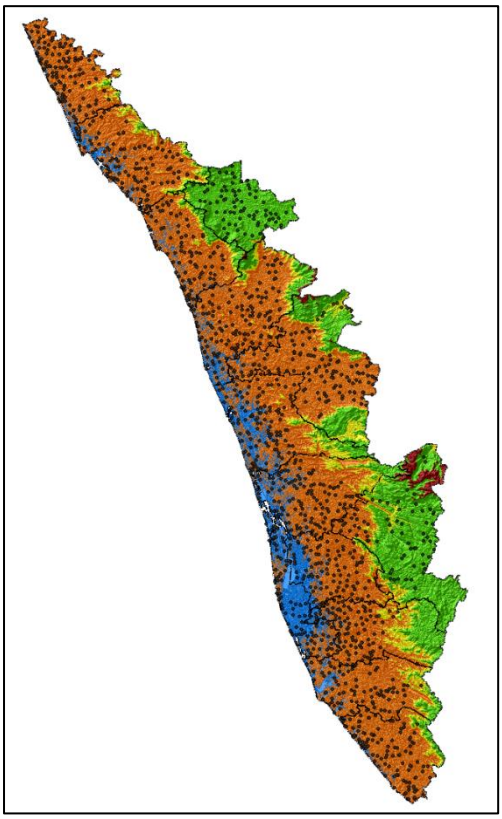
TECHNICAL REPORT SERIES

GOVERNMENT OF INDIA
MINISTRY OF JALSHAKTI
CENTRAL GROUND WATER BOARD

GROUND WATER YEAR BOOK OF KERALA (2021-2022)



KERALA REGION
THIRUVANANTHAPURAM

SEPTEMBER 2022

GROUND WATER YEAR BOOK OF KERALA (2021-2022)

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FOREWORD

Ground water is an important source of water for meeting the drinking, agricultural and industrial needs in India. Over the last few decades, the use of ground water in the country has increased manifold, exerting pressure on the limited resources available and threatening their long-term sustainability in many places. Kerala, though blessed with copious rainfall and abundant surface water resources, depends heavily on the limited ground water resources to meet its drinking and domestic water requirements, especially in the rural habitations. In the recent past, scarcity of drinking water resources during summer months is being faced by several habitations in the State with increasing regularity.

Kerala State has limited ground water development prospects owing to the largely undulating topography and predominance of crystalline rocks devoid of any primary porosity. Increasing demand of fresh water resources due to change in life styles, agricultural practices and urbanisation has resulted in increasing stress on the ground water regime in several areas of the State. Contamination of ground water resources from natural and anthropogenic sources is also emerging as a major threat to the sustainability of ground water resources in many areas. Anticipated impact of impending climate change and sea level rise also has the potential to change the ground water regime in the State. Scientific management of ground water resources of the State has become imperative to ensure prevention of further ground water depletion and contamination and to ensure its long-term sustainability.

To build a realistic ground water management strategy, assessment of ground water availability and its quality is a pre-requisite. With this in view, Central Ground water Board has established a network of Ground Water Monitoring Wells (GWMW) tapping different aquifers in the State. Presently, there are 1591 GWMW in Kerala State, out of which 1374 are dug wells tapping phreatic aquifers and 217 are bore wells /tube wells tapping deeper semi-confined/confined aquifers, which are monitored four times a year. The document "**Ground Water Year Book Kerala (2021-22)**" is a compilation of water level and water quality data collected from these wells during 2021-22. The behaviour of water level during the four monitoring periods and their fluctuations – both seasonal and long term, have been analysed and included in this report. Besides this, behaviour of piezometric heads of deeper aquifers in hard rock as wells as in sedimentary aquifers have also been discussed. The chapter on Hydrochemistry brings out the ground water quality of water samples collected from the wells tapping the phreatic aquifer.

The efforts of the Officers of CGWB, Kerala Region, Thiruvananthapuram in collecting the data and the meticulous work done by the team of officers comprising **Shri. M.Santhana Subramani,Scientist D (HG), Smt. Rakhi U R, Scientist C (HG), Smt. Sabna T, Scientist B (HM), Shri. Aneesh Kumar V, Scientist B (HG), Shri. Pankaj Patru Bakshe, Scientist B (CH) and Dr. Aneesh Kumar N, Asst Chemist** in compiling this document deserves appreciation. I hope this compilation will be of use to planners, policy makers and stakeholders in the field of ground water in Kerala.

Thiruvananthapuram
September 2022.

(T S. Anitha Shyam)
Regional Director

I INTRODUCTION

The awareness among the public about the importance of the groundwater has increased during the recent years. The need for groundwater being felt by all sectors because of the shortage of surface water sources to mitigate the growing needs of the society. Recently the problems of decline in water table, contamination of groundwater, seawater intrusion etc are being reported at many places. The change in rainfall pattern in recent years and the increased utilisation of ground water caused concern among the public that water may become scarce commodity in future. In order to assess the real situation of ground water conditions, it is very essential to monitor the groundwater level and water quality over time and space. Central Ground Water Board is monitoring water level and quality through a network of Ground Water Monitoring Wells distributed throughout the State. The monitoring started from the year 1969 for nine monitoring wells and the numbers of monitoring wells were increased during the subsequent years and became 224 by the year 1979 and the number became 460 by the year 1988. Presently the total number of Ground Water Monitoring Wells (GWMWs) through out the Kerala State is 1591. Water level is being monitored four times a year during January, April, August and November months and water quality is being monitored from the water samples collected from GWMWs during April.

Kerala State is a narrow stretch of land covering 38863 sq.km area bordering the Lakshadweep Sea on the western side and Tamil Nadu and Karnataka States on the eastern side. The length of the State from north to south is 560 km and the average width is 70 km. with a maximum of 125 km. It lies between North latitudes $08^0$18’ and $12^0$48’ and East longitudes $74^0$52’ and $77^0$22’.

The total number of GWMWs as on 31.3.2022 is 1591. Out of these, 1374 are dug wells tapping phreatic aquifers and 217 are borewells /tubewells tapping deeper aquifers of confined / semi-confined nature. These GWMWs are spread over all the physiographic divisions of the State. About 62% of the GWMWs fall in the midland region, 18% in coastal plains, 15% in highlands and 5% in Plateau region. Among the GWMWs tapping phreatic aquifer, 65% are tapping laterite, 17% tapping weathered and fractured crystallines, 15% tapping coastal alluvium and 3% tapping riverine alluvium. The data of

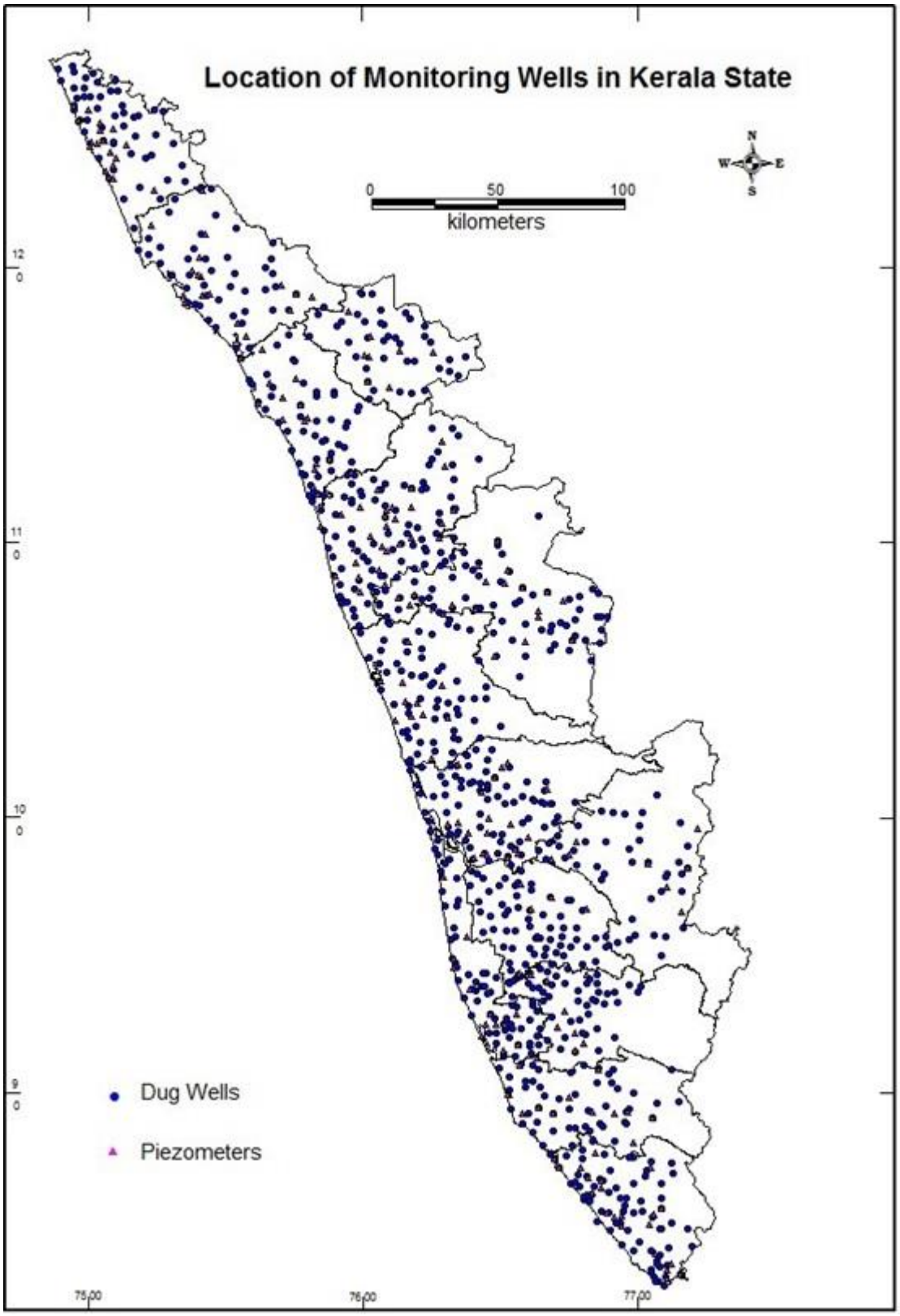
these GWMWs were analysed to understand the depth to water level scenario in the State, annual fluctuation in the water levels due to the monsoon recharge, long term trend in water levels and the nature of the quality of ground water and the salient features are brought out in this report. Maps of depth to water level, water level fluctuation with respect to April and decadal mean are prepared using the data of GWMWs tapping phreatic aquifer. Some hydrographs representing phreatic, semi-confined and confined aquifers in sedimentary and hard rock aquifers are also incorporated in this report.

The district wise break-up of GWMWs is given in the Table 1.1 and locations are shown in Figure 1.1. The water level data collected during the year 2021-2022 of GWMWs (dug wells) are given in Annexure-I. The hydro-chemical data of water samples collected during April 2021 are given in Annexure- II.

Table 1.1: District wise breakup of Ground Water Monitoring Wells in Kerala State as on 31-03-2022

Sl No.	Name of district	No. of GWMW as on 31-03-2022			Density km^2/ GWMW
		Dug Wells	Piezometers	Total	
1.	Thiruvananthapuram	109	18	127	17.26
2.	Kollam	109	14	123	20.19
3.	Pathanamthitta	81	12	93	28.41
4.	Alappuzha	78	15	93	15.22
5.	Kottayam	96	5	101	21.86
6.	Idukki	67	7	74	58.89
7.	Ernakulam	121	15	136	22.52
8.	Thrissur	112	15	127	23.87
9.	Palakkad	118	39	157	28.55
10.	Malappuram	121	18	139	24.10
11.	Kozhikode	81	15	96	24.43
12.	Wayanad	75	7	82	26.00
13.	Kannur	100	15	115	25.75
14.	Kasaragod	106	22	128	15.56
	Total	**1374**	**217**	**1591**	**24.43**

Fig No 1.1: Locations of Ground water monitoring wells in of Kerala state



II HYDROGEOLOGY

The occurrence and movement of ground water is mainly controlled by factors like physiography, geological setting, etc and are described in the following paragraphs.

Physiography

Physiographically the State is divided into three major units viz. the coastal plains, the midlands and the hill ranges. The coastal plains have an elevation of less than 7.6m whereas the elevation of the midland ranges from 7.6 to 76 m and that of the hill ranges is more than 76 m above mean sea level (amsl). Along the hill ranges two distinct plateau regions are seen, the important being the Wayanad plateau, which covers major part of Wayanad district, the general elevation of which is above 700 m amsl. The other plateau is the Munnar plateau in Idukki district, the elevation of which is about 1000 m amsl.

Geology

Geologically 88% of the State is underlain by crystalline rocks of Archaean age, which is a part of the peninsular shield. The crystalline complex of Kerala is composed of charnockites, gneisses, schists, migmatites and rocks of the Wayanad supracrustals. Along the western portion of the State the crystalline rocks are overlain by the sedimentary formations of Tertiary age and Recent alluvial formations. The Tertiary sequence of formations have been divided into four beds viz. Alleppey, Vaikom, Quilon and Warkalli, the age of which ranges from Eocene to Lower Miocene. Laterites of Sub-recent age derived from the crystallines as well as sedimentary formations are seen all along the midlands. Along the coastal plains, sedimentaries and laterites are overlain by alluvium of Recent age. The geological succession in Kerala is given in Table 2.1.

Table 2.1: Geological Succession of Kerala

AGE	FORMATION	LITHOLOGY
Recent	Alluvium	Sand, clay, riverine alluvium etc. and flood plain deposits of Kuttanad area
Sub-recent	Laterite	Derived from crystalline and sedimentary rocks
Tertiary	Warkalli	Sand stone, clays with lignite seams

	Quilon	Limestone, marl and clay
	Vaikom	Sandstone with pebbles and gravel beds, clay and lignite
	Alleppey	Carbonaceous clay and fine sand
Undated	Intrusives	Dolerite, Gabbro, Granites, Quartzo-feldspathic Veins
Archaean	Wayanad group	Granitic gneiss and Schists
	Charnockites	Charnockites and associated rocks
	Khondalites	Khondalites suite of rocks and its associates

Occurrence of Groundwater

Ground water occurs under phreatic, semi-confined and confined conditions in the above formations. The weathered crystallines, laterites and alluvial formations form the major phreatic aquifers, whereas the deep fractures in the crystallines and the granular zones in the Tertiary sedimentary formations form the semi-confined and confined aquifers.

Thick zones of weathered crystallines are seen along midland region. The depth to water level in the weathered crystallines in the midland area ranges from 3 to 16 mbgl. The midland area sustains medium capacity dug wells for irrigation. Along the hill ranges, the crystalline rocks are covered by thin weathered zone. Mostly dug wells that can cater to domestic needs are feasible along topographic lows. Bore wells tapping deeper fracture aquifer are feasible along potential fractures in the midland and hill ranges. Potential fractures are seen down to 240 mbgl and the most productive zone lies between 60 and 175 mbgl and the discharge of bore wells range between 36,000 and 1,25,000 lph.

Of the four Tertiary beds, the two beds viz. the Vaikom and Warkalli form potential aquifers. The oldest Alleppey beds contain brackish water as inferred from electrical logs, whereas the Quilon beds are poor aquifers. The Vaikom aquifer is seen all along the coast between Quilon and Ponnani and the piezometric surface ranges from 1 to 18 m above msl. The aquifer is extensively developed between Quilon and Kayamkulam. The aquifer contains fresh water south of Karuvatta in Alleppey district and also in isolated pockets in Ernakulam district. The annual flow in the aquifer is computed as 43 MCM, of which 10 MCM is brackish. The Warkalli aquifer is seen south of Cochin. The piezometric head in the aquifer varies from 2.6 m above msl to 10 m below msl. The aquifer is largely

developed in and around Alleppey. The annual flow in the aquifers is computed as 63 MCM and the draft is around 22 MCM.

