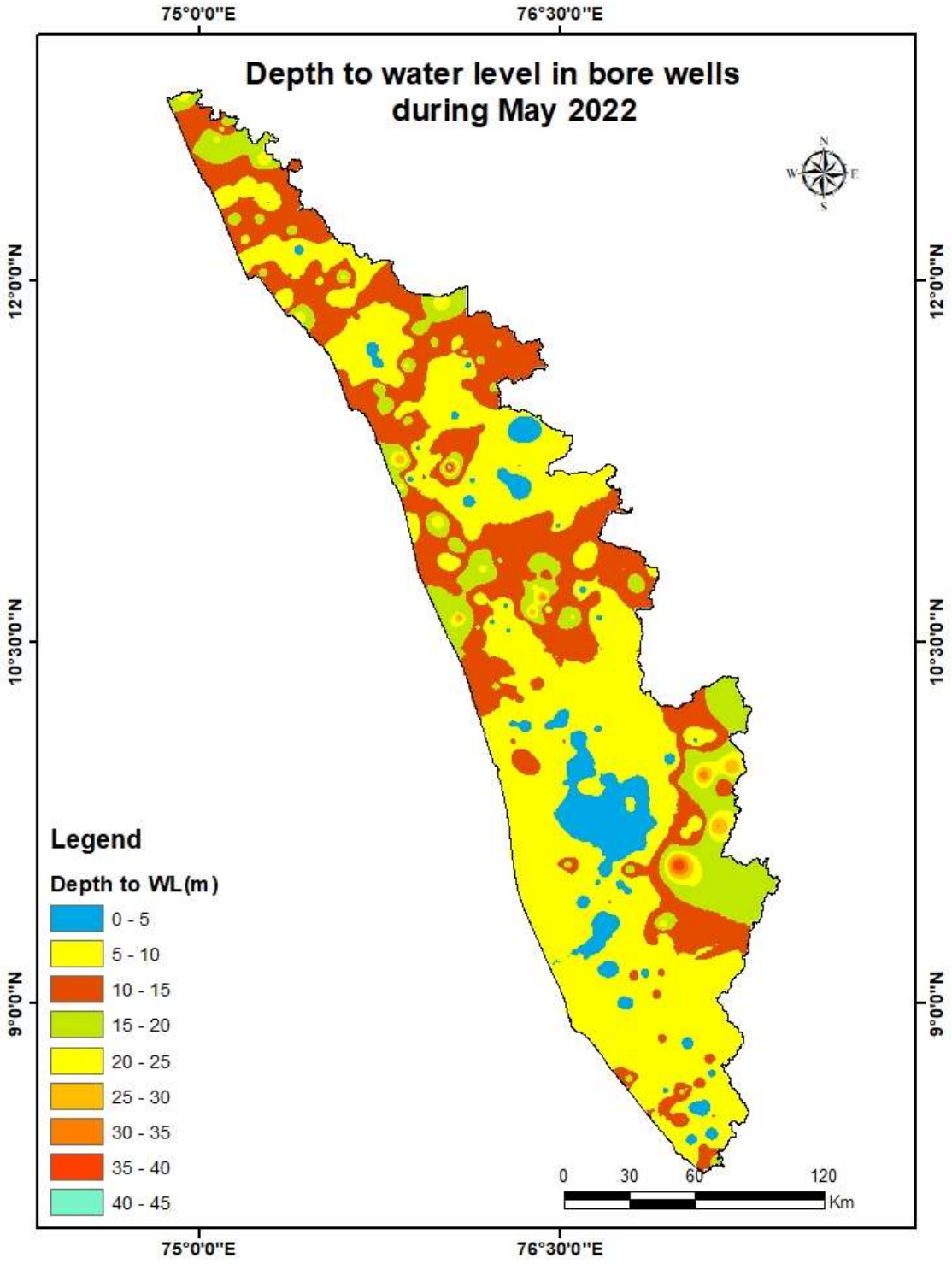


Fig:5. Depth to water level in Bore wells during May **2022**

Tubewells (coastal sedimentary terrain):-The depth to groundwater level in the observation tubewells during the month of May2022 ranges from a minimum of -0.50m in tube well no 08 Thrikkunnappuzha, Alappuzha to a maximum of 32.17mbgl, in KLM/29,Sasthamkotta,KOLLAM. Out of 42 tube wells monitored in the state, water level in 26 % of tube wells ranges between 0-2m, 31% of tube wells ranges between 2-5 m, 22% ranges between 5-10 m and14%ranges between10-20 and 7%(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 May2022with respect toMay 2021

Comparison of the groundwater level in 420 observation dug wells during May**2022**with respect to the corresponding month in the previous year indicates that 62 % of observation dug wells show a fall in water level and 38 % of the dug wells show no remarkable change /marginal rise in water level.Out of 62% of the dugwells showing falling trend, 31% recorded fall in water level less than 0.5m, 20 % of dug wells show fall in the range between 0.5-1m,13% of dug wells show fall in the range between 1-1.5 m, 9% of dug wells show a fall in the range between 1.5 -2m and 27% 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 May 2022 with respect to May 2021is appended.

(Annexure-II).