Laterites are the most widely distributed lithological unit in the State and the thickness of the formation varies from a few meters to about 30m. The depth to water level in the formation ranges from less than a meter to 25 mbgl. Laterite forms potential aquifers along valleys and can sustain medium duty irrigation wells with the yields in the range of 0.5 - 6 m^3 per day.

The alluvium forms potential aquifer along the coastal plains and ground water occurs under phreatic and semi-confined conditions in this aquifer. The thickness of this formation varies from few meters to above 100 m and the depth to water level ranges from less than a meter to 6 mbgl. Filter point wells are feasible wherever the saturated thickness exceeds 5 m.

III HYDROMETEOROLOGY

Introduction

Rainfall is the major source of ground water recharge and the rainfall pattern plays an important role on the water levels in the phreatic aquifers and in the deeper aquifers. The rainfall data received from India Meteorological Department, Trivandrum for the period from 1st April 2021 to 31st March 2022 is analysed and discussed in this report.

Annual Rainfall Distribution during 2021-2022

The state received an average rainfall of 3505 mm during the period 1st April 2021 to 31st March 2022. The district wise rainfall varied from 2391 mm in Palakkad district to 4756 mm in Pathanamthitta district. During the Southwest monsoon season, Thiruvananthapuram district received the lowest rainfall of 746 mm and Kasaragod district received the highest rainfall of 2399 mm with state average of 1729 mm. During the Northeast monsoon season, Wayanad district recorded the lowest rainfall of 570 mm and Pathanamthitta district recorded the highest rainfall of 1695 mm with state average of 1026 mm.

Monthly Rainfall Distribution during 2021-2022

The monthly rainfall data for all the fourteen districts are given in Table 3.1. The state received large excess (60% & above normal) rainfall during the months of May (157% above normal), October (93% above normal) and November (163% above normal), deficient rainfall (-20 to -59% departure) in June (-37%) and July (-21%) and received normal rainfall in remaining months in 2021-2022. There is a significant decrease in rainfall during the month of June in recent years.

Comparison of Actual Rainfall with Normal Rainfall

The actual rainfall during different seasons has been compared with the normal rainfall of the seasons to find out the variation of the rainfall and is discussed in detail in the following paragraphs.

Summer period (Pre-Monsoon)

The seasonal rainfall and their percentage departure from normal rainfall are given in Table 3.2. During the months April-May 2021, the departure percentage of pre-monsoon rainfall from normal varied from 74% in Kasaragode district to 181% in Pathanamthitta district

with an average state departure percentage of 113%. As per the IMD norms, all the districts of the state received large excess rainfall (60% & above normal) with departure percentage of more than 100% in Alappuzha, Kannur, Ernakulam, Kollam, Kottayam, Pathanamthitta & Thiruvananthapuram districts. The details are presented in Figure 3.1(a) and table. 3.2.

Southwest Monsoon period

Southwest monsoon was normal during the year 2021. During the southwest monsoon season from June to September 2021, the departure percentage of rainfall from normal varied from -32% in Wayanad district to 4% in Pathanamthitta district with state average of -16%. Five districts of the state received deficient rainfall and remaining 9 districts of the state received normall rainfall during the period as per IMD Classification. The details are given in Figure 3.1(b) and table.3.2.

Northeast Monsoon period

During the Northeast monsoon season from October to December 2021, the state received large excess rainfall (1026 mm, 109% above normal). Departure percentage from normal varied from 58% in Alappuzha district to 181% in Pathanamthitta district. Thirteen districts of the state received large excess rainfall (60% & above normal) and the remaining one district Alappuzha received excess rainfall (+20% to 59% above normal) during the period. The details are presented in Figure 3.1(c) and table.3.2.

Winter period

During the months of January to February 2022, the state received deficient rainfall (14.9 mm, 33% below normal). The departure percentage of rainfall varied from -100 % (No rain) to 54 % (Excess rainfall) in Thiruvananthapuram district. The details are presented in Figure 3.1(d) and table.3.2.

Seasonal Rainfall Contribution to the total Rainfall of the year 2021-22

The seasonal rainfall contributions to the total rainfall in percentages are given in Table 3.3 and shown in Figure 3.2. The rainfall during April to May contributes 20%, Southwest monsoon season from June to September 49%, Northeast monsoon season from October to December 29 % and January to March months 2 % to the annual rainfall of the Water Year 2021-22 from 1st April 2021 to 31st March 2022.

Comparison of 2021-22 Rainfall with previous year Rainfall

The rainfall in various seasons of 2021-22 has been compared with the previous year rainfall (2020-21) for the assessment of the change in the ground water regime. The state

received an annual rainfall of 3505 mm during the year 2021-22 which is 12% more than the rainfall received during the year 2020-21. The departure percentage from previous year varied from -12% in Kasaragode district to 41% in Kollam district. Eleven districts of the state received more rainfall than previous year and Kasaragode, Kozhikode & Ernakulam districts showed negative departure from previous year. Season wise details are given in the following paragraphs.

Summer (Pre-Monsoon) season

The rainfall of April and May 2021 has been compared with the summer rainfall of 2020 and the departure is given in Table 3.4 and Figure 3.3. State received 99% more rainfall during April to May 2021 compared to 2020. The percentage of departure varied from 59% in Thiruvananthapuram district to 259% in Kasaragode district. All the districts of the state received more rainfall compared to 2020.

Southwest Monsoon season

The rainfall during June to September in 2021 has been compared with that in 2020 and the departure is given in Table 3.4 and Figure 3.3. State received 23% less rainfall during southwest monsoon 2021 compared to 2020. The departure percentage varied from -38% in Ernakulam district to -7% in Kottayam district. All districts recorded less rainfall in comparison with the previous year.

Northeast Monsoon season

The rainfall during October to December 2021 has been compared with that of 2020 and the departure is given in Table 3.4 and Figure 3.3. The state received 175% more rainfall during Northeast monsoon 2021 compared to 2020. All the districts of the state received more rainfall in comparison with previous year. The departure percentage varied from 109% in Kasaragode district to 306% in Malappuram district.

Winter season

The rainfall during January to February of 2022 has been compared with the rainfall of January to Febrauary 2021 and the departure is given in Table 3.4 and Figure 3.3. The state received 86% less rainfall during January to Febrauary 2022 in comparison with previous year. All the districts of the state received less rainfall compared to previous year. The departure percentage varied from -100% in Malappuram district to -40% in Thiruvananthapuram district.

Extreme Weather Events in Kerala during 2021

The state experienced heavy to very rainfall and strong winds under the influence of Extremely Severe Cyclonic Storm "TAUKTAE" (14th to 19th May 2021) which formed in the pre-monsoon season over the Arabian Sea, crossed Saurashtra coast on 17th May 2021. The state received Large Excess rainfall (157% above normal) during May 2021 due to above Cyclonic Storm. The state received large excess rainfall in post monsoon months October and November 2021 due to to very heavy to extremely rainfall events from 11th to 19th October and 10th to 15th November 2021. Which shows that apart from Southwest monsoon months state received good rainfall in pre and post monsoon months in 2021.
The onset of La Niña conditions also contributed to excess Post Monsoon Rainfall in 2021 in the region. The state experienced very heavy to extremely heavy rainfall events over the past four years in short durations compared to earlier years, which in turn caused flash floods and landslides in the region. Above changes in rainfall pattern can be attributed as the impact of climate change in the state and increase in sea surface temperature in Indian Ocean.

Drought Analysis and Standardized Precipitation Index

Standardized Precipitation Index (SPI) based on Precipitation is used for measuring drought. This index is negative for drought and positive for wet conditions. Wet conditions were observed in all the districts of the state with positive Annual SPI values in 2021 as per SPI data from IMD. Extremely wet/severely wet conditions were observed over Kottayam, Pattanamittia, Kollam and Thiruvananthapuram districts of the state. So, no drought conditions were observed in the state during the year 2021.

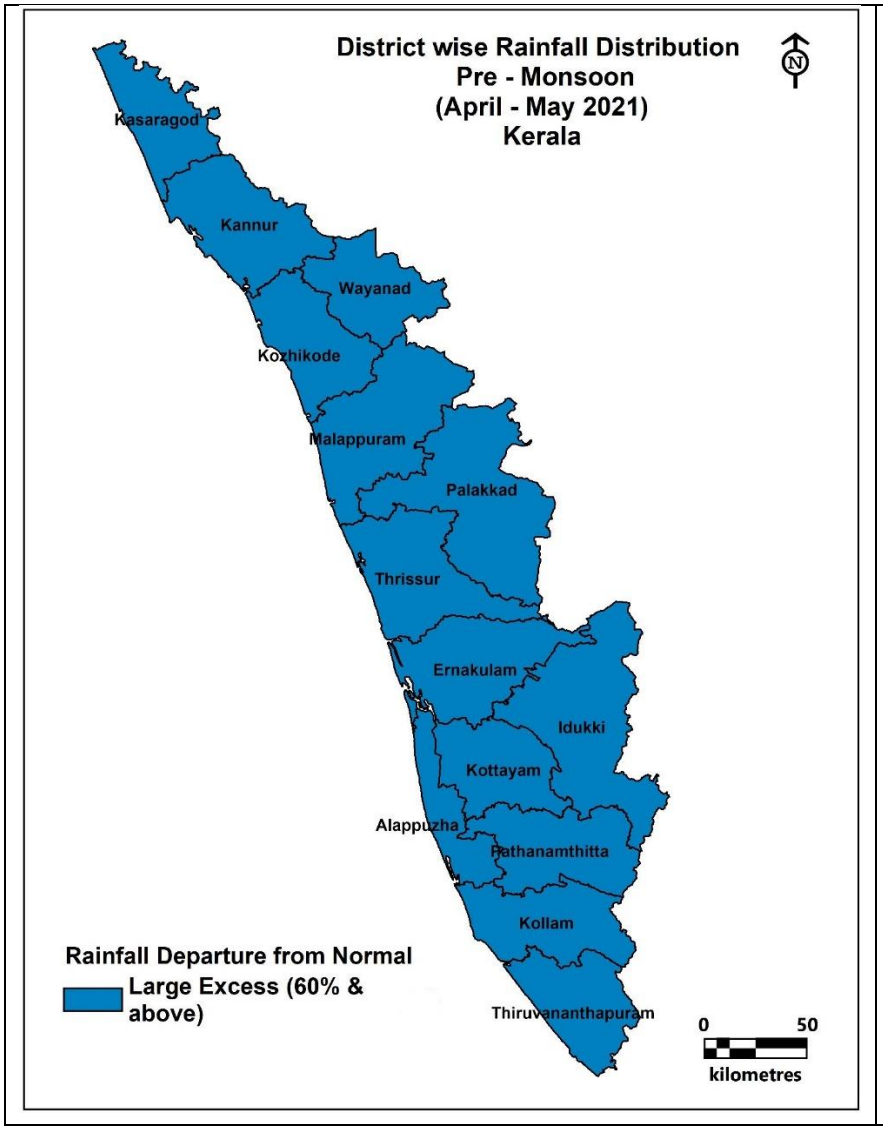


Fig 3.1(a)

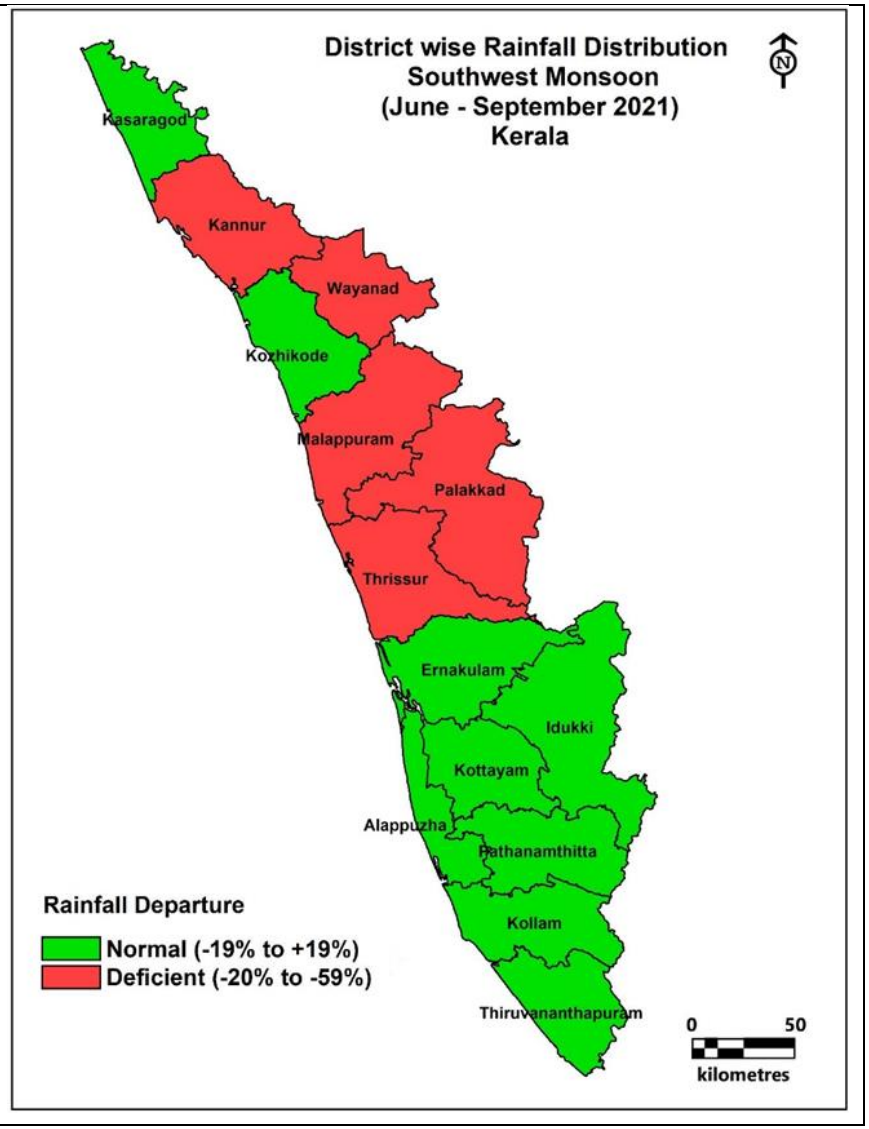


Fig 3.1(b)

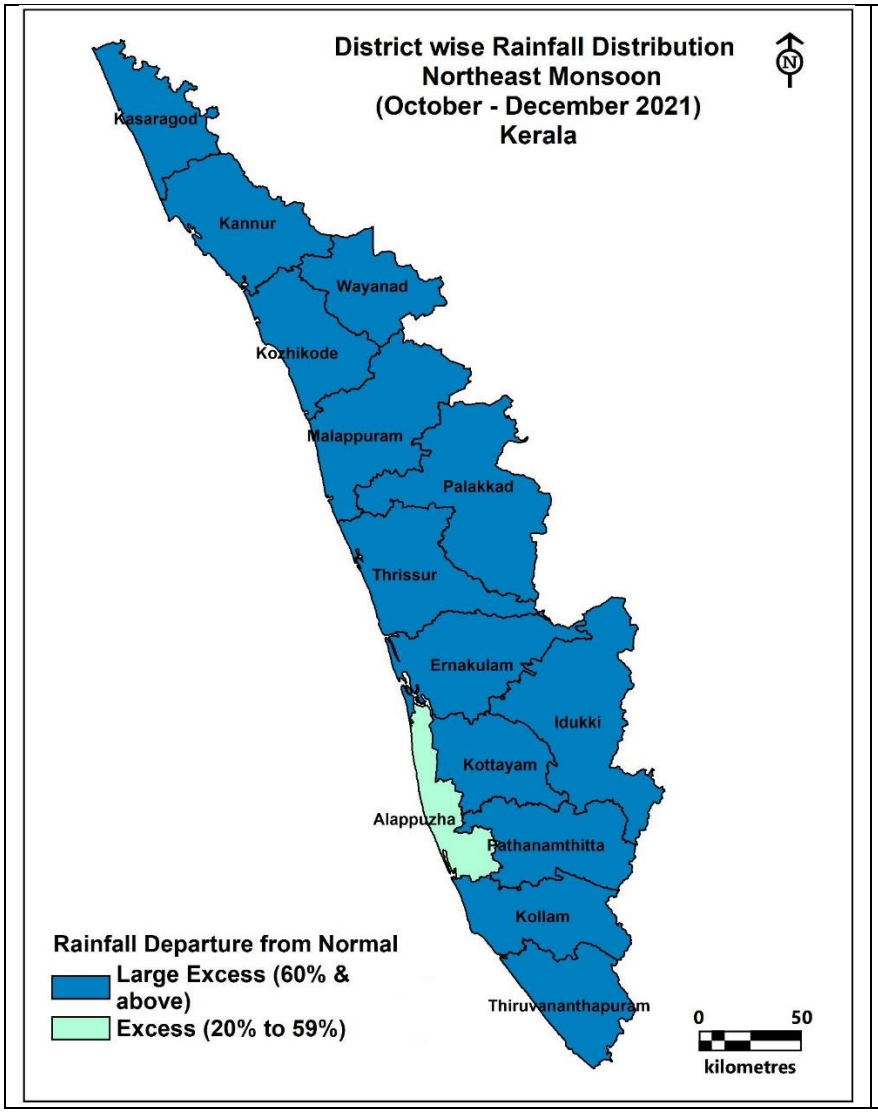


Fig 3.1(c)

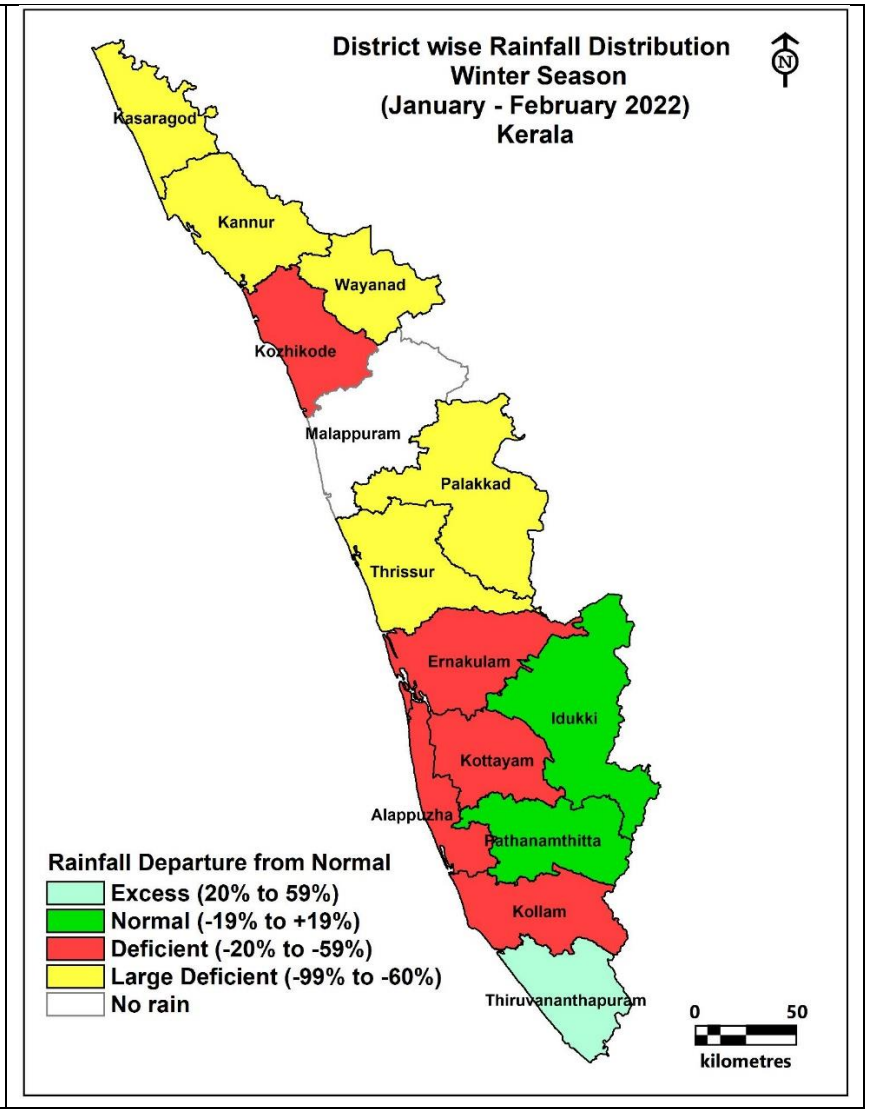


Fig 3.1(d)

Table 3.1: Monthly Rainfall Distribution during 2021-22

(Rainfall in mm)

Sl No	District	2021									2022			Total
		April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
1	Allapuzha	109	732.7	315.1	423.3	410.4	346.2	447.2	460.5	22.1	3.4	23.8	66.8	3360.5
2	Kannur	114.9	514.6	502.9	653.7	530.9	383.1	546.2	297.7	14.6	0	0.1	11.3	3570
3	Ernakulam	115.4	684.7	455.7	674.3	472.1	301.8	585.4	386	28.1	5.1	16	79.6	3804.2
4	Idukki	157.7	551.8	555.8	759.8	465.2	327.7	710.5	476.8	68.7	8	18.3	57.5	4157.8
5	Kasaragod	80.6	368.8	600	817.6	592.2	388.8	487.9	313.6	23.5	0	1	52.1	3726.1
6	Kollam	113.7	718.2	261	255	302.4	332	644.7	595.8	84.6	11.1	13	49.2	3380.7
7	Kottayam	187.2	780.1	543.9	648.5	549.8	423.8	599.3	535.1	81.2	2	15.2	66.3	4432.4
8	Kozhicode	46.2	589.8	527.9	820.6	537.4	402.6	625.4	373.7	33.8	2.5	1.2	32.9	3994
9	Malappuram	136.1	420.4	386.1	487.6	393.7	282.6	556	246.5	14.5	0	0	28.5	2952
10	Palakkad	89.7	302.2	227	401.8	268.3	234.5	575.2	205.2	51.5	0.2	0	35.6	2391.2
11	Pathanamthitta	329.9	877.2	397.4	532.8	430	324.2	866.9	752.5	76	6.7	40.7	121.7	4756
12	Thiruvananthapuram	90.3	804.8	140.8	212.8	172.6	219.5	499.8	467.8	31.8	0.7	56.4	22.4	2719.7
13	Thrissur	84.3	596.7	406.8	674.1	423.2	288.5	559.6	364.1	24.8	0.1	0	5.3	3427.5
14	Waynad	115.7	330.4	399.3	692.6	354.2	279.4	351.8	202.9	15.1	0.1	0	60.4	2801.9
	State Total	**127.6**	**569.5**	**408.3**	**577.4**	**416.3**	**317.2**	**589.5**	**394.5**	**42.3**	**3**	**12**	**47.5**	**3505.1**

Table 3.2: Seasonal Rainfall, Normal Rainfall and the percentage Departure in 2021-2022 in Kerala State (Rainfall in mm)

Sl No.	District	Pre – monsoon			S.W. Monsoon Season			N.E. Monsoon Season			Winter season		
		2021			2021			2021			2022		
		April to May	Normal	% Dep	June to September	Normal	% Dep	October to December	Normal	% Dep	January to February	Normal	% Dep
1	Allapuzha	841.7	404.9	108%	1495.0	1722.3	-13%	929.8	587.9	58%	27.2	44.7	-39%
2	Kannur	629.5	268.4	135%	2070.6	2638.1	-22%	858.5	375.6	129%	0.1	4	-98%
3	Ernakulam	800.1	368.1	117%	1903.9	2038.0	-7%	999.5	519.9	92%	21.1	27.2	-22%
4	Idukki	709.5	383.8	85%	2108.5	2615.0	-19%	1256	567.7	121%	26.3	29	-9%
5	Kasaragod	449.4	258.9	74%	2398.6	2971.4	-19%	825	344.4	140%	1	2.7	-63%
6	Kollam	831.9	393.4	111%	1150.4	1280.9	-10%	1325.1	630.8	110%	24.1	45	-46%
7	Kottayam	967.3	388.0	149%	2166.0	1871.9	16%	1215.6	535.1	127%	17.2	35.2	-51%
8	Kozhikode	636.0	329.7	93%	2288.5	2577.4	-11%	1032.9	450.1	129%	3.7	6.4	-42%
9	Malappuram	556.5	292.3	90%	1550.0	2005.5	-23%	817	478.9	71%	0	7.4	-100%
10	Palakkad	391.9	219.1	79%	1131.6	1531.6	-26%	831.9	403.3	106%	0.2	9.3	-98%
11	Pathanamthitta	1207.1	430.3	181%	1684.4	1618.7	4%	1695.4	603.2	181%	47.4	57.5	-18%
12	Trivandrum	895.1	323.8	176%	745.7	865.1	-14%	999.4	550.8	81%	57.1	37.1	54%
13	Thrissur	681.0	351.0	94%	1792.6	2280.8	-21%	948.5	514.3	84%	0.1	14.6	-99%
14	Waynad	446.1	255.3	75%	1725.5	2525.5	-32%	569.8	335.9	70%	0.1	13.2	-99%
	State Total	**717.4**	**333.4**	**115%**	**1729.4**	**2038.7**	**-15%**	**1026.3**	**491.6**	**109%**	**16.1**	**23.8**	**-32%**

IMD Classification

Large Excess: +60% and above, Excess: +20% to +59%, Normal: +19% to -19%, Deficient: -20% to -59%, Large Deficient: -60% or less, No rain: -100%

Table 3.3: Seasonal Rainfall Distribution and their Percentage Contribution to Annual Rainfall (2021-22)

District	April & May		June to September		October to December		January to March		Annual Rainfall (2021-22)			
	2021		2021		2021		2022					
	Rainfall	*%	Rainfall	*%	Rainfall	*%	Rainfall	*%	Actual	Normal	Dep (%)	Classification
Allapuzha	841.7	25%	1495.0	44%	929.8	28%	94	3%	3360.5	2806.6	20%	Excess
Ernakulam	629.5	18%	2070.6	58%	858.5	24%	11.4	0%	3570	3299.6	8%	Normal
Idukki	800.1	21%	1903.9	50%	999.5	26%	100.7	3%	3804.2	2985.7	27%	Excess
Kannur	709.5	17%	2108.5	51%	1256	30%	83.8	2%	4157.8	3638.1	14%	Normal
Kasaragod	449.4	12%	2398.6	64%	825	22%	53.1	1%	3726.1	3591.8	4%	Normal
Kollam	831.9	25%	1150.4	34%	1325.1	39%	73.3	2%	3380.7	2411.9	40%	Excess
Kottayam	967.3	22%	2166.0	49%	1215.6	27%	83.5	2%	4432.4	2875.4	54%	Excess
KozhiKode	636.0	16%	2288.5	57%	1032.9	26%	36.6	1%	3994	3383.5	18%	Normal
Malappuram	556.5	19%	1550.0	53%	817	28%	28.5	1%	2952	2805.1	5%	Normal
Palakkad	391.9	16%	1131.6	47%	831.9	35%	35.8	1%	2391.2	2188.2	9%	Normal
Pathanamthitta	1207.1	25%	1684.4	35%	1695.4	36%	169.1	4%	4756	2774.7	71%	Large Excess
Trivandrum	895.1	33%	745.7	27%	999.4	37%	79.5	3%	2719.7	1816.9	50%	Excess
Trichur	681.0	20%	1792.6	52%	948.5	28%	5.4	0%	3427.5	3180.7	8%	Normal
Waynad	446.1	16%	1725.5	62%	569.8	20%	60.5	2%	2801.9	3149.9	-11%	Normal
State	**717.4**	**20%**	**1729.4**	**49%**	**1021.7**	**29%**	**62.5**	**2%**	**3505.1**	**2922.0**	**20%**	**Excess**

***%: Percentage contribution to Annual Rainfall**

IMD Classification

Large Excess: +60% and above, Excess: +20% to +59%, Normal: +19% to -19%, Deficient: -20% to -59%, Large Deficient : -60% or less, No rain : -100%

Table 3.4: Comparison of 2021-22 Seasonal Rainfall with the Previous Year Seasonal Rainfall of 2020-2021

District	Pre-Monsoon Season (April to May)			Southwest Monsoon (June to September)			Northeast Monsoon (October to December)			Winter season (January to February)			Annual Rainfall (mm)		
	2020 (mm)	2021 (mm)	% Dep	2020 (mm)	2021 (mm)	% Dep	2020 (mm)	2021 (mm)	% Dep	2020 (mm)	2021 (mm)	% Dep	2020-2021	2021-2022	% Dep
Allapuzha	468	842	80%	1856	1495	-19%	416	930	123%	99.9	27.2	-73%	2890	3361	16%
Ernakulam	211	630	199%	3366	2071	-38%	345	859	149%	79.8	0.1	-100%	4005	3570	-11%
Idukki	378	800	112%	2256	1904	-16%	433	1000	131%	149.5	21.1	-86%	3270	3804	16%
Kannur	387	710	83%	2470	2109	-15%	508	1256	147%	129.2	26.3	-80%	3556	4158	17%
Kasaragod	125	449	259%	3606	2399	-33%	394	825	109%	114	1	-99%	4240	3726	-12%
Kollam	437	832	90%	1352	1150	-15%	434	1325	205%	97	24.1	-75%	2397	3381	41%
Kottayam	568	967	70%	2330	2166	-7%	454	1216	168%	155.9	17.2	-89%	3588	4432	24%
Kozhicode	338	636	88%	3440	2289	-33%	379	1033	173%	170.5	3.7	-98%	4329	3994	-8%
Malappuram	232	557	140%	1987	1550	-22%	201	817	306%	95.2	0	-100%	2526	2952	17%
Palakkad	153	392	156%	1706	1132	-34%	220	832	278%	39.7	0.2	-99%	2142	2391	12%
Pathanamthitta	683	1207	77%	1836	1684	-8%	533	1695	218%	270.8	47.4	-82%	3492	4756	36%
Trivandrum	561	895	59%	1154	746	-35%	347	999	188%	95.7	57.1	-40%	2188	2720	24%
Thrissur	230	681	196%	2000	1793	-10%	295	949	221%	67.3	0.1	-100%	2629	3428	30%
Waynad	270	446	65%	2082	1726	-17%	240	570	137%	85.1	0.1	-100%	2698	2802	4%
State Total	**360**	**717**	**99%**	**2246**	**1729**	**-23%**	**371**	**1022**	**175%**	**117.8**	**16.1**	**-86%**	**3139**	**3505**	**12%**

Fig. 3.2 Seasonal rainfall contribution to annual rainfall in percentage (2021-2022)