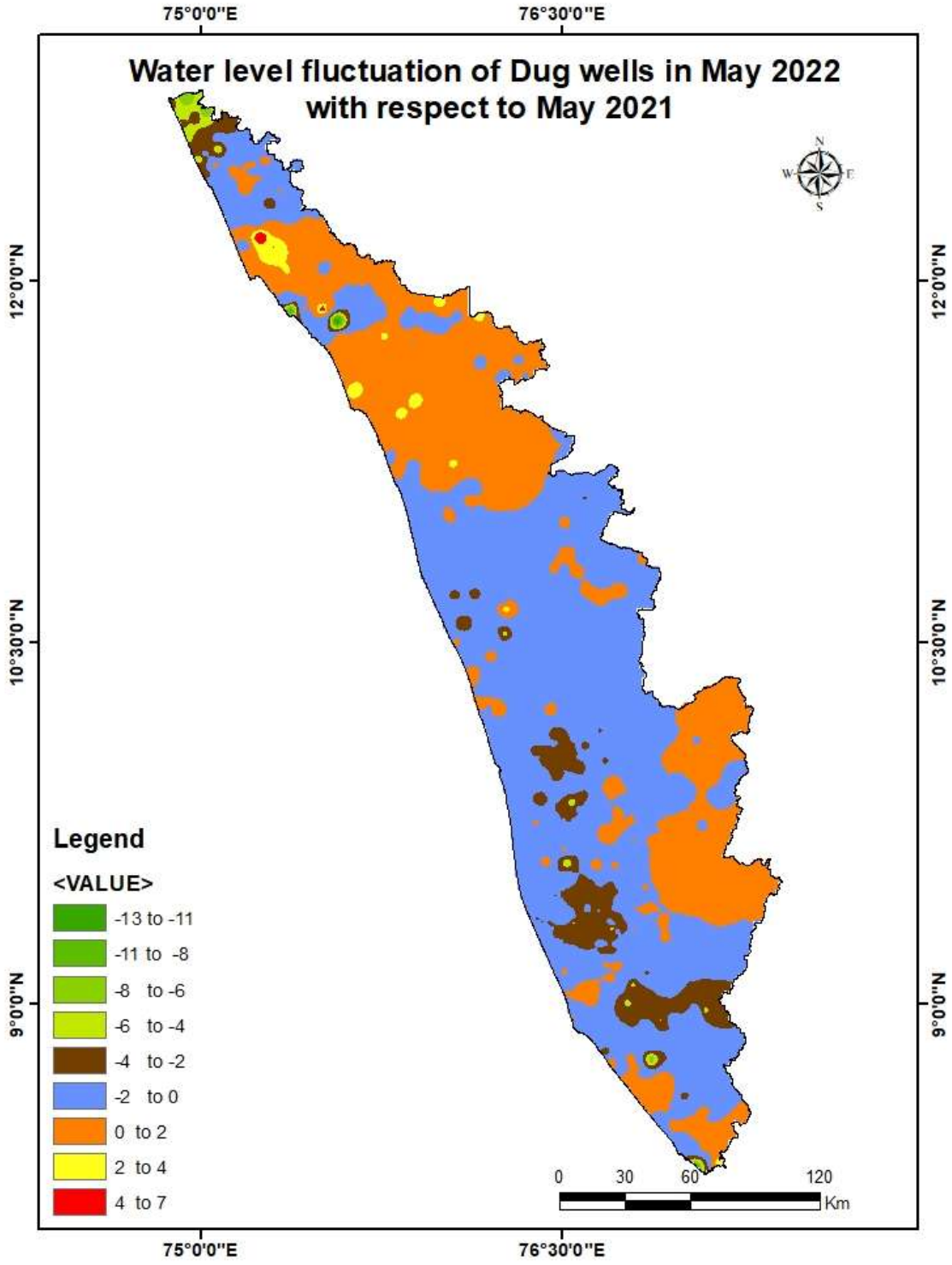


Fig: 6. Comparison of water level in Dug wells during May 2022 with respect to May 2021

Comparison of the water level in 335 observation bore wells (hard rock terrain in midland and high land areas) in May**2022**with that of the previous year, it has been noticed that43% of bore wells show fall in water level and 57% of the wells shows no remarkable change/marginal rise in water level. Out of 43 % of the bore wells showing falling trend, 28% of the bore wells recorded fall in water level less than 0.5m, 17% show fall in the range between 0.5 - 1m, 15% of bore wells show fall in the range between 1 - 1.5m, 10% of bore wells show a fall in range between1.5-2m, 30% of bore wells show a fall inwater level more than 2m.

Table showing water level comparison of bore wells during May2022with respect to May 2021(Annexure-II)isappended.

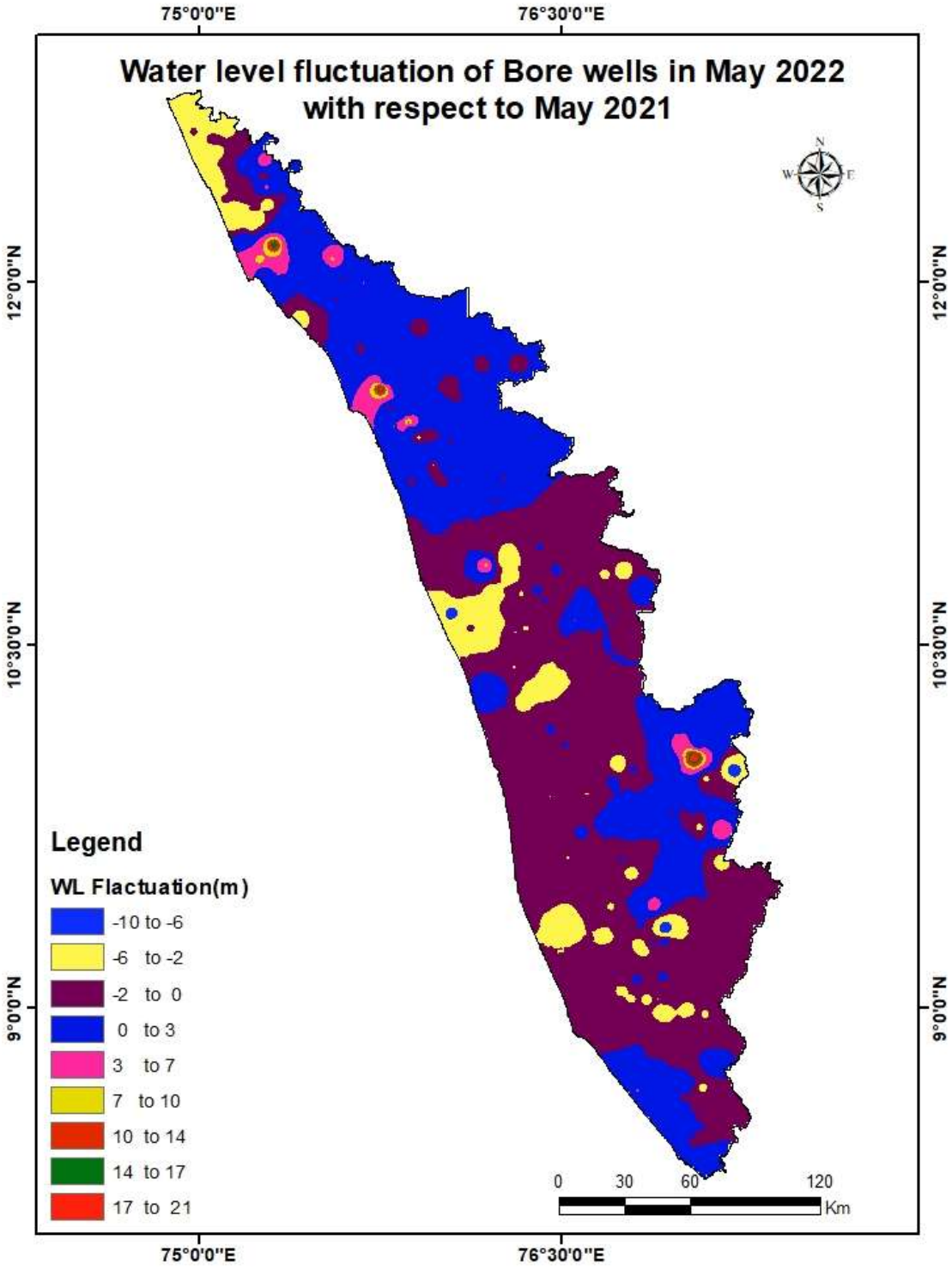
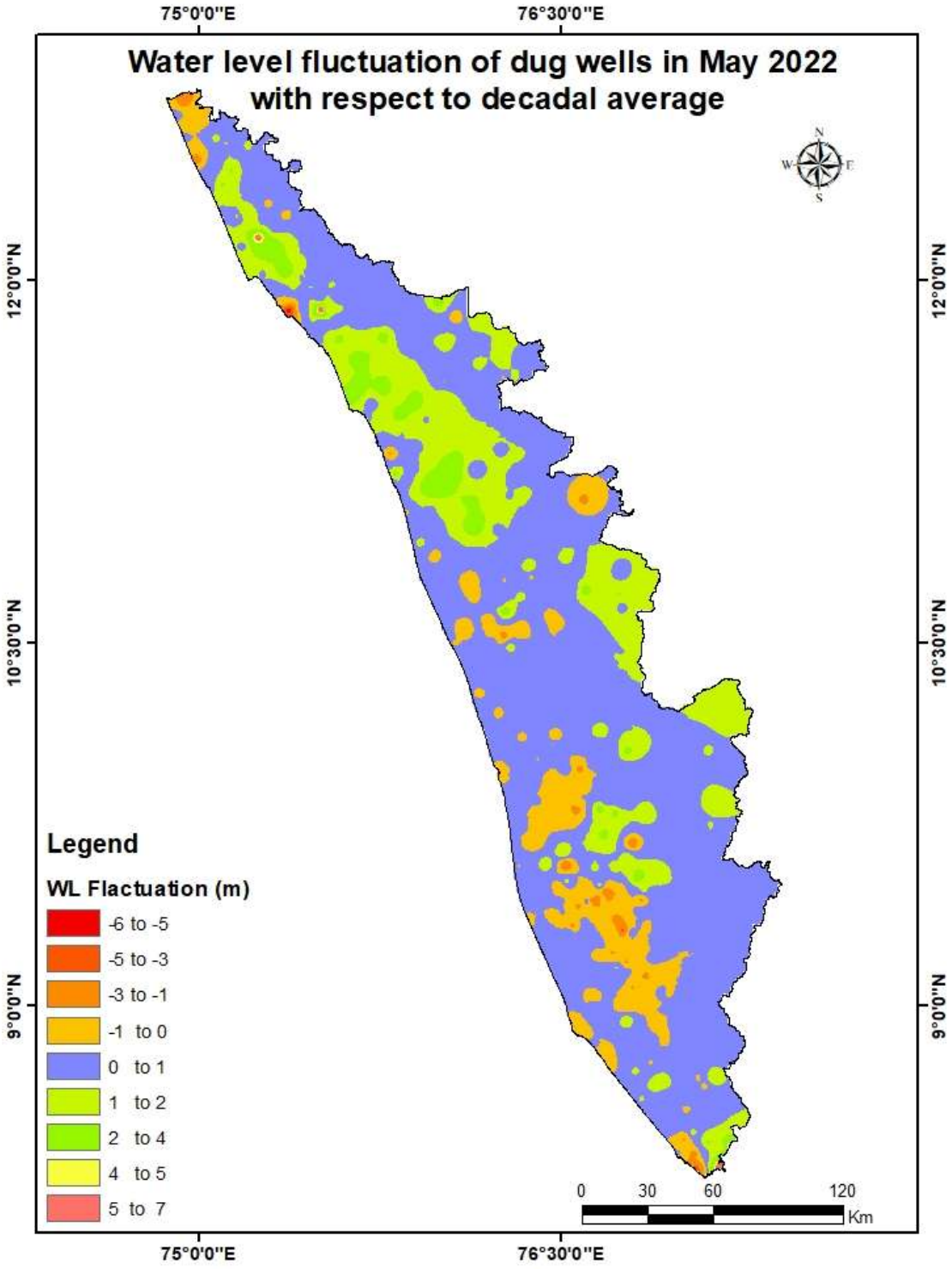


Fig:7. Comparison of water level in Bore wells during May**2022wrt**May**2021**

Comparison of the water level in 12 observation tube wells (in the coastal sedimentary areas)during May2022with that of the previous year reveals that 33 % of tube wellsrecorded a falling trend and 67 % of the wells shows no remarkable change /marginal rise of water level.Out of 33% of the tube wells showing a falling trend,50% of wells recorded fall in range between 0.5-1m .25% of the tube wells (only 1 well in Kollam district) show a fall inwater level between1.5-2m and 25% of the tube wells (only 1 well in Kollam district) show a fall in water level more than 2m..Table showing comparison of water level during May 2022with May 2021is appended. (Annexure-II)

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

On comparison of the water level inMay 2022with the decadal mean, it has been noticed that out of 379 nos of observation dug wells 21% of wells (79nos) recorded a fall in water level and 79% of the wells (300nos)shows marginal rise /no remarkable change in water level.Out of 21% of the dugwells show a falling trend, 66% of the dug wells recorded fall in water level less than 0.5m,13% show fall in the range between 0.5-1m, 11% of dug wells show fall in the range between1-1.5m, 5% of dug wells show a fall in range between 1.5-2m and5% of dug wells(1 well each in Thiruvananthapuram, Kottayam Kannur and Kasaragod districts) 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 May 2022with respect to decadal mean is appended. (Annexure - III)



Fig;8 Comparison of water level in Dug wells during May **2022 wrt Decadal mean**

Compared water level in the 342observation bore wells during May 2022with that of the decadal mean. It has been noticed that 22% of bore wells show fall in water level, and 78% of the wells shows marginal rise,no remarkable change in water level.Out of 22% of the bore wells shows a falling trend,47% shows a fall in water level less than 0.5m, 12 % show fall in the range between 0.5 - 1m, 12% show fall in the range between 1-1.5,7% of wells show a fall in range between 1.5 - 2m, 22% show a fall in water level more than 2 m.Table showing water level comparison of bore wells duringMay 2022with respect to decadal mean is appended. (Annexure-III)