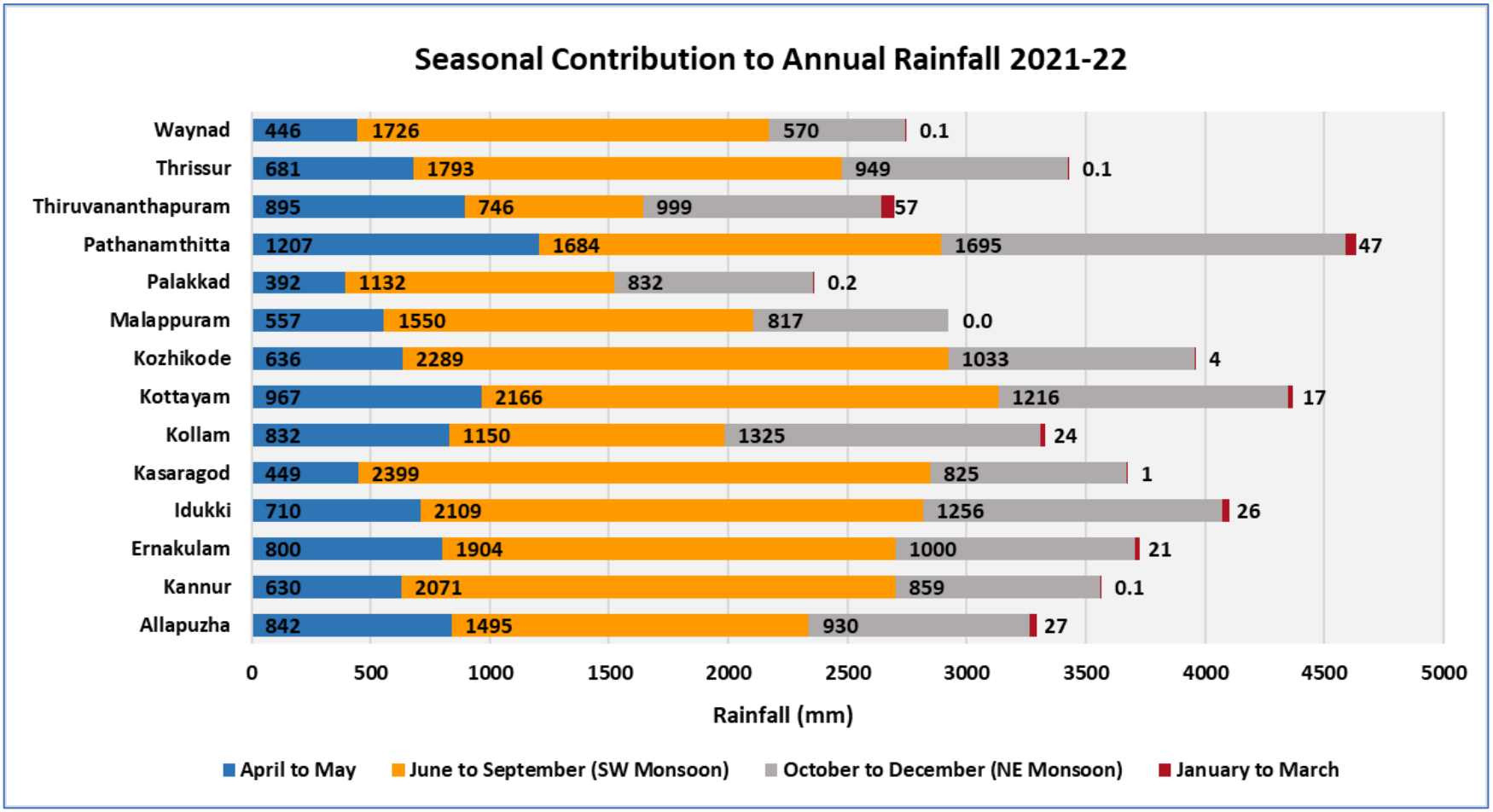
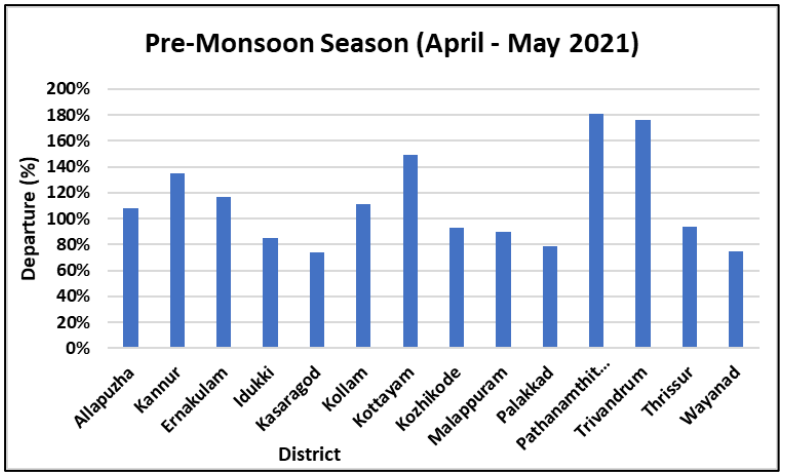
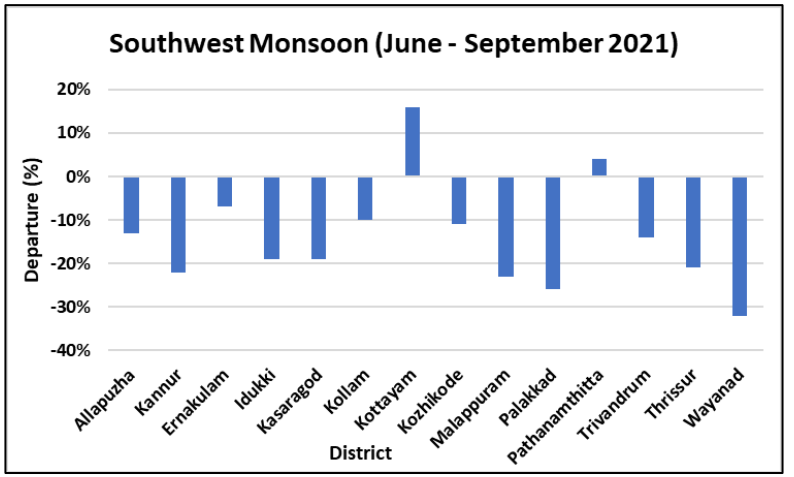
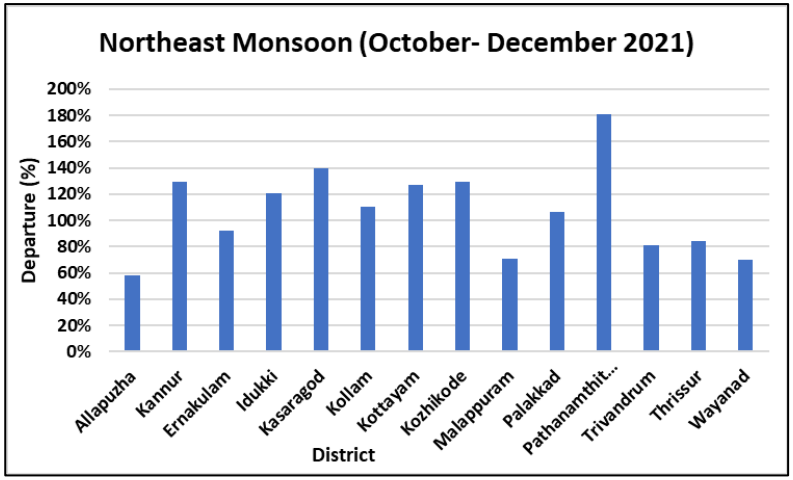


Fig.3.3 Seasonal rainfall Departure from its Normal during the period 2021-2022







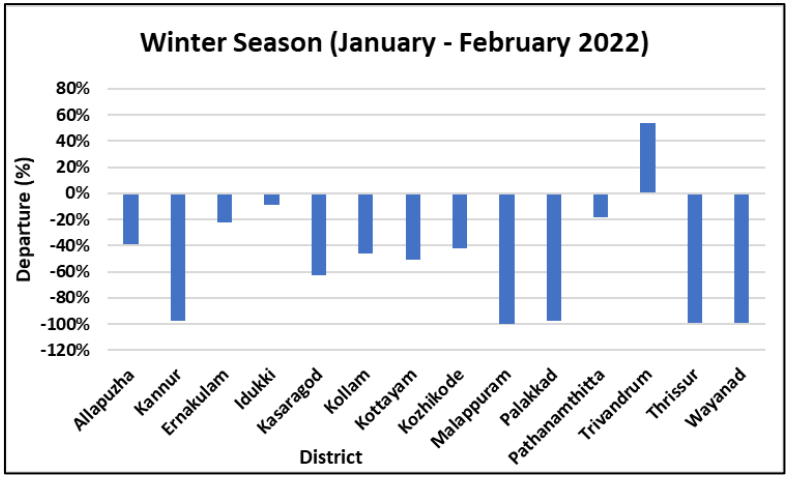
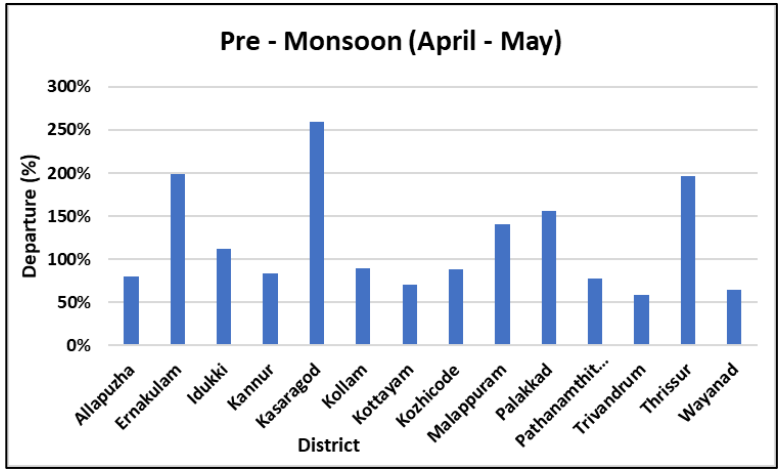
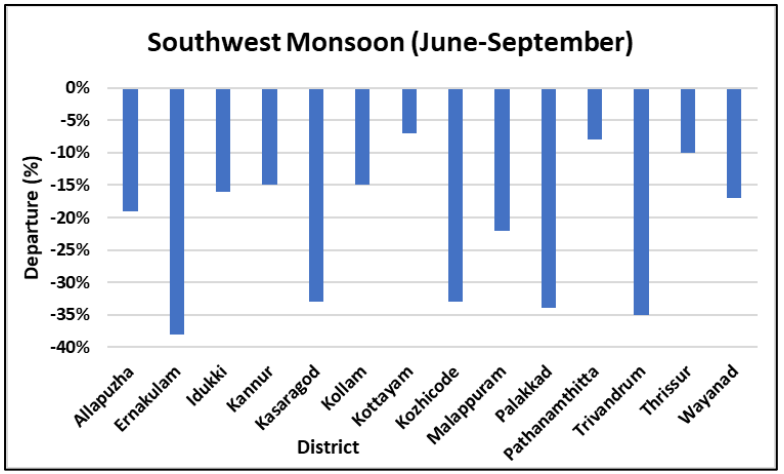
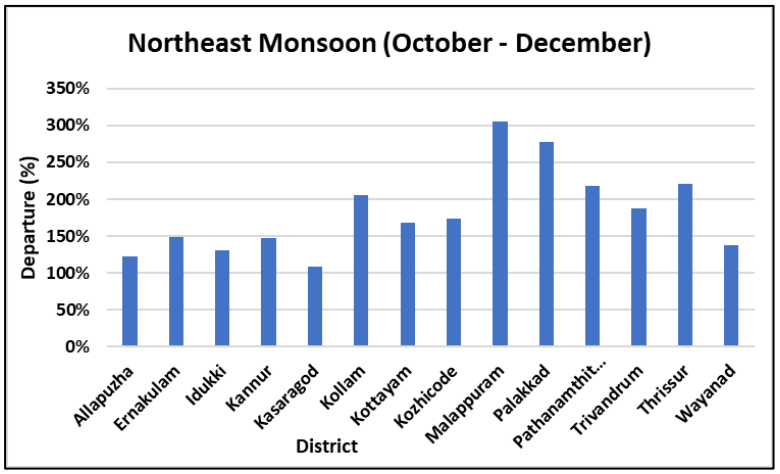
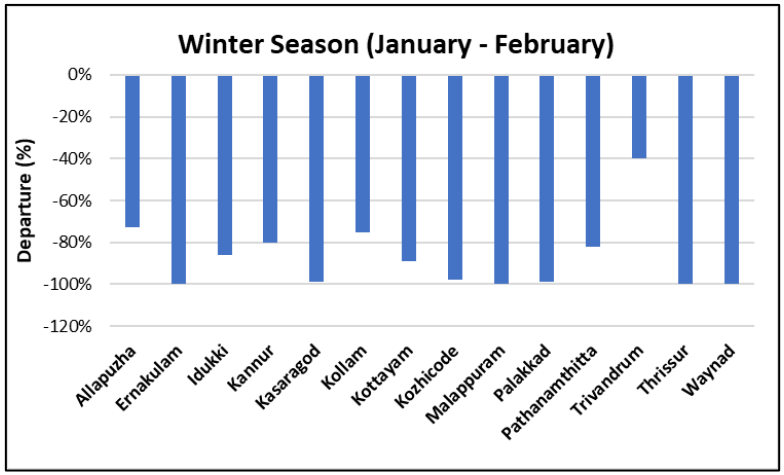


Fig.3.4 Comparison of Seasonal rainfalls of year (2021-22) with previous year (2020-21) rainfall









IV. DEPTH TO WATER LEVEL SCENARIO DURING 2021-22

The depth to water level is being monitored from 1591 monitoring wells distributed throughout the state during the months of April, August, November and January. The water level measured during the month of April is taken as pre-monsoon water level and the data of August and November are taken as post-monsoon water level depending on the rainfall distribution. The water level data of GWMWs during 2021-22 is compiled in Annexure I. The depth to water level mostly depends on the hydrogeological conditions of the area as well as topography, rainfall pattern etc. In coastal plains the depth to water level is generally restricted to 6 mbgl. In midland areas, where the undulating topography is seen, the depth to water level generally varies from near ground level to 25 mbgl. The variation is mostly due to topographical variations, thickness of lateritic overburden etc. In areas where laterites are underlain by sedimentary aquifers of Tertiary age, the water level goes very deep, even to the extent of 55 mbgl. In highlands the depth to water level is in the range of few cm to 10 mbgl depending on the topography and thickness of overburden (weathered zone).

Depth to water level during April 2021

During the month of April 2021, the depth to water level in Kerala State in dug wells varied widely from 0.13 mbgl to 55.00 mbgl. Shallow water level in the range of 0 to 2 mbgl is mainly observed in Alappuzha, Ernakulam and parts of Idukki & Kottayam districts covering 4% area of the state. Water level in the range of 2 to 5 mbgl observed in all the districts of the state, significantly in Kottayam, Kozhikode, Palakkad, Idukki, Enakulam and Thrissur districts covering 32 % area of the state. Water level of 5 to 10 mbgl is observed mainly in Malappuram, Thrissur, Palakkad, Kollam and Ernakulam districts covering 54% area of the state. Water level in the range of 10 to 20 mbgl is mainly observed in Kasaragod, Malappuram, Kolam, Thrissur and Thiruvananthapuram districts covering around 10 % area of the state.