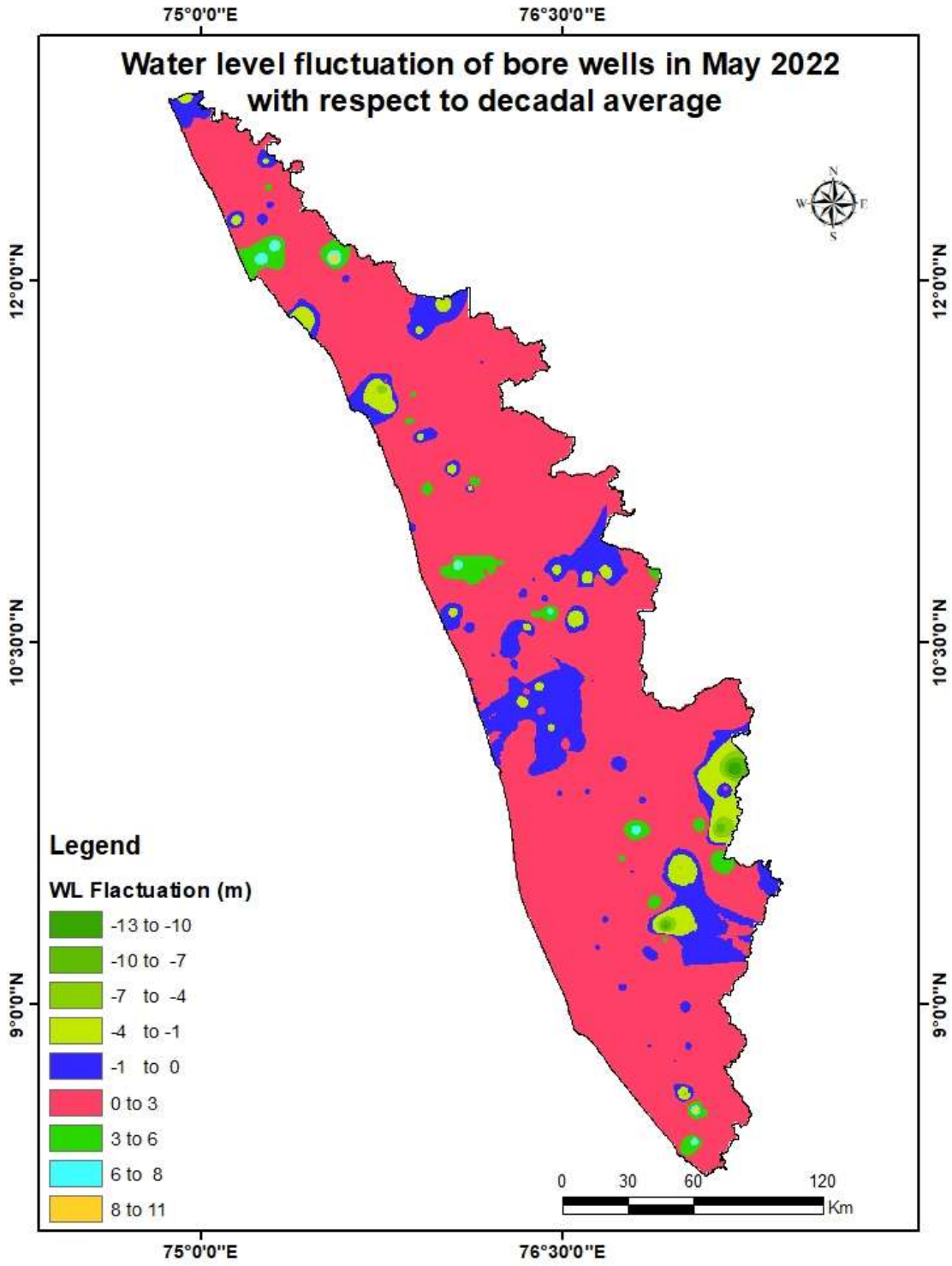


Fig:9. Comparison of water level in Bore wells during May **2022wrt Decadal mean**

Comparison of the water level in the 42observation tube wells during May 2022with that of the decadal mean reveals that 19 % of tube wells recorded a falling trend and81 % of the tube wells show marginal rise/no remarkable change in water level.Out of 19% of the tube wells shows a falling trend, 50% of the tube wells show fall in water level less than 0.5m and25% of wells show fall in the range0.5-1 m and 25 % of wells show fall in the water level more than 2m.Table showing water level comparison of tube wells during May 2022with respect to decadal mean is appended. (Annexure-III)

IV. Groundwater Draught Index

Prepareddistrict wise and well wise groundwater draught index of the state during May2022. 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 444 observation dug wells, 407 wells comes under the normal category, 25 wells comes under the mild category, 7 wells comes under the moderate category , 2 wells fall in severe category, and 3 wellsfall in extreme category. Table showing GWDI is appended as Annexure V

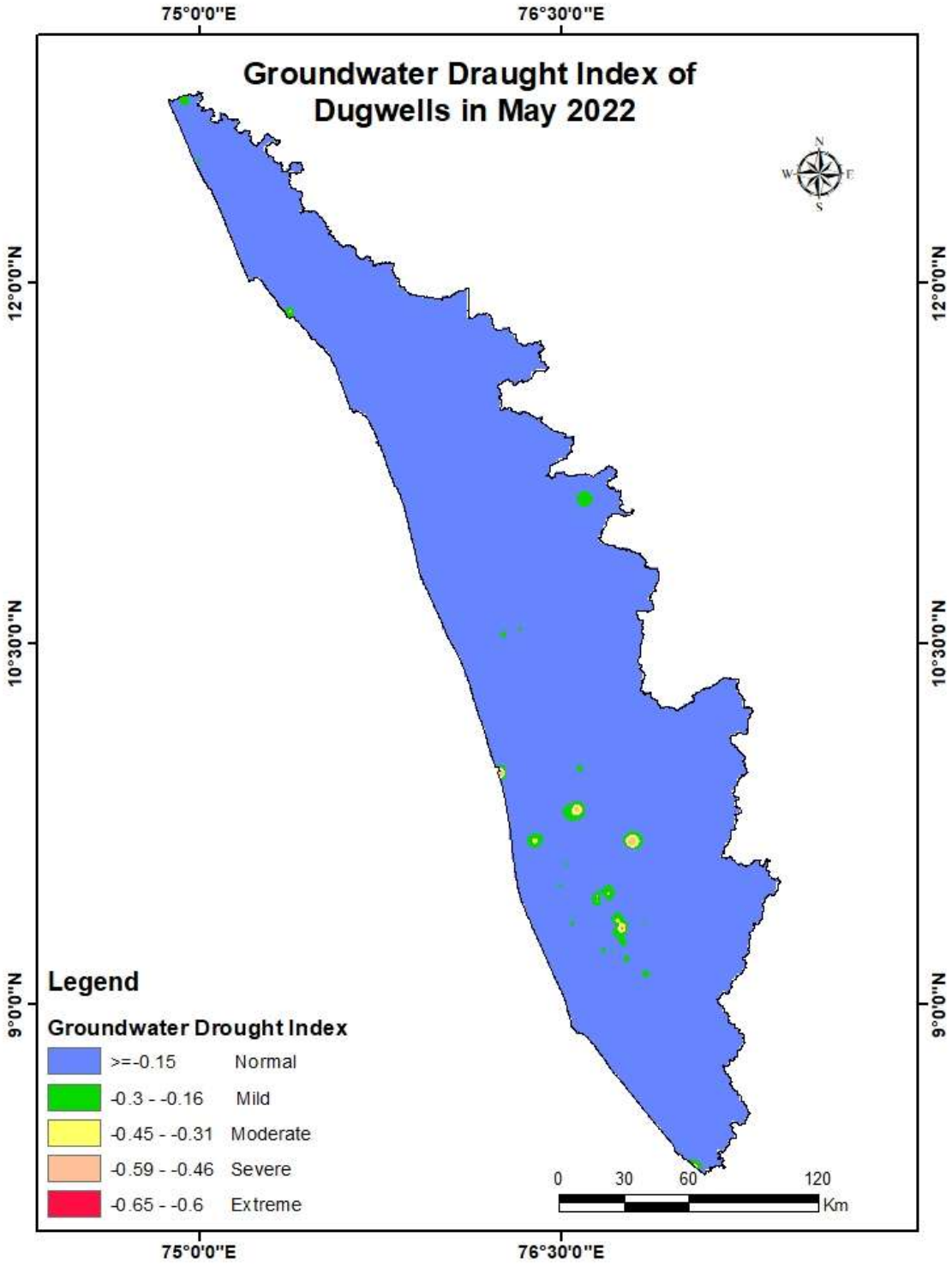


Fig-10 Groundwater drought index of dug well during May2022

Summary

Rainfall

- The premonsoonrainfall occurred in the state during 2021 (March - May) is 750.9mm, which is 108% large excess than that of the normal rainfall.

- The Actual premonsoon rainfall (March - May) occurred in the state during 2022 is 668.5 mm, which is 85% Large excess than that of the normal Rainfall (361.5mm).

Groundwater level

- The depth to groundwater level in the observation dug wells during the month of May2022 range from a minimum of -0.3mbgl to a maximum of 16.12mbgl, in bore wells -0.79 m to a maximum of 46.06mbgl and in the tubewells -0.5 to a maximum of 32.17mbgl. Details are given in Abstract I
- Comparison of groundwater level in May 2022 with respect to theprevious year reveals that 62% of observation dug wells (262 out of 420) ,43 % of bore wells (144 out of 335) and 33% of tube wells (4 out of 12) recorded a falling trend. 39% of total observation wells (410 out of 767) show falling trend. 30%of the observation wells with falling trend (122 out of 410) show decline in water level less than 0.5 m.Details are given in Abstract II.

- Comparison of the water level inMay 2022 with the, decadal mean reveals that 21 % of observation dug wells (79 out of 379), 22% of bore wells (76 out of 342) and 19% of tube wells(8 out of 42) recorded a falling trend.23%of all the observation wells(163 out of 763) show decline in water level.56% of all the observation wells (91 out of 163) 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. 68nos 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 5nos open wells show more than 2m fluctuation on

comparison of water level during the month with the decadal mean water level.. 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 91.7% of observation dug wells during May 2022 are in Normal and 5.6% Mild categories1.5% in moderate and 0.5% fall in Severe and 0.7% in Extreme categories. Details are given in annexure V.

District wise Observation well Frequency on May2022 **Annexure I**

District	Well Type	No. of WL measured	DTWL(mbgl)		Location		Depth range of wells (mts)				
			Min	Max	Min	Max	0 to 2	2 to 5	5 to 10	10 to 20	>20
Thiruvananthapuram	Dug well	29	1.29	13.62	TVM OW01, Athiyannur	TVM OW28,Kazhakkoottam.	2	10	12	5	0
	Bore well	35	-0.79	18.28	06, Nemom, Neyyattinkara	25, Parassala,Thiruvananthapuram	5	4	17	9	0
	Tube well	4	3.61	10.20	36,Chirayinkeezhu,Thiruvananthapuram	37,Chirayinkeezhu,Thiruvananthapuram	0	1	2	1	0
Kollam	Dug well	24	1.14	11.65	OW-31,Neendakara,KOLLAM	KLM OW 24,Munroethuruthu,KOLLAM	3	7	11	3	0
	Bore well	16	0.67	10.68	KLM/6,Kottarakkara Municipality,KOLLAM	KLM/10, Vilakkudy	1	1	12	2	0
	Tube well	9	2.75	32.17	KLM/25, Panmana, Chavara	KLM/29, Sasthamkotta	0	2	2	2	3
Pathanamthitta	Dug well	74	0.76	11.24	10 Seethathode,PATHANAMTHITTA	20 Civil Station,Adoor Municipality,PATHANAMTHITTA	7	35	31	1	0
	Bore well	25	0.60	23.05	PTA/02, Kalanjoor	PTA/15,Chittar,PATHANAMTHITTA	2	8	12	2	1
Alappuzha	Dug well	20	-0.07	11.52	OW-01 Kayamkulam	OW-02 Kattanam,Mavelikara,Alappuzha	8	10	1	1	0
	Bore well	2	3.68	4.17	36 Punthala,Chengannoor,Alappuzha	35 Pennukkara,Chengannoor,Alappuzha	0	2	0	0	0
	Tube well	28	-0.50	17.60	08 Thrikkunnappuzha	04 Charumoodu,Bharanikavu,Alappuzha	11	10	5	2	0
Kottayam	Dug well	18	-0.30	9.05	KTM-OW-5,Kumarakom,Kottayam	KTM-OW_6	7	8	3	0	0

	Bore well	20	-0.09	19.07	10, Veliyannur, Uzhavur	03,Kanjirappally,Kottayam	7	8	3	2	0
	Dug well	21	0.60	9.51	73, Santhanpara, Devikulam	71,Kattappana Municipality,Idukki	7	8	6	0	0
Idukki	Bore well	23	1.39	38.95	SO415,Udumbannoor,Idukki	SO428,Peermade,IDUKKI	2	6	7	4	4
	Dug well	37	0.18	9.60	E88, Chellanam	GWE-01, Kizhakkambalam	10	13	14	0	0
	Bore well	26	0.41	11.05	BW 112, uvattupuzha Municipality	BW 114,Vadavukodu-Puthankurisu	3	11	10	2	0
Ernakulam	Tube well	1	10.89	10.89	TW 01,Kochi Corporation,ERNAKULAM.	TW 01,Kochi Corporation,ERNAKULAM.	0	0	0	1	0
	Dug well	31	1.40	12.51	TSROW28,Athirappally	TSROW21, Poyya, Thrissur	6	11	10	4	0
Thrissur	Bore well	37	2.44	34.81	TSR124,Kolazhy,Thrissur	TSR122,Pazhayannur,Thrissur	0	5	15	12	5
	Dug well	24	0.90	12.13	MPM.OW.18,Kondotty,Malappuram	MPM OW23,Vengara	1	11	9	3	0
Malappuram	Bore well	25	1.56	46.06	MPM185, Nilambur	MPM174,Areekode,Malappuram	3	9	9	2	2
	Dug well	30	1.14	10.98	PKD S-2, Alathur	135, Mannarkkad	3	12	12	3	0
Palakkad	Bore well	33	1.76	22.36	160 PKD-12, Kuzhalmannam	160 PKD-2,Pattambi	1	3	10	16	3
	Dug well	32	0.55	12.03	KKDOW 014,Panangad	QKKDO63 Kozhikode(corporation)	4	16	9	3	0
Kozhikkode	Bore well	34	1.25	29.84	KKDPZ 197,Ramanattukara Municipality	KKDPZ 210 Kozhikode (corporation)	2	11	9	7	5
	Dug well	26	0.18	11.73	SOW-10,Poothadi,WAYANAD	SOW-4,Nenmeni,WAYANAD	4	6	14	2	0
Wayanad	Bore well	19	1.63	23.24	WYD216,Muttil,WAYANAD	WYD223,Thirunelly,WAYANAD	1	2	6	9	1
Kannur	Dug well	36	0.80	16.12	KNR-MOW186,Payyannur Municipality,Kannur	KNR-POW-C8,Chapparappadavu,Kannur	5	7	18	6	0

	Bore well	27	0.87	23.11	KNRPz239,Chapparappadavu,Talipa ramba,Kannur	KNRPz240,Kannur Corporation	1	1	15	8	2
	Dug well	43	2.58	15.65	KSOW-22,Parappa, Kasaragod	200,Karadka,Kasaragod	0	6	19	18	0
Kasaragod	Bore well	21	3.38	25.56	PZKGD241,Parappa,Kasaragod	PZKGD242,Karadka,Kasaragod	0	2	6	10	3

Comparison of Water level May 2022 with respect to May 2021 **Annexure II**

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	28	Rise	15	5	5	1	3	1
			Fall	13	5	3	2	0	3
	Bore well	34	Rise	24	12	4	2	2	4
			Fall	10	6	1	1	1	1
	Tube well	4	Rise	4	3	1	0	0	0
			Fall	0	0	0	0	0	0
Kollam	Dug well	21	Rise	4	3	1	0	0	0
			Fall	17	2	3	3	1	8
	Bore well	15	Rise	0	0	0	0	0	0
			Fall	15	1	2	2	3	7
	Tube well	7	Rise	4	2	1	0	0	1
			Fall	3	0	1	0	1	1
Pathanamthitta	Dug well	74	Rise	11	9	2	0	0	0
			Fall	63	13	7	11	7	25
	Bore well	25	Rise	9	5	1	1	0	2
			Fall	16	3	4	2	0	7
Kottayam	Dug well	18	Rise	10	9	1	0	0	0
			Fall	8	2	2	1	2	1