The district-wise well frequency for different ranges of depth to water level during April 2021 has been prepared and is given in Table 4.1. The analysis of the data of 1390 wells reveals that 10% of the monitoring wells (GWMWs) shows water level within the range of ground level to 2 mbgl, 31% wells within the range of 2 to 5 mbgl, 41 % wells within the range of 5 to 10 mbgl and 17% wells in the rage of 10 to 20 mbgl. Deeper water level (>

20 mbgl) is observed in isolated pokets of Thiruvananthapuram, Kasaragod, Palakkad, Malappuram and Thrissur districts, which can be attributed to the local hydrogeological conditions mainly due to thick lateritic overburden and moreover the wells are located in an elevated area. The map showing the depth to water level in Kerala State during April 2021 is given in Figure 4.1. More than 50% of monitoring wells recorded water level greater than 10 m bgl in Kasaragod district.

Depth to water level during August 2021

During the month of August 2021, the depth to water level in Kerala State in dug wells varied widely from 0.02 to 34.35 mbgl. Shallow water level in the range of 0 – 2 mbgl is seen in Alappuzha district, coastal tracts of Ernakulam, in the valley portion found in Idukki, Pathanamthitta, Thrissur Kottayam, and Kozhikkode districts and also as small patches in remaining districts. The areas falling in the midland region generally show water level in the range of 2 – 10 mbgl. Water level of more than 20 m bgl is seen very few patches in Thiruvananthapuram district only. The district-wise well frequency for different ranges of depth to water level during August 2021 has been prepared and is given in Table 4.2. The analysis of the data reveals that 93.03 % of the monitoring wells (GWMWs) shows water level within the range of 0.1 to10 mbgl. Deeper water level (> 20 mbgl) is seen in Thiruvananthapuram (Kanjiramkulam), Malappuram, Palakkad and Kasargod district as isolated pockets which can be attributed to the local hydrogeological conditions mainly due to thick lateritic overburden and moreover the wells are located in an elevated area. The map showing the depth to water level in Kerala State during August 2021 is given in Figure 4.2. In Alappuzha district it is observed that majority (73%) of monitoring wells show water level less than 2 m bgl. Deepest water level cluster is encountered in Thiruvananthapuram district (4 wells).

Depth to water level during November 2021

During the month of November 2021, the depth to water level in Kerala State in dug wells varied widely from ground level to 56.31 mbgl. Shallow water level in the range of 0 to 2 mbgl is significantly observed in Alappuzha, Palakkad, Pathanamthitta, coastal tracts of Ernakulam & Thrissur, Kottayam and Kozhikode districts as well as in the valley portion of Idukki district covering 14% area of the state. The areas falling in the midland region generally show water level in the range of 2 to 10 mbgl. Water level in the range of 2 to 5

mbgl observed in all the districts of the state significantly in Thiruvananthapuram, Ernakulam, Kannur, Kottayam, Palakkad and valley portion of Idukki and Wayanad districts covering 47% area of the state. Water level of 5 to 10 mbgl is observed mainly in Malappuram, Kasargode, Thrissur, Kollam, Kannur and Palakkad districts covering 36% area of the state. Water level in the range of 10 to 20 mbgl is observed in Kasaragod, Malappuram, Thrissur and Thiruvananthapuram districts covering around 3% area of the state.

The district-wise well frequency for different ranges of depth to water level during November 2021 has been prepared and is given in Table 4.3. The analysis of the data of 1485 wells reveals that 92 % of the monitoring wells (GWMWs) shows water level within the range of ground level to 10 mbgl. Deeper water level (> 20 mbgl) is mainly observed in Thiruvananthapuram (Veyilur, Tirupuram, Melvettur, Kanjiramkulam & Pulluvila), Kasaragod (Sasthangode, Karindalam & Mavinakatta), Palakkad (Nanniyidu & Mundur), Malappuram (Othukkungal & Parambilpeedika) and Thrissur (Chowannur) districts as isolated pockets, which can be attributed to the local hydrogeological conditions mainly due to thick lateritic overburden and moreover the wells are located in an elevated area. The map showing the depth to water level in Kerala State during November 2021 is given in Figure 4.3. More than 50% of monitoring wells recorded water level greater than 5 m bgl in Kasaragod, Malappuram and Thrissur districts. Deepest water level is encountered in Trivandrum district (Pulluvila).

Depth to water level during January 2022

During the month of January 2022, the depth to water level in Kerala State in dug wells varied widely from ground level to 55.5 mbgl. Shallow water level in the range of 0 to 2 mbgl is significantly observed in Alappuzha, coastal tracts of Ernakulam & Thrissur districts and in the valley portion of Idukki district covering 5% area of the state. The areas falling in the midland region generally show water level in the range of 2 to 10 mbgl. Water level in the range of 2 to 5 mbgl observed in all the districts of the state significantly in Kozhikode, Palakkad, Kottayam, Pathanamthitta and Idukki ditricts covering 34% area of the state. Water level of 5 to 10 mbgl is observed in all the districts covering 54% area of the state. Water level 10 to 20 mbgl mainly observed in Kasaragode, Kannur, Malappuram and Thiruvananthapuram districts covering 6% area of the state.

The district-wise well frequency for different ranges of depth to water level during January 2022 has been prepared and is given in Table 4.4. The analysis of the data of 1500 wells reveals that 12% of the monitoring wells (173 wells) shows water level within the range of ground level to 2 mbgl, 31% wells (472 wells) within the range of 2 to 5 mbgl, 43 % wells (644 wells) within the range of 5 to 10 mbgl and 13% wells (191 wells) in the rage of 10 to 20 mbgl. Deeper water level (> 20 mbgl) is observed in 1% wells as isolated pockets of Thiruvananthapuram, Thrissur, Kasaragode, Malappuram & Palakkad sistricts. Deepest water level 55.5 mbgl is encountered in Trivandrum district (Pulluvila). The map showing the depth to water level in Kerala State during January 2022 is given in Figure 4.4.

Figure 4.1

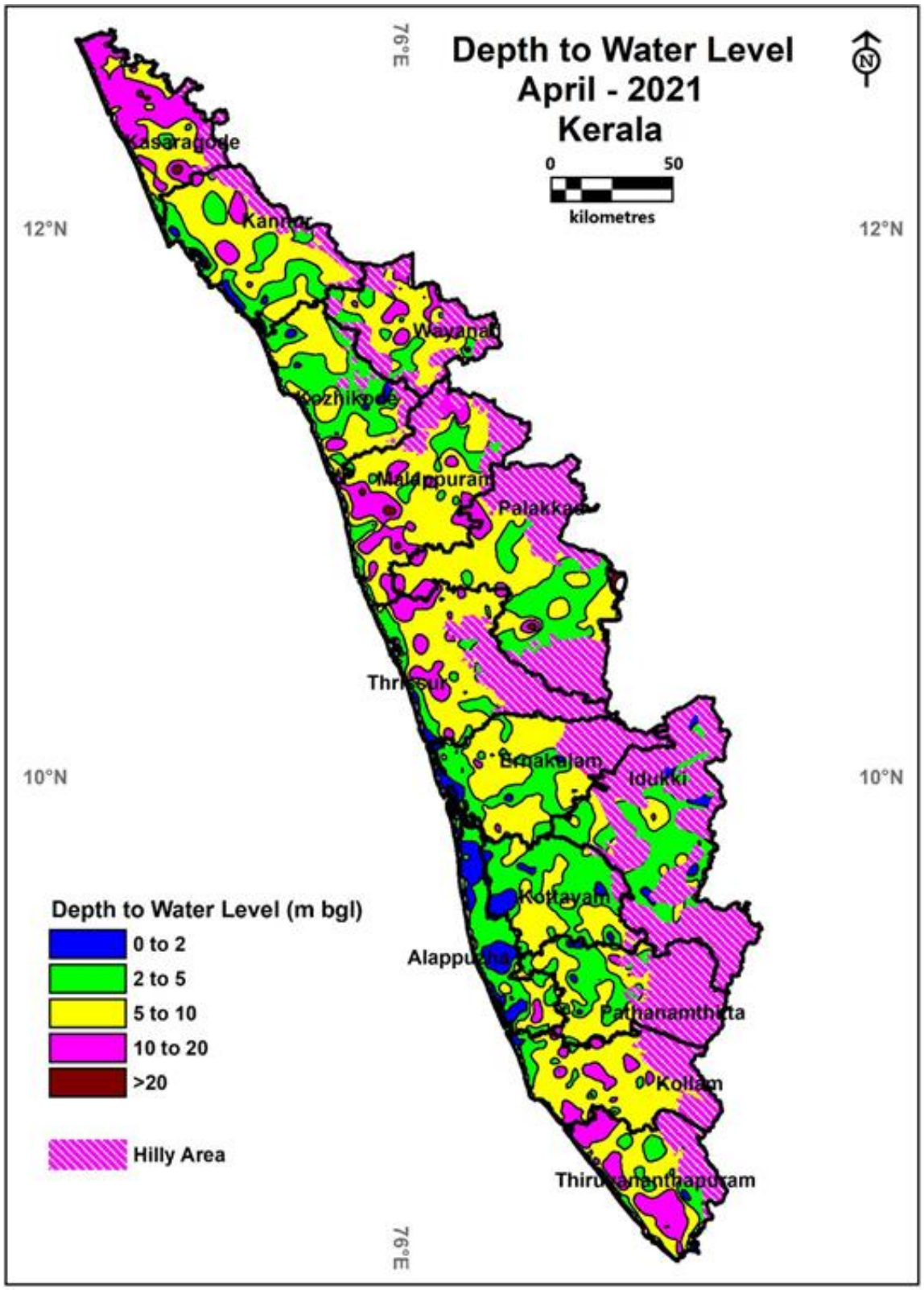

Depth to Water Level
April - 2021
Kerala
0
50
kilometres
N
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Depth to Water Level (m bgl)
0 to 2
2 to 5
5 to 10
10 to 20
>20
Hilly Area

Figure 4.2

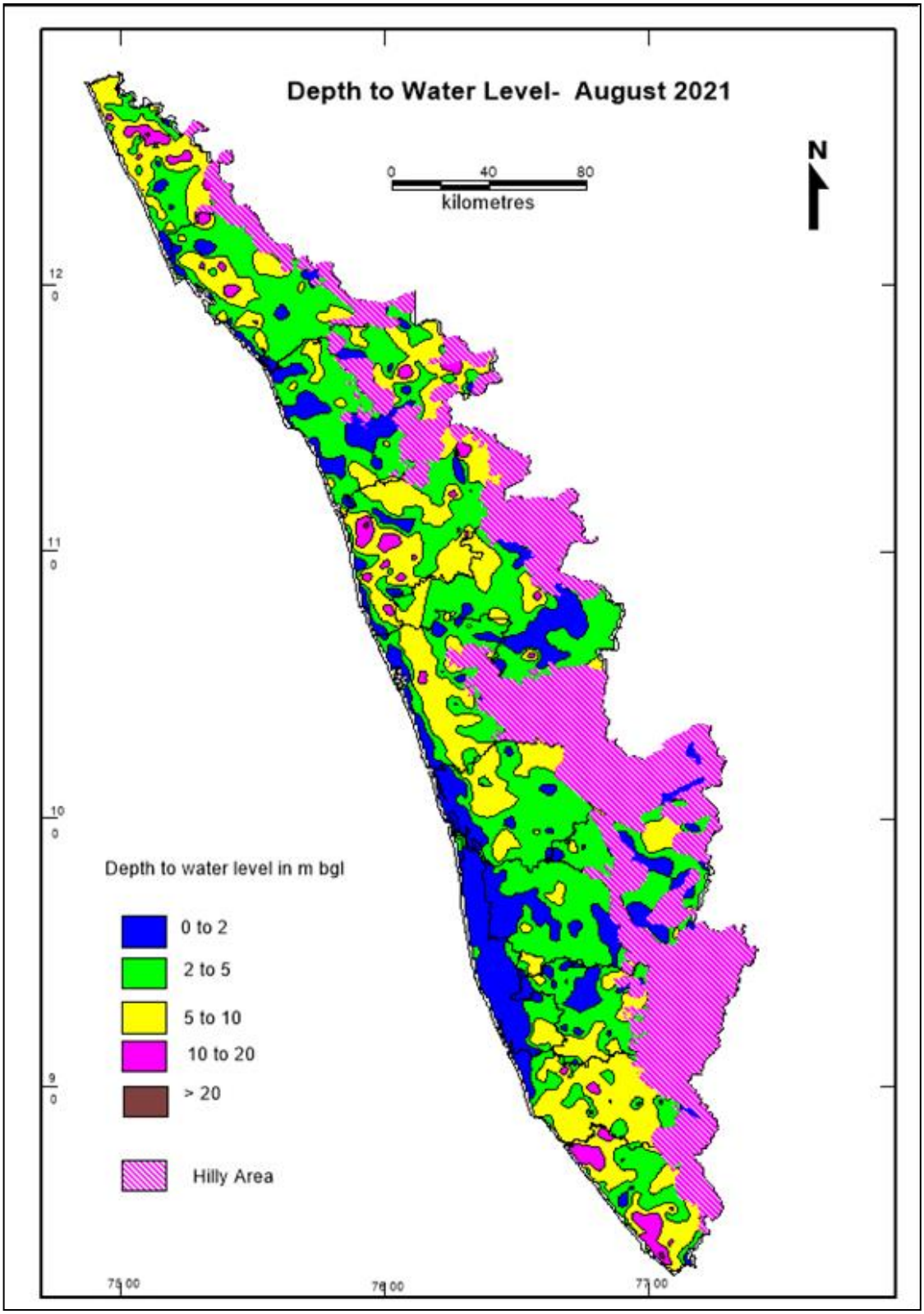

Depth to Water Level- August 2021
0
40
80
kilometres
N
12
0
11
0
10
0
9
0
Depth to water level in m bgl
0 to 2
2 to 5
5 to 10
10 to 20
> 20
Hilly Area
75 00
76 00
77 00