	Bore well	19	Rise	9	8	1	0	0	0
			Fall	10	3	2	0	2	3
Idukki	Dug well	20	Rise	11	4	3	2	1	1
			Fall	9	9	0	0	0	0
	Bore well	23	Rise	17	10	3	1	0	3
			Fall	6	2	0	0	0	4
Ernakulam	Dug well	37	Rise	3	2	1	0	0	0
			Fall	34	7	6	4	5	12
	Bore well	24	Rise	2	2	0	0	0	0
			Fall	22	4	6	6	2	4
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	1	0	0	0
Thrissur	Dug well	31	Rise	8	6	1	0	0	1
			Fall	23	10	7	2	0	4
	Bore well	37	Rise	6	3	1	0	1	1
			Fall	31	4	4	3	2	18
Malappuram	Dug well	24	Rise	14	9	1	1	2	1
			Fall	10	2	2	1	4	1
	Bore well	25	Rise	16	7	6	2	0	1
			Fall	9	4	0	2	2	1
Palakkad	Dug well	30	Rise	8	6	2	0	0	0
			Fall	22	6	9	3	3	1
	Bore well	33	Rise	10	5	1	0	1	3
			Fall	23	8	2	7	1	5
Kozhikkode	Dug well	32	Rise	26	4	11	4	3	4
			Fall	6	5	1	0	0	0
	Bore well	34	Rise	27	10	7	3	2	5
			Fall	7	3	2	1	0	1
Wayanad	Dug well	26	Rise	17	7	3	4	0	3
			Fall	9	6	1	2	0	0

	Bore well	19	Rise	15	12	0	1	1	1
			Fall	4	1	3	0	0	0
Kannur	Dug well	36	Rise	24	8	8	1	3	4
			Fall	12	6	4	0	0	2
	Bore well	27	Rise	22	8	5	3	1	5
			Fall	5	4	0	0	0	1
Kasaragod	Dug well	43	Rise	7	4	1	1	0	1
			Fall	36	8	6	6	2	14
	Bore well	20	Rise	3	0	0	1	0	2
			Fall	17	2	2	0	3	10

Comparison of Water level May 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	29	Rise	21	5	7	4	2	3
			Fall	8	5	0	1	1	1
	Bore well	32	Rise	26	8	10	2	2	4
			Fall	6	5	0	0	0	1
	Tube well	4	Rise	4	3	1	0	0	0
			Fall	0	0	0	0	0	0
Kollam	Dug well	24	Rise	15	11	3	0	1	0
			Fall	9	5	1	3	0	0
	Bore well	16	Rise	11	10	0	0	0	1
			Fall	5	5	0	0	0	0
	Tube	9	Rise	7	4	0	0	0	3

	well		Fall	2	2	0	0	0	0
Pathanamthitta	Dug well	14	Rise	7	3	3	1	0	0
			Fall	7	5	2	0	0	0
	Bore well	25	Rise	20	9	5	1	3	2
			Fall	5	3	1	0	0	1
Alappuzha	Dug well	15	Rise	12	4	8	0	0	0
			Fall	3	2	1	0	0	0
	Bore well	2	Rise	1	1	0	0	0	0
			Fall	1	1	0	0	0	0
	Tube well	28	Rise	23	12	6	3	1	1
			Fall	5	2	1	0	0	2
Kottayam	Dug well	18	Rise	13	0	0	6	2	5
			Fall	5	2	0	1	1	1
	Bore well	23	Rise	22	4	7	3	4	4
			Fall	1	1	0	0	0	0
Idukki	Dug well	20	Rise	20	9	5	3	3	0
			Fall	0	0	0	0	0	0
	Bore well	23	Rise	18	6	4	3	1	4
			Fall	5	0	1	0	0	4
Ernakulam	Dug well	37	Rise	27	21	3	1	1	1
			Fall	10	5	3	2	0	0
	Bore well	26	Rise	15	9	4	1	1	0
			Fall	11	7	1	2	0	1
	Tube well	1	Rise	0	0	0	0	0	0
			Fall	1	0	1	0	0	0
Thrissur	Dug well	31	Rise	22	12	7	1	1	1
			Fall	9	7	1	0	1	0
	Bore well	37	Rise	21	6	7	2	3	3
			Fall	16	5	4	2	2	3
Malappuram	Dug	24	Rise	21	2	6	7	0	6

	well		Fall	3	3	0	0	0	0
	Bore well	25	Rise	21	3	4	6	4	4
			Fall	4	2	0	0	0	2
Palakkad	Dug well	30	Rise	24	8	7	3	3	3
			Fall	6	5	0	1	0	0
	Bore well	33	Rise	27	8	4	4	2	9
			Fall	6	2	0	0	1	3
Kozhikkode	Dug well	32	Rise	31	4	8	6	6	7
			Fall	1	0	0	1	0	0
	Bore well	34	Rise	30	9	7	8	4	2
			Fall	4	0	1	0	1	2
Wayanad	Dug well	26	Rise	23	8	6	3	2	4
			Fall	3	2	1	0	0	0
	Bore well	19	Rise	16	7	7	0	2	0
			Fall	3	1	0	2	0	0
Kannur	Dug well	36	Rise	31	13	10	2	1	5
			Fall	5	4	0	0	0	1
	Bore well	27	Rise	25	6	10	2	1	6
			Fall	2	0	1	0	0	1
Kasaragod	Dug well	43	Rise	33	15	7	7	0	4
			Fall	10	7	1	0	1	1
	Bore well	20	Rise	13	4	2	4	1	2
			Fall	7	3	0	3	1	0

Annexure IV - Open wells showing more than 2m fall

Water Level Data & Fluctuation															
SNo	District	Block	GP/Municipality/Corporation	WellNo	Well Type	Latitude(°)	Longitude(°)	May-2022	May-2021	May-2020	Decadal Avg(2012-2021)		Fluctuation in May-2022 wrt.		
											WL	Yrs	May-2021	May-2020	Decadal Avg
2	Thiruvananthapuram	Nedumangad	Municipal area	TVM OW12	Dug Well	8.61278	77.01000	7.910	5.010	8.590	8.948	10	-2.900	0.680	1.038
4	KOLLAM	Anchal	Anchal	KLM OW 16	Dug Well	8.93218	76.91446	7.090	2.900		6.063	9	-4.190		-1.027
5	KOLLAM	Anchal	Aryankavu	KLM OW 17	Dug Well	8.97034	77.09732	5.970	1.540	6.110	6.014	10	-4.430	0.140	0.044
6	KOLLAM	Anchal	Karavaloor	KLM OW 19	Dug Well	8.98159	76.92441	7.360	3.860	7.150	7.479	10	-3.500	-0.210	0.119
7	KOLLAM	Anchal	Thenmala	OW-28	Dug Well	8.99367	76.99998	10.090	7.460	11.170	10.891	9	-2.630	1.080	0.801
8	KOLLAM	Ithikkara	Poothakkulam	KLM OW 22	Dug Well	8.79871	76.68104	9.180	6.660	8.360	8.467	10	-2.520	-0.820	-0.713
9	KOLLAM	Kottarakkara	Kottarakkara Municipality	OW-37	Dug Well	9.00113	76.77229	6.400	1.900	5.480	5.354	10	-4.500	-0.920	-1.046
10	KOLLAM	Kottarakkara	Veliyam	KLM OW 25	Dug Well	8.94046	76.77284	7.380	5.370	11.170	9.209	10	-2.010	3.790	1.829
11	KOLLAM	Pathanapuram	Pattazhi	KLM OW 20	Dug Well	9.07711	76.79648	7.360	2.650	5.860	6.217	10	-4.710	-1.500	-1.143
12	PATHANAMTHITTA	Elanthoor	Cherukole	48 Anganvadi cheruko	Dug Well	9.34655	76.73444	6.200	3.050	3.620	3.335	2	-3.150	-2.580	-2.865