Figure 4.3

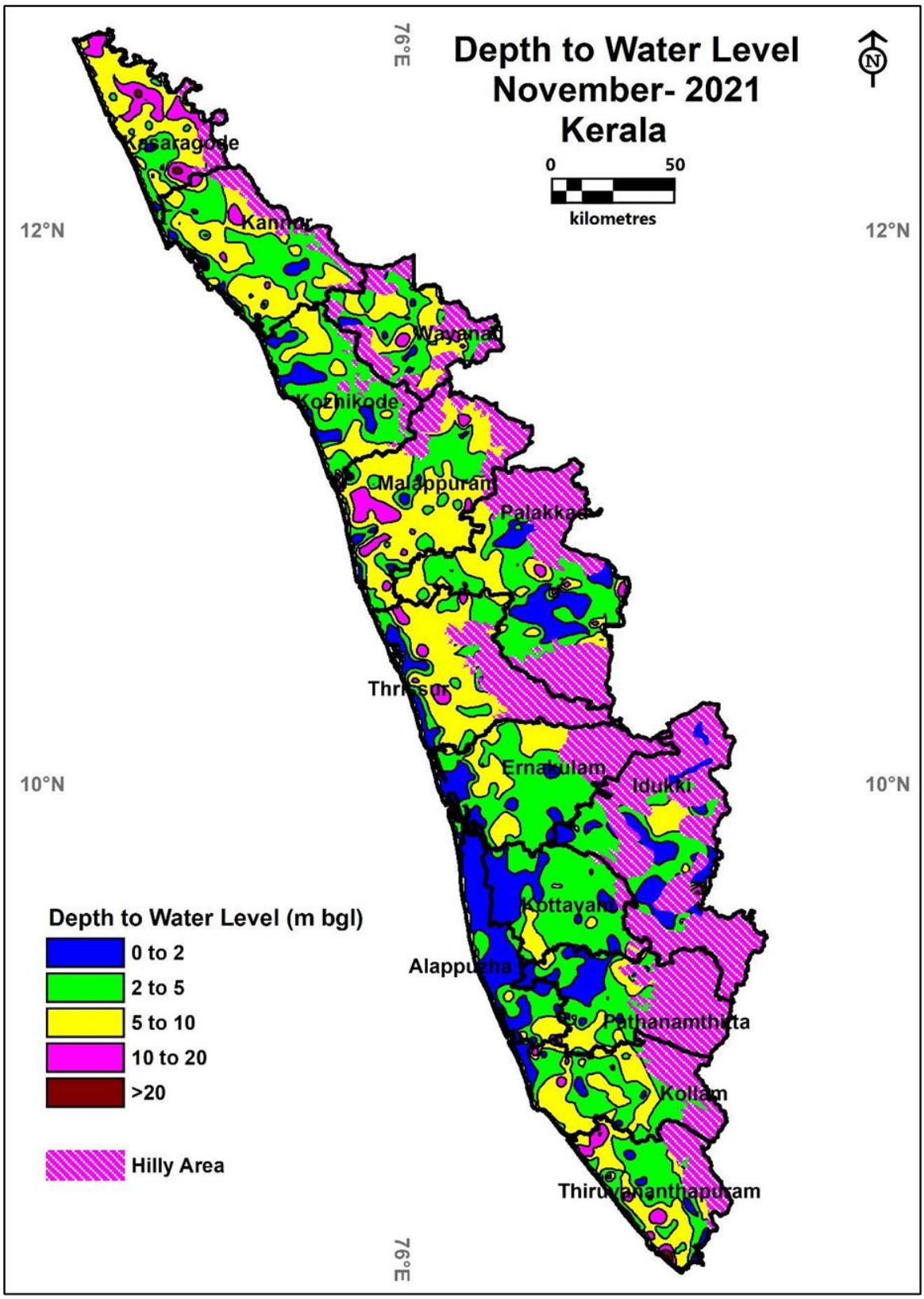

Depth to Water Level
November- 2021
Kerala
0
50
kilometres
N
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Depth to Water Level (m bgl)
0 to 2
2 to 5
5 to 10
10 to 20
>20
Hilly Area

Figure 4.4

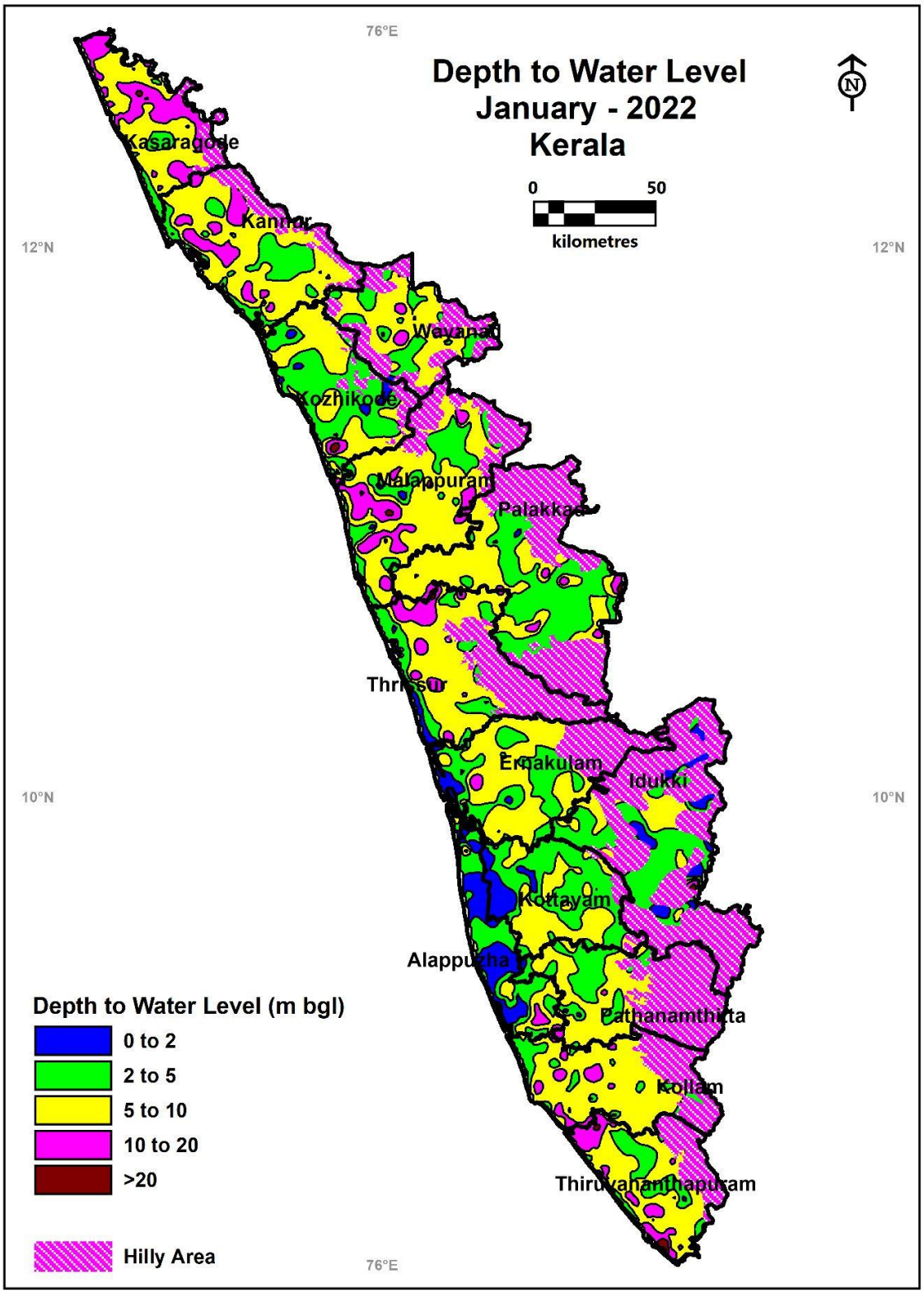

Depth to Water Level
January - 2022
Kerala
0
50
kilometres
N
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Depth to Water Level (m bgl)
0 to 2
2 to 5
5 to 10
10 to 20
>20
Hilly Area

Table 4.1: District Wise Well Frequency For Different Ranges Of Depth To Water Level For April 2021

District	No of Wells Analysed	Depth to Water Table (m bgl)		No and Percentage of Wells Showing Depth to Water Table (m bgl) in Range of											
				0 - 2		2 - 5		5 - 10		10 – 20		20 - 40		> 40	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Alappuzha	82	0.13	17.60	30	37%	31	38%	13	16%	8	10%	0	0%	0	0%
Ernakulam	127	0.42	15.46	24	19%	42	33%	54	43%	7	6%	0	0%	0	0%
Idukki	71	0.39	10.32	8	11%	43	61%	18	25%	2	3%	0	0%	0	0%
Kannur	71	0.60	20.80	10	14%	23	32%	31	44%	6	8%	1	1%	0	0%
Kasargod	123	2.25	24.80	0	0%	7	6%	44	36%	68	55%	4	3%	0	0%
Kollam	105	0.42	20.78	10	10%	12	11%	61	58%	21	20%	1	1%	0	0%
Kottayam	99	0.15	12.66	14	14%	46	46%	37	37%	2	2%	0	0%	0	0%
Kozhikode	90	0.72	19.73	10	11%	40	44%	33	37%	7	8%	0	0%	0	0%
Malappuram	132	1.69	37.07	4	3%	31	23%	62	47%	31	23%	4	3%	0	0%
Palakkad	125	1.06	55.00	3	2%	47	38%	60	48%	11	9%	3	2%	1	1%
Pathanamthitta	88	0.70	15.86	11	13%	34	39%	37	42%	6	7%	0	0%	0	0%
Thiruvananthapuram	72	0.9	29.42	3	4%	16	22%	27	38%	24	33%	2	3%	0	0%
Thrissur	126	0.73	26.72	9	7%	34	27%	62	49%	20	16%	1	1%	0	0%
Wayanad	79	0.8	18.2	4	5%	31	39%	26	33%	18	23%	0	0%	0	0%
State Total	**1390**	**0.13**	**55.00**	**140**	**10%**	**437**	**31%**	**565**	**41%**	**231**	**17%**	**16**	**1%**	**1**	**0%**

Table 4.2: District Wise Well Frequency for Different Ranges of Depth to Water Level for August 2021

District	No of Wells Analysed	Depth to Water Table (m bgl)		No and Percentage of Wells Showing Depth to Water Table (m bgl) in Range of											
				0 - 2		2 - 5		5 - 10		10 – 20		20 - 40		> 40	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Alappuzha	67	0.05	9.86	49	73%	9	13%	9	13%	0	0%	0	0%	0	0%
Ernakulam	121	0.02	14.74	39	32%	48	40%	32	26%	2	2%	0	0%	0	0%
Idukki	72	0.23	9.44	21	29%	41	57%	10	14%	0	0%	0	0%	0	0%
Kannur	108	0.05	19.85	23	21%	40	37%	36	33%	9	8%	0	0%	0	0%
Kasargod	117	0.30	21.7	19	16%	38	32%	42	36%	17	15%	1	1%	0	0%
Kollam	99	0.38	18.52	15	15%	17	17%	60	61%	7	7%	0	0%	0	0%
Kottayam	99	0.04	10.34	36	36%	50	51%	12	12%	1	6%	0	0%	0	0%
Kozhikode	87	0.17	12.55	39	45%	29	33%	16	18%	3	3%	0	0%	0	0%
Malappuram	115	0.14	21.98	27	23%	31	27%	42	37%	14	12%	1	1%	0	0%
Palakkad	115	0.2	31.98	35	30%	48	42%	27	23%	4	3%	1	1%	0	0%
Pathanamthitta	82	0.05	14.6	28	34%	35	43%	18	22%	1	1%	0	0%	0	0%
Thiruvananthapuram	99	0.45	34.35	9	9%	29	29%	38	38%	19	19%	4	4%	0	0%
Thrissur	104	0.27	11,7	29	28%	36	35%	35	34%	4	4%	0	0%	0	0%
Wayanad	68	0.5	16.81	17	25%	17	25%	28	41%	6	9%	0	0%	0	0%
State Total	**1353**	**0.02**	**34.35**	**386**	**29%**	**468**	**35%**	**405**	**30%**	**87**	**6%**	**7**	**1%**	**0**	**0%**

Table 4.3: District Wise Well Frequency for Different Ranges of Depth to Water Level for November 2021

District	No of Wells Analysed	Depth to Water Table (m bgl)		No and Percentage of Wells Showing Depth to Water Table (m bgl) in Range of											
				0 - 2		2 - 5		5 - 10		10 – 20		20 - 40		> 40	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Alappuzha	70	0.00	17.20	49	70%	11	16%	8	11%	2	3%	0	0%	0	0%
Ernakulam	128	0.00	14.53	43	34%	50	39%	33	26%	2	2%	0	0%	0	0%
Idukki	73	0.16	43.21	32	44%	31	42%	9	12%	0	0%	0	0%	1	1%
Kannur	112	0.06	19.99	16	14%	43	38%	45	40%	8	7%	0	0%	0	0%
Kasargod	125	0.54	25.00	5	4%	27	22%	61	49%	29	23%	3	2%	0	0%
Kollam	103	0.00	17.32	20	19%	34	33%	44	43%	5	5%	0	0%	0	0%
Kottayam	99	0.04	10.28	31	31%	53	54%	14	14%	1	1%	0	0%	0	0%
Kozhikode	91	0.35	12.85	27	30%	36	40%	23	25%	5	5%	0	0%	0	0%
Malappuram	134	0.38	28.74	20	15%	30	22%	64	48%	18	13%	2	1%	0	0%
Palakkad	144	0.00	31.50	40	28%	56	39%	39	27%	7	5%	2	1%	0	0%
Pathanamthitta	88	0.00	14.87	33	38%	28	32%	26	30%	1	1%	0	0%	0	0%
Thiruvananthapuram	117	0.01	53.6	17	15%	44	38%	38	32%	13	11%	3	3%	2	2%
Thrissur	125	0.52	20.98	23	18%	30	24%	61	49%	10	8%	1	1%	0	0%
Wayanad	76	0.72	15.75	15	20%	**26**	34%	**29**	38%	**6**	8%	**0**	0%	**0**	0%
State Total	**1485**	**0.00**	**53.6**	**371**	**25%**	**499**	**34%**	**494**	**33%**	**107**	**7%**	**11**	**1%**	**3**	**0%**

Table 4.4: District Wise Well Frequency For Different Ranges Of Depth To Water Level For January 2022

District	No of Wells Analysed	Depth to Water Table (m bgl)		No and Percentage of Wells Showing Depth to Water Table (m bgl) in Range of											
				0 - 2		2 - 5		5 - 10		10 – 20		20 - 40		> 40	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Alappuzha	86	0.27	17.30	48	56%	19	22%	9	10%	10	12%	0	0%	0	0%
Ernakulam	117	0.39	13.78	21	18%	32	27%	60	51%	4	3%	0	0%	0	0%
Idukki	73	0.31	46.79	14	19%	39	53%	19	26%	0	0%	0	0%	1	1%
Kannur	115	0.98	20.50	8	7%	29	25%	55	48%	22	19%	1	1%	0	0%
Kasargod	127	0.55	23.30	2	2%	15	12%	62	49%	45	35%	3	2%	0	0%
Kollam	102	0.54	20.47	8	8%	15	15%	64	63%	13	13%	1	1%	1	1%
Kottayam	98	0.36	11.88	14	14%	41	42%	41	42%	2	2%	0	0%	0	0%
Kozhikode	95	0.66	30.08	11	12%	46	48%	30	32%	7	7%	1	1%	0	0%
Malappuram	138	0.95	31.53	7	5%	36	26%	63	46%	30	22%	2	1%	0	0%
Palakkad	141	0.83	25.17	9	6%	67	48%	56	40%	7	5%	2	1%	0	0%
Pathanamthitta	87	0.95	14.80	5	6%	36	41%	43	49%	3	3%	0	0%	0	0%
Thiruvananthapuram	123	0.73	55.5	6	5%	32	26%	53	43%	28	23%	2	2%	2	2%
Thrissur	122	0.78	24.53	12	10%	38	31%	58	48%	10	8%	4	3%	0	0%
Wayanad	76	1.00	16.70	8	11%	27	36%	31	41%	10	13%	0	0%	0	0%
State Total	**1500**	**0.27**	**55.5**	**173**	**12%**	**472**	**31%**	**644**	**43%**	**191**	**13%**	**16**	**1%**	**4**	**0%**

V WATER LEVEL FLUCTUATION IN KERALA DURING 2021-2022

In Kerala the premonsoon water level measurements are carried out during April and postmonsoon measurements during August and November. The fourth water level measurement is during January. The estimation of water level fluctuation between premonsoon and postmonsoon is very important in the estimation of natural recharge to groundwater regime, which gives the dynamic resource of available groundwater. The water level fluctuation between and pre and postmonsoon periods in coastal alluvium, riverine alluvium and valley fills are mostly restricted to 4 meters. In laterites water level fluctuation is generally in the range of a few centimetres to 9 metres, but mostly restricted to 4 m. In crystalline areas the water level fluctuation is in the range of a few cm to 6m.

Due to lockdown/ Covid situation the water levels of NHS wells in Kannur district could not be measured during April 2021 and the same were measured only during June which indicate shallow water level due to monsoon and hence data pertaining to Kannur is omitted for fluctuation comparison. Fluctuation for Kannur district is analysed using April 2019 data as there was no water level monitoring in April 2020 due to national lockdown.

Fluctuation between April 2021 and August 2021

Comparison of August 2021 water level with that of April 2021 indicates rise in water level in the range of 0 – 8 metres in most parts of the State whereas fall in water level also is noticed in certain small isolated pockets in all districts. Except Kasaragod district, all the districts of Kerala have rise in water level is in the range of 0 – 2 m and rise in water level up to 8 m is seen particularly in Kasaragod. In Kasaragod district majority of wells (63%) indicate rise in water level is in the range on 4-8 m. Rise in water level is represented by 93.88 % of total monitoring wells. Rise in water level fluctuation of more than 4 m is encountered in mainly in Thiruvananthapuram, Palakkad, Eranakulam and Idukki districts. The map of Kerala showing fluctuation between April 2021 and August 2021 is given in Figure 5.1. District-wise well frequency for different ranges of water level fluctuation (April 2021 and August 2021) is given in Table 5.1.

Fluctuation between April 2021 and November 2021

Seasonal water level fluctuation has been calculated by comparing the water level data during November 2021 with April 2021. Analysis of data of 1387 wells shows that 94% wells (1290 wells) recorded rise in water level covering 96% area of the state and remaining 6% wells (97 wells) recorded fall in water level covering 4% area of the state. The Comparison of data shows that water level rise is in the order of 0.01 to 23.27 m and fall is in the order of 0.01 to 9.22 m. Rise in water level upto 4 m is observed in 79% wells. Rise in water level in the range of 0 to 2 m is observed in all districts of the state, rise of 2 to 4 m is also observed in all the districts of the state significantly in Kannur, Kollam, Pathanamthitta, Wayanad districts and rise of greater than 4 m is mainly observed in Kollam, Kasaragode, Kannur, Thiruvananthapuram & Palakkad districts. Fall in water level of 0 to 4 m is mainly noticed as isolated pockets of Ernakulam, Malappuram, Kozhikode, Wayanad & Thrissur districts. The map of Kerala showing fluctuation between April 2021 and November 2021 is given in Figure 5.2. District-wise well frequency for different ranges of water level fluctuation (April 2021 and November 2021) is given in Table 5.2.

Fluctuation between April 2021 and January 2022

Seasonal water level fluctuation has been calculated by comparing the water level data during January 2022 with April 2021. Analysis of data of 1303 wells shows that 73% wells (953 wells) recorded rise in water level covering 80% area of the state and remaining 27% wells (350 wells) recorded fall in water level covering 20% area of the state. The Comparison of data shows that water level rise is in the order of 0.01 to 12.00 m and fall is in the order of 0.01 to 3.71 m. Rise in water level in the range of 0 to 2 m is observed in all districts of the state, rise of 2 to 4 m is mainly observed in Palakkad, Kasaragode, Kannur & Thiruvananthapuram districts and rise of greater than 4 m is mainly observed at a few wells Kasaragode, Kannur, Malappuram, Palakkad & Thiruvananthapuram districts. Fall in water level of 0 to 2 m is observed in all the districts of the state significantly in Ernakulam, Kottayam and Pathanamthitta districts and fall of >2 m is observed in 2% of wells of the state as isolated pockets. The map of Kerala showing fluctuation between April 2021 and January 2022 is given in Figure 5.3. District-wise well frequency for different ranges of water level fluctuation (April 2021 and January 2022) is given in Table 5.3.

Figure 5.1

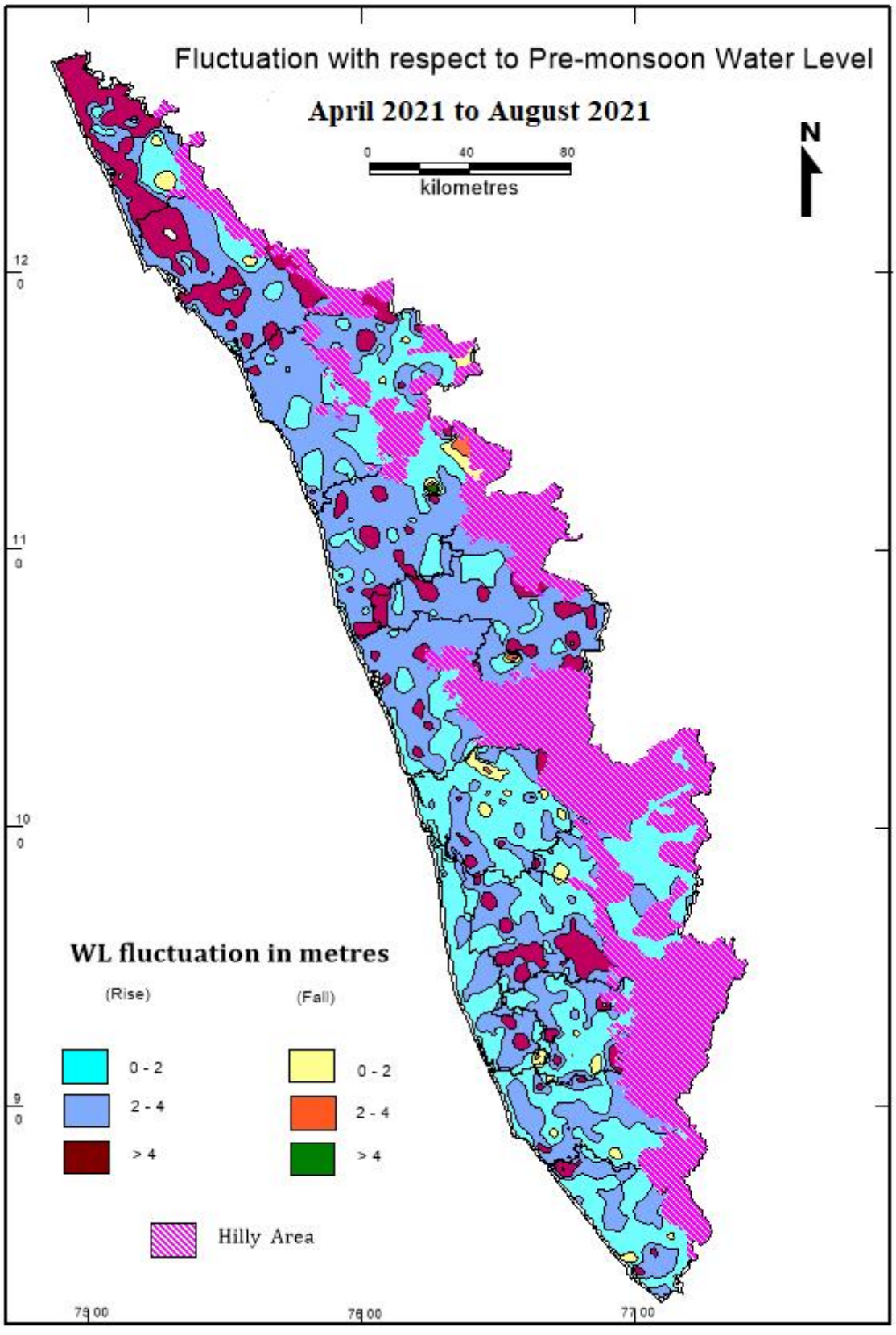

Fluctuation with respect to Pre-monsoon Water Level
April 2021 to August 2021
0
40
80
kilometres
N
12 0
11 0
10 0
9 0
WL fluctuation in metres
(Rise)
(Fall)
0 - 2
2 - 4
> 4
0 - 2
2 - 4
> 4
Hilly Area
75 00
76 00
77 00

Figure5.2

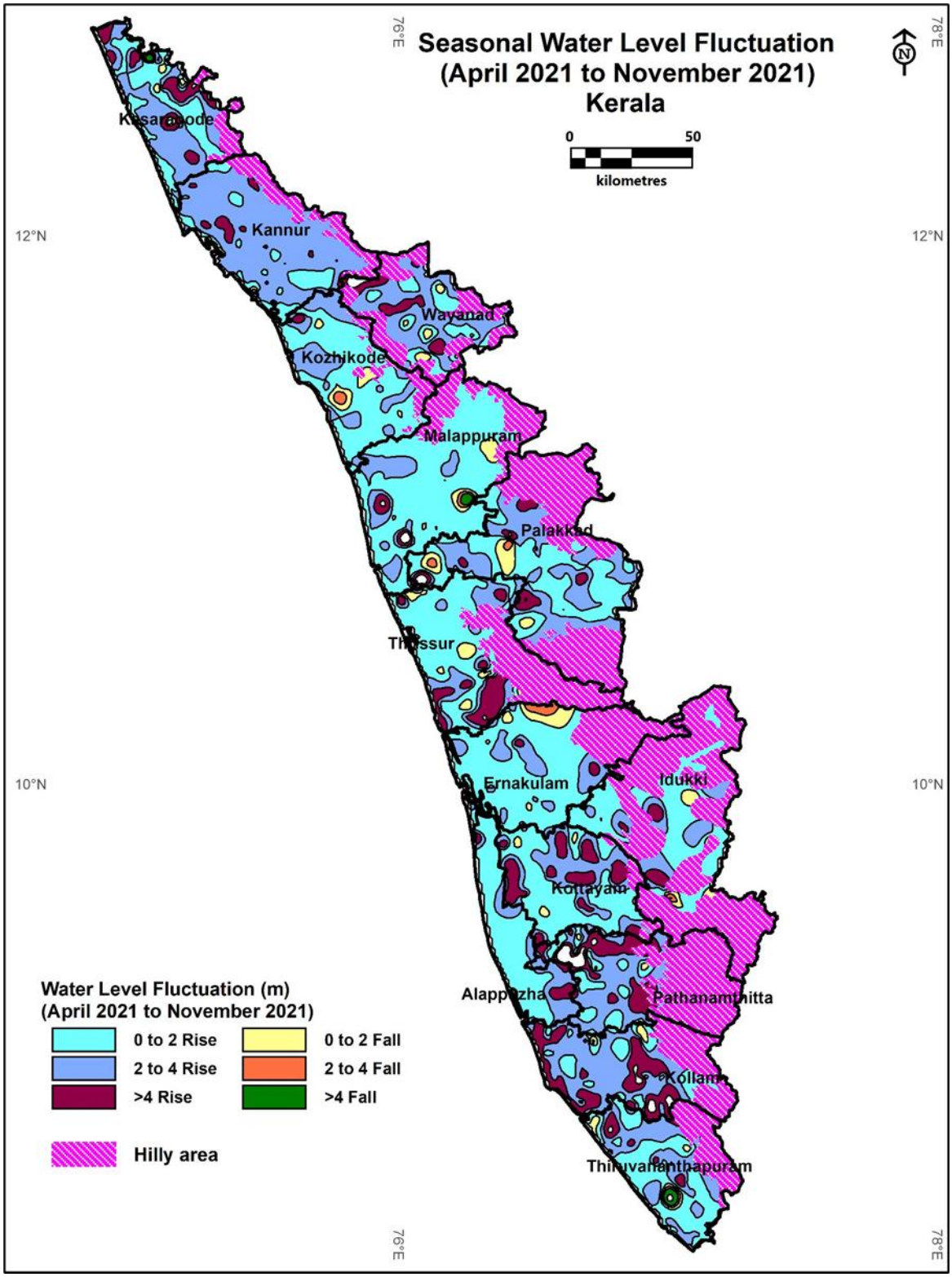

Seasonal Water Level Fluctuation
(April 2021 to November 2021)
Kerala
0
50
kilometres
N
76°E
78°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Water Level Fluctuation (m)
(April 2021 to November 2021)
0 to 2 Rise
2 to 4 Rise
>4 Rise
0 to 2 Fall
2 to 4 Fall
>4 Fall
Hilly area

Figure 5.3

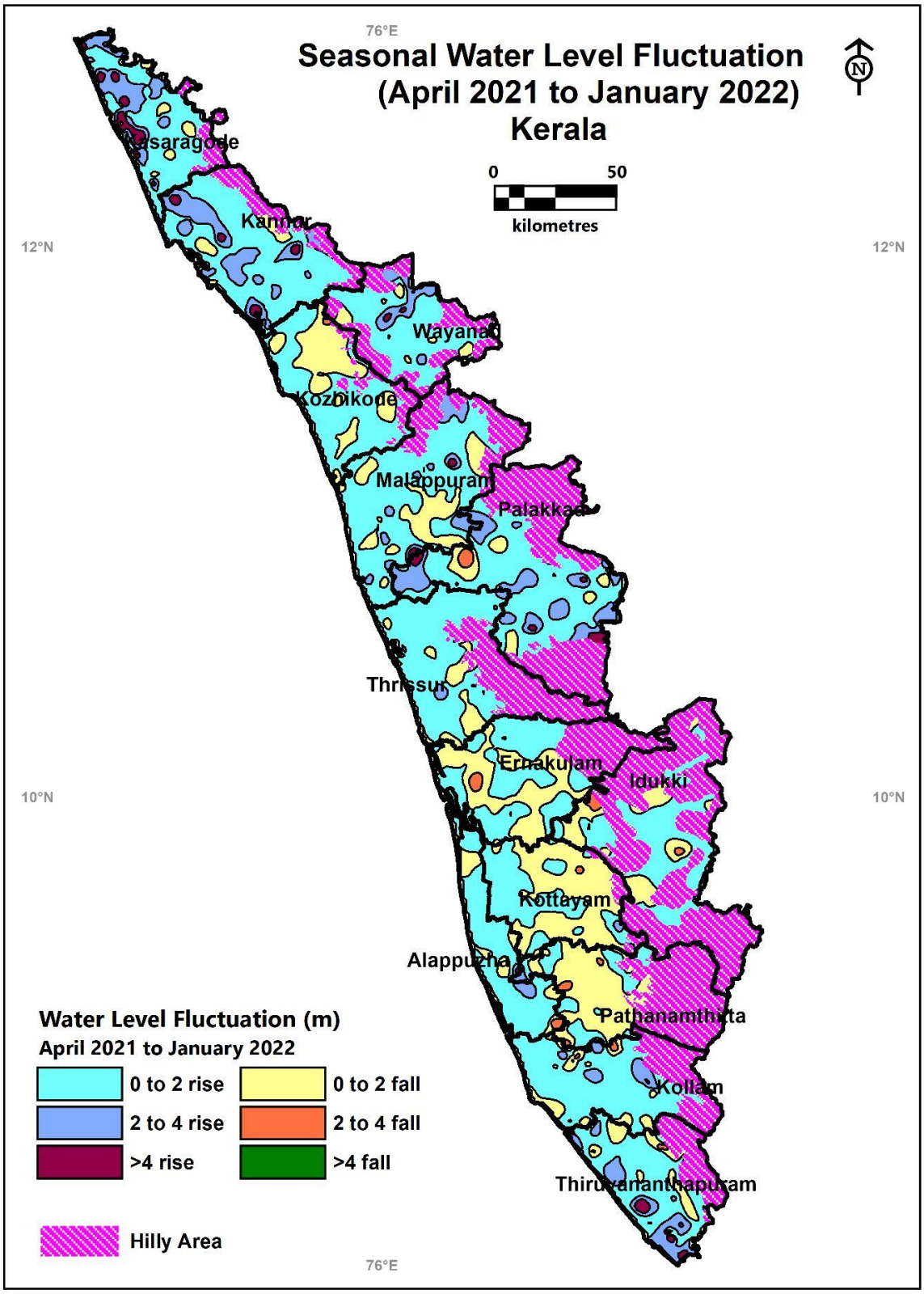

Seasonal Water Level Fluctuation
(April 2021 to January 2022)
Kerala
0
50
kilometres
N
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Water Level Fluctuation (m)
April 2021 to January 2022
0 to 2 rise
0 to 2 fall
2 to 4 rise
2 to 4 fall
>4 rise
>4 fall
Hilly Area