13	PATHANAMTHITTA	Elanthoor	Mallapuzhassery	50 Mallapuzhassery	Dug Well	9.31084	76.70990	8.580	2.820	11.520	7.170	2	-5.760	2.940	-1.410
14	PATHANAMTHITTA	Elanthoor	Narangana m	34 Vetinary Hospital	Dug Well	9.31467	76.75471	5.790	2.030		2.030	2	-3.760		-3.760
15	PATHANAMTHITTA	Koipuram	Ayroor	47 Govt Ayurveda Hos	Dug Well	9.35293	76.73007	6.900	3.440	6.770	5.105	2	-3.460	-0.130	-1.795
16	PATHANAMTHITTA	Koipuram	Eraviperoor	37 UPS Eraviperoor	Dug Well	9.38391	76.63735	5.520	3.180	6.400	4.790	2	-2.340	0.880	-0.730
17	PATHANAMTHITTA	Koipuram	Koipuram	36 Block Office	Dug Well	9.36137	76.67692	6.140	3.300	8.190	5.745	2	-2.840	2.050	-0.395
18	PATHANAMTHITTA	Mallappally	Anicadu	42 CMS HS Punnaveli	Dug Well	9.47380	76.68539	5.140	2.030	5.190	3.610	2	-3.110	0.050	-1.530
19	PATHANAMTHITTA	Mallappally	Anicadu	43 Govt HSS Vaipur	Dug Well	9.45819	76.69733	5.000	1.220	4.850	3.035	2	-3.780	-0.150	-1.965
20	PATHANAMTHITTA	Mallappally	Kallooppara	41 UPS Thuruthikad	Dug Well	9.42419	76.65057	5.230	1.240	5.350	3.295	2	-3.990	0.120	-1.935
21	PATHANAMTHITTA	Mallappally	Kunnanthanam	39 LPS Pulinthanam	Dug Well	9.43685	76.62549	8.140	3.800	9.180	6.490	2	-4.340	1.040	-1.650
22	PATHANAMTHITTA	Mallappally	Kunnanthanam	PTA OW 43	Dug Well	9.43461	76.61060	8.280	5.420	9.300	9.347	10	-2.860	1.020	1.068
23	PATHANAMTHITTA	Mallappally	Mallappally	40 Civil Station	Dug Well	9.44600	76.65171	4.830	1.600	4.480	3.040	2	-3.230	-0.350	-1.790
24	PATHANAMTHITTA	Mallappally	Mallappally	44 FWC Murani	Dug Well	9.45224	76.67410	4.650	2.130	6.000	4.065	2	-2.520	1.350	-0.585
25	PATHANAMTHITTA	Mallappally	Mallappally	PTA OW 41	Dug Well	9.43164	76.67039	4.710	1.450	4.730	4.215	9	-3.260	0.020	-0.495

26	PATHANAMTHITTA	Mallappally	Mallappally	PTA OW 49	Dug Well	9.46269	76.63721	5.330	1.800	4.950	4.639	10	-3.530	-0.380	-0.691
27	PATHANAMTHITTA	Mallappally	Thiruvalla Municipality	53 LPS Chummathara	Dug Well	9.41138	76.57304	9.280	5.130	10.530	7.830	2	-4.150	1.250	-1.450
28	PATHANAMTHITTA	Mallappally	Thiruvalla Municipality	54 Civil Thiruvalla	Dug Well	9.38152	76.56963	7.720	4.150	9.500	6.825	2	-3.570	1.780	-0.895
29	PATHANAMTHITTA	Pandalam	Aranmula	60 Civil Aranmula	Dug Well	9.32641	76.68122	5.220	2.620	7.910	5.265	2	-2.600	2.690	0.045
30	PATHANAMTHITTA	Pandalam	Mezhuveli	61 Mezhuveli	Dug Well	9.26919	76.70159	7.330	3.440	10.180	6.810	2	-3.890	2.850	-0.520
31	PATHANAMTHITTA	Pandalam	Pandalam Municipality	30 UPS Pandalam	Dug Well	9.22793	76.67809	4.700	1.620	4.270	2.945	2	-3.080	-0.430	-1.755
32	PATHANAMTHITTA	Pandalam	Pandalam Municipality	PTA OW 37 A	Dug Well	9.22761	76.67923	4.680	1.630	4.600	4.083	10	-3.050	-0.080	-0.597
33	PATHANAMTHITTA	Pandalam	Thumpamon	29 LPS Thumpamon	Dug Well	9.22217	76.71422	6.750	3.080	7.570	5.325	2	-3.670	0.820	-1.425
34	PATHANAMTHITTA	Parakode	Kalanjoor	14 VHSS Kalanjoor	Dug Well	9.12342	76.85121	5.610	3.350	5.350	4.350	2	-2.260	-0.260	-1.260
35	PATHANAMTHITTA	Pulikeezhu	Kadapra	59 LPS Parumala	Dug Well	9.33173	76.54792	6.370	1.820	6.880	4.350	2	-4.550	0.510	-2.020
36	PATHANAMTHITTA	Pulikeezhu	Kuttoor	52 GHSS Kuttoor	Dug Well	9.35688	76.59051	2.850	0.580	5.830	3.205	2	-2.270	2.980	0.355
37	Kottayam	Pallom	Kottayam Municipality	KTM-OW_6	Dug Well	9.58197	76.52125	9.950	4.810	7.810	7.704	9	-5.140	-2.140	-2.246
38	ERNAKULAM	Koovappady	Perumbavoor Municipality	E95	Dug Well	10.11590	76.47304	7.950	4.890	7.335	7.354	10	-3.060	-0.615	-0.596

39	ERNAKULAM	Kothamangalam	Nellikkuzhi	GWE-14	Dug Well	10.06981	76.60320	2.260	0.090	1.805	2.389	10	-2.170	-0.455	0.129
40	ERNAKULAM	Kothamangalam	Pindimana	E97	Dug Well	10.12779	76.65895	2.350	0.160	4.250	3.932	10	-2.190	1.900	1.583
41	ERNAKULAM	Kothamangalam	Pothanikadu	E79	Dug Well	10.00662	76.68121	3.370	1.057	4.085	3.480	10	-2.313	0.715	0.110
42	ERNAKULAM	Mulamthuruthy	Amballur	GWE-09	Dug Well	9.84938	76.40713	7.420	4.840	7.890	7.465	10	-2.580	0.470	0.045
43	ERNAKULAM	Muvattupuzha	Muvattupuzha Municipality	E80	Dug Well	9.97967	76.57984	5.800	3.290	5.340	4.408	10	-2.510	-0.460	-1.393
44	ERNAKULAM	Muvattupuzha	Valakom	GWE-03	Dug Well	9.97917	76.51667	6.710	4.680	7.670	7.459	10	-2.030	0.960	0.749
45	ERNAKULAM	Pampakkuda	Elanji	GWE-21	Dug Well	9.83223	76.54427	6.580	1.370	5.390	5.548	9	-5.210	-1.190	-1.032
46	ERNAKULAM	Pampakkuda	Koothattukulam Municipality	E81	Dug Well	9.86248	76.59414	4.260	1.940	3.450	4.314	9	-2.320	-0.810	0.054
47	ERNAKULAM	Pampakkuda	Ramamangalam	E82	Dug Well	9.94268	76.48225	4.980	2.770	4.055	4.427	10	-2.210	-0.925	-0.553
48	ERNAKULAM	Vadavukodu	Kunnathunadu	GWE-16	Dug Well	10.02617	76.44948	7.330	4.210	7.310	7.453	10	-3.120	-0.020	0.123
49	ERNAKULAM	Vazhakkulam	Kizhakkambalam	GWE-01	Dug Well	10.05278	76.39778	9.600	6.695	10.120	10.084	10	-2.905	0.520	0.484
50	THRISSUR	Chowannur	Kadangode	TSROW25	Dug Well	10.70072	76.13911	7.500	4.920	7.080	7.220	10	-2.580	-0.420	-0.280
51	THRISSUR	Chowannur	Kattakampal	TSROW14	Dug Well	10.69069	76.05661	7.790	5.290	8.200	7.934	10	-2.500	0.410	0.144
52	THRISSUR	Mullassery	Elavally	TSROW24	Dug Well	10.57591	76.08686	8.930	5.410	8.920	8.609	10	-3.520	-0.010	-0.321
53	THRISSUR	Thrissur	Puzhakkal	TSROW2	Dug Well	10.53333	76.26222	5.530	0.900	1.810	3.908	10	-4.630	-3.720	-1.622

54	Palakkad	Mannarkad	Attappady	OW137	Dug Well	11.09472	76.59583	5.120	3.090	4.170	3.962	10	-2.030	-0.950	-1.158
55	Malappuram	Ernad	Areekode	MPM.OW.16	Dug Well	11.12917	76.11250	4.890	2.830	7.160	6.331	10	-2.060	2.270	1.441
56	KANNUR	Kannur	Kannur Corporation	KNR-MOW181	Dug Well	11.87747	75.37308	15.570	5.240	8.630	9.584	9	######	-6.940	-5.986
58	Kasaragod	Hosdurg	Kanhangad	194	Dug Well	12.44028	75.02639	7.240	4.850	8.020	7.480	10	-2.390	0.780	0.240
59	Kasaragod	Hosdurg	Kanhangad	195	Dug Well	12.33750	75.10555	5.590	3.540	9.760	7.328	10	-2.050	4.170	1.738
60	Kasaragod	Kasaragod	Karadka	213	Dug Well	12.56944	75.28472	8.380	6.200		8.428	9	-2.180		0.048
61	Kasaragod	Kasaragod	Kasaragod	212	Dug Well	12.54444	75.07500	8.030	2.010	9.130	8.360	10	-6.020	1.100	0.330
62	Kasaragod	Kasaragod	Kasaragod	KSOW-01	Dug Well	12.50444	74.99611	9.110	3.760	5.380	7.149	10	-5.350	-3.730	-1.961
63	Kasaragod	Manjeshwaram	Kasaragod	KSOW-2A	Dug Well	12.59528	74.94278	9.370	4.900	9.210	9.523	7	-4.470	-0.160	0.153
64	Kasaragod	Manjeshwaram	Manjeshwar	204	Dug Well	12.65083	74.92361	8.770	5.000	7.240	8.211	10	-3.770	-1.530	-0.559
65	Kasaragod	Manjeshwaram	Manjeshwar	205	Dug Well	12.67917	74.90556	11.690	7.500	10.530	12.710	10	-4.190	-1.160	1.020
66	Kasaragod	Manjeshwaram	Manjeshwar	207	Dug Well	12.64722	75.10889	10.140	6.970	10.750	10.195	10	-3.170	0.610	0.055
67	Kasaragod	Manjeshwaram	Manjeshwar	208	Dug Well	12.75139	74.93333	11.080	2.950	7.640	8.561	9	-8.130	-3.440	-2.519
68	Kasaragod	Manjeshwaram	Manjeshwar	209	Dug Well	12.73333	74.88333	8.880	5.650	9.170	8.848	10	-3.230	0.290	-0.032
69	Kasaragod	Manjeshwaram	Manjeshwar	210	Dug Well	12.69861	75.01389	11.910	3.880	9.420	11.736	10	-8.030	-2.490	-0.174
70	Kasaragod	Manjeshwaram	Manjeshwar	KSOW-04	Dug Well	12.68361	74.98389	10.400	7.840	10.320	9.968	10	-2.560	-0.080	-0.432
71	Kasaragod	Vellarikkundu	Parappa	198	Dug Well	12.31944	75.28750	4.670	0.750	4.810	4.406	10	-3.920	0.140	-0.264

Observation well frequency on May 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	445	-0.3	16.12	KTM-OW-5	KNR-POW-C8,Chapparappadavu,KANNUR	67	160	169	49	0
				Kottayam		15.09%	36.04%	38.06%	11.04%	0.00%
Bore well	343	-0.79	46.06	06, Nemam	MPM174, Areekkod	28	73	131	85	26
						8.16%	21.28%	38.19%	24.78%	7.58%
Tube well	42	-0.5	32.17	31 Ezhupunna, Alappuzha.	KLM-31, Kollam Corporation	11	13	9	6	3
						26.19%	30.95%	21.43%	14.29%	7.14%

Comparison of Water level May 2022 with respect to May 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	420	Rise	158	76	40	14	12	16
		%	38%	48%	25%	9%	8%	10%
		Fall	262	81	51	35	24	71
		%	62%	31%	19%	13%	9%	27%
Bore well	335	Rise	191	116	28	14	7	26
		%	57%	61%	15%	7%	4%	14%
		Fall	144	41	24	21	14	44
		%	43%	28%	17%	15%	10%	31%
Tube well	12	Rise	8	5	2	0	0	1
		%	67%	62%	25%	0%	0%	13%
		Fall	4	0	2	0	1	1
		%	33%	0%	50%	0%	25%	25%

Comparison of Water level May 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	379	Rise	300	115	80	44	22	39
		%	79%	38%	27%	15%	7%	13%
		Fall	79	52	10	9	4	4
		%	21%	66%	13%	11%	5%	5%
Bore well	342	Rise	266	90	71	36	28	41
		%	78%	34%	27%	14%	11%	15%
		Fall	76	35	9	9	5	18
		%	22%	46%	12%	12%	7%	24%
Tube well	42	Rise	34	19	7	3	1	4
		%	81%	56%	21%	9%	3%	12%
		Fall	8	4	2	0	0	2
		%	19%	50%	25%	0%	0%	25%