Table5.1: District wise Water Level Fluctuation and Frequency Distribution for Different Ranges from April 2021 -August 2021

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	63	0.3	5.32	0.09	2.28	42	67%	14	22%	3	5%	3	5%	1	2%	0	0%	59	4
Ernakulam	107	0.04	11.30	0.14	4.29	71	66%	22	21%	8	7%	5	5%	0	0%	1	1%	101	6
Idukki	67	0.09	4.38	0.13	4.3	48	72%	10	15%	2	3%	6	9%	0	0%	1	1%	60	7
Kasaragod	107	0.3	18.7	1.6	1.8	20	19%	21	20%	63	59%	2	2%	0	0%	0	0%	104	2
Kollam	90	0.07	10.25	0.04	1.44	47	52%	27	30%	11	12%	5	6%	0	0%	0	0%	85	5
Kottayam	94	0.08	5.59	0.18	1.7	55	59%	26	28%	9	10%	4	4%	0	0%	0	0%	90	4
Kozhikode	84	0.07	3.8	0.13	0.53	41	49%	40	48%	0	0%	3	4%	0	0%	0	0%	81	3
Malappuram	111	0.15	15.9	0.38	3.15	50	45%	43	39%	15	14%	2	4%	1	1%	0	0%	108	3
Palakkad	102	0.13	7.88	0.07	9.00	33	32%	51	50%	13	13%	4	4%	0	0%	1	1%	97	5
Pathanamthitta	79	0.09	8.97	0.03	3.1	39	49%	22	28%	4	5%	12	15%	0	0%	0	0%	65	14
Trivandrum	58	0.1	4.55	0.17	10	25	43%	21	36%	3	5%	6	10%	1	2%	1	2%	49	9
Thrissur	100	0.1	5.75	0.12	2.35	39	39%	49	49%	7	7%	4	4%	0	0%	0	0%	95	5
Wayanad	66	0.02	9.75	0.01	0.01	37	36%	22	33%	6	9%	1	2%	0	2%	0	0%	65	1
State Total	**1128**	**0.56**	**15.9**	**0.01**	**9.00**	**547**	**48%**	**368**	**33%**	**144**	**13%**	**57**	**5%**	**2**	**0%**	**4**	**0%**	**1059**	**68**

Table5.2: District wise – Water Level Fluctuation and Frequency Distribution for Different Ranges from April 2021–November 2021

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	68	0.29	7.28	0.10	1.03	44	65%	13	19%	8	12%	3	4%	0	0%	0	0%	65	3
Ernakulam	125	0.17	7.21	0.01	1.53	72	58%	39	31%	5	4%	9	7%	0	0%	0	0%	116	9
Idukki	71	0.09	5.53	0.12	4.55	44	62%	18	25%	3	4%	5	7%	0	0%	1	1%	65	6
Kannur	108	0.20	11.65	0.20	3.98	27	25%	46	43%	32	30%	2	2%	1	1%	0	0%	105	3
Kasaragod	123	0.01	13.60	0.50	6.10	37	30%	44	36%	36	29%	5	4%	0	0%	1	1%	117	6
Kollam	94	0.42	7.92	0.09	3.82	21	22%	44	47%	24	26%	3	3%	2	2%	0	0%	89	5
Kottayam	97	0.01	6.16	0.02	0.79	71	73%	20	21%	2	2%	4	4%	0	0%	0	0%	93	4
Kozhikode	89	0.21	14.78	0.01	3.17	54	61%	25	28%	2	2%	7	8%	1	1%	0	0%	81	8
Malappuram	132	0.03	17.54	0.02	5.38	85	64%	25	19%	12	9%	9	7%	0	0%	1	1%	122	10
Palakkad	124	0.02	23.27	0.10	6.59	37	30%	51	41%	29	23%	3	2%	3	2%	1	1%	117	7
Pathanamthitta	86	0.01	8.72	0.04	2.07	48	56%	25	29%	8	9%	4	5%	1	1%	0	0%	81	5
Thiruvananthapuram	71	0.25	8.78	0.14	6.22	19	27%	21	30%	24	34%	5	7%	0	0%	2	3%	64	7
Thrissur	125	0.05	18.21	0.01	4.07	77	62%	27	22%	7	6%	11	9%	2	2%	1	1%	111	14
Wayanad	74	0.06	9.18	0.07	6.55	38	51%	16	22%	11	15%	6	8%	3	4%	1	1%	64	10
State Total	**1387**	**0.01**	**23.27**	**0.01**	**6.59**	**674**	**49%**	**414**	**30%**	**203**	**15%**	**76**	**5%**	**13**	**1%**	**8**	**1%**	**1290**	**97**

Table 5.3: District wise – Water Level Fluctuation and Frequency Distribution for Different Ranges from April 2021 - January 2022.

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	63	0.01	4.70	0.01	3.46	44	70%	2	3%	2	3%	13	21%	2	3%	0	0%	48	15
Ernakulam	114	0.01	2.07	0.01	3.43	61	54%	1	1%	0	0%	50	44%	2	2%	0	0%	62	52
Idukki	70	0.01	3.26	0.01	3.45	46	66%	5	7%	0	0%	17	24%	2	3%	0	0%	51	19
Kannur	108	0.05	5.79	0.08	1.70	74	69%	20	19%	7	6%	7	6%	0	0%	0	0%	101	7
Kasaragod	117	0.01	12.00	0.10	2.80	70	60%	21	18%	17	15%	7	6%	2	2%	0	0%	108	9
Kollam	82	0.04	4.27	0.06	3.22	61	74%	6	7%	1	1%	11	13%	3	4%	0	0%	68	14
Kottayam	93	0.03	2.89	0.01	2.67	35	38%	2	2%	0	0%	55	59%	1	1%	0	0%	37	56
Kozhikode	88	0.01	1.94	0.01	1.76	64	73%	0	0%	0	0%	24	27%	0	0%	0	0%	64	24
Malappuram	129	0.01	10.77	-0.65	3.11	74	57%	10	8%	6	5%	38	29%	1	1%	0	0%	90	39
Palakkad	115	0.01	8.90	0.09	3.43	68	59%	26	23%	8	7%	12	10%	1	1%	0	0%	102	13
Pathanamthitta	77	0.01	2.08	0.01	3.71	25	32%	1	1%	0	0%	45	58%	6	8%	0	0%	26	51
Thiruvananthapuram	59	0.17	7.8	0.11	3.03	26	44%	13	22%	5	8%	12	20%	3	5%	0	0%	44	15
Thrissur	118	0.05	4.53	0.03	2.04	84	71%	7	6%	1	1%	25	21%	1	1%	0	0%	92	26
Wayanad	70	0.01	4.77	0.17	2.41	50	71%	6	9%	4	6%	9	13%	1	1%	0	0%	60	10
State Total	**1303**	**0.01**	**12.00**	**0.01**	**3.71**	**782**	**60%**	**120**	**9%**	**51**	**4%**	**325**	**25%**	**25**	**2%**	**0**	**0%**	**953**	**350**

VI COMPARISON OF 2021-2022 WATER LEVELS WITH THE DECADAL MEAN (2011-2020)

Water levels during the year 2021-22 in comparison with the decadal mean (2011-2020) value of the respective measurements is discussed in this chapter. The analysis brings out the deviations in water level from the general behaviour of water level of the past decade. In general, the change in water level is confined to the range of +2 to –2 m.

Fluctuation between Mean April (2011-2020) and April 2021

The change in water level over the last ten years period is brought out by the comparison of April 2021 water level with the mean value of April measurements of the period 2011-2020. Analysis of data of 1234 wells shows that 73% wells (902 wells) recorded rise in water level and remaining 27% wells (332 wells) recorded fall in water level.

Analysis indicates that the rise in water level 0 to 2 m is observed in 65% wells, 2 to 4 m rise in 6% wells and >4 m in 2% wells. Water level rise of less than 2 m is observed in all the districts of the state. Water level rise of 2 to 4 m is observed mainly in parts of Kannur, Kottayam, and Thiruvananthapuram districts and greater than 4 m is mainly observed in isolated pockets of Kannur & Thiruvananthapuram districts. Fall in water level in the range of 0 to 2m observed in 24% wells and observed in all the districts of the state. Fall greater than 2 m is observed mainly in isolated pockets of Malappuram & Kasaragod districts. The frequency of wells showing rise and fall in different ranges when compared with decade mean water level is given in Table 6.1. The water level fluctuation in the state for April 2021 with respect to Decadal mean (2011-2020) is given in Figure 6.1.

Fluctuation between Mean August (2011-2020) and August 2021

The change in water level over the last ten years period is brought out by the comparison of water level with the mean value of August measurements of the period 2011-2020.This analysis indicate that the change in water level is mostly restricted to +2(rise)to -2(fall) m as recorded by 91.34% of GWMW. However, rise in waterlevel is predominant in many parts of the state as represented by 65.95%. of monitoring wells. Fall with more than 4 m is observed in isolated pockets of Ernakulam, Kollam, Kottayam, Malappuram, Palakkad and Thiruvananthapuram districts. In Thiruvananthapuram district, the fall (>4 m) is predominantly seen at Kanjiramkulam area. The frequency of wells showing rise and fall in different ranges (0-2m,2-4m, 4m) when compared with decade mean water level is given in

Table 6.2. Figure 6.2 shows the water level fluctuation in the state for August 2021 with respect to Decadal mean (2011-2020).

Fluctuation between Mean November (2011-2020) and November 2021

The change in water level over the last ten years period is brought out by the comparison of November 2021 water level with the mean value of November measurements of the period 2011-2020. Analysis of data of 1234 wells shows that 84% wells (1025 wells) recorded rise in water level covering 89% area of the state and remaining 16% wells (208 wells) recorded fall in water level covering 11% area of the state. Analysis indicates that the rise in water level 0 to 2 m is observed in 65% wells, 2 to 4 m rise in 14% wells and >4 m in 5% wells. Water level rise of less than 2 m is observed in all the districts of the state. Water level rise of 2 to 4 m is observed mainly in parts of Thiruvananthapuram, Kollam, Pathanamthitta, Palakkad, Kannur & Kasaragod districts and greater than 4 m is mainly observed in isolated pockets of Thiruvananthapuram, Kollam, Kannur & Thrissur districts. Fall in water level in the range of 0 to 2m observed in 15% wells, mainly in Thrissur, Malappuram & Kasaragod districts and greater than 2 m is observed mainly in isolated pockets of Malappuram & Wayanad districts. The frequency of wells showing rise and fall in different ranges when compared with decade mean water level is given in Table 6.3. Figure 6.3 shows the water level fluctuation in the state for November 2021with respect to Decadal mean (2011-2020).

Fluctuation between Mean January (2012-2021) and January 2022

The change in water level over the last ten years period is brought out by the comparison of January 2022 water level with the mean value of January measurements of the period 2012-2021. Analysis of data of 1334 wells shows that 69% wells (919 wells) recorded rise in water level covering 69% area of the state and remaining 31% wells (415wells) recorded fall in water level covering 31% area of the state. Analysis indicates that the rise in water level 0 to 2 m is observed in 64% wells, 2 to 4 m rise in 4% wells and >4 m rise in 1% wells. Water level rise of less than 2 m is observed in all the districts of the state. Water level rise of 2 to 4 m is observed mainly in few parts of Kasaragod, Palakkad and Thiruvananthapuram districts and greater than 4 m is observed in isolated parts of Thiruvananthapuram district. Fall in water level in the range of 0 to 2m observed in all the districts of the state and greater than 2 m is observed mainly in isolated pockets of Kasaragode, Kollam, Pathanamthitta & Thiruvananthapuram districts. The frequency of wells showing rise and fall in different ranges when compared with decade mean water level is given in Table 6.4. Figure 6.4 shows

the water level fluctuation in the state for January 2022 with respect to Decadal mean (2012-2021).

Figure 6.1

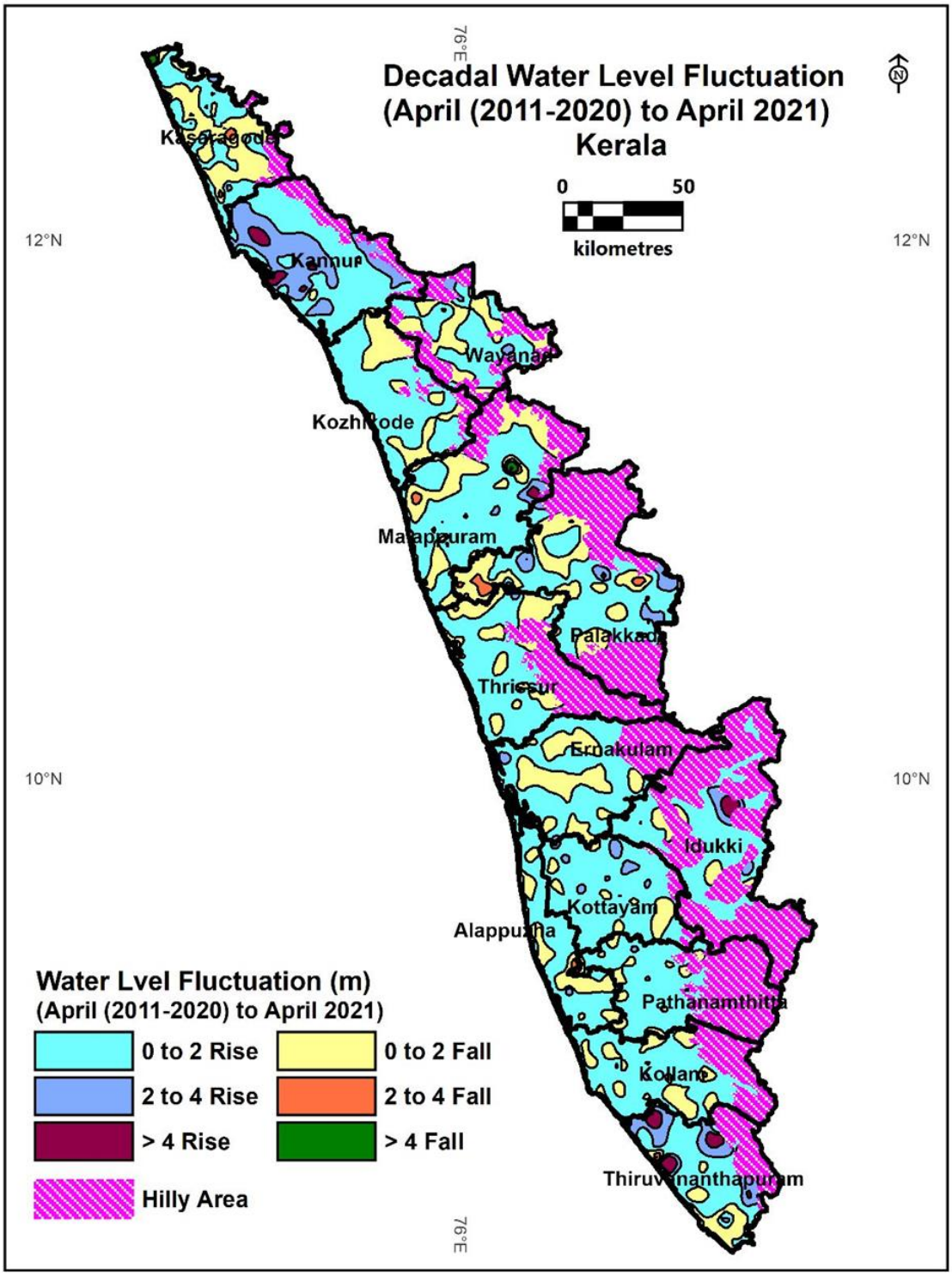


Figure 6.2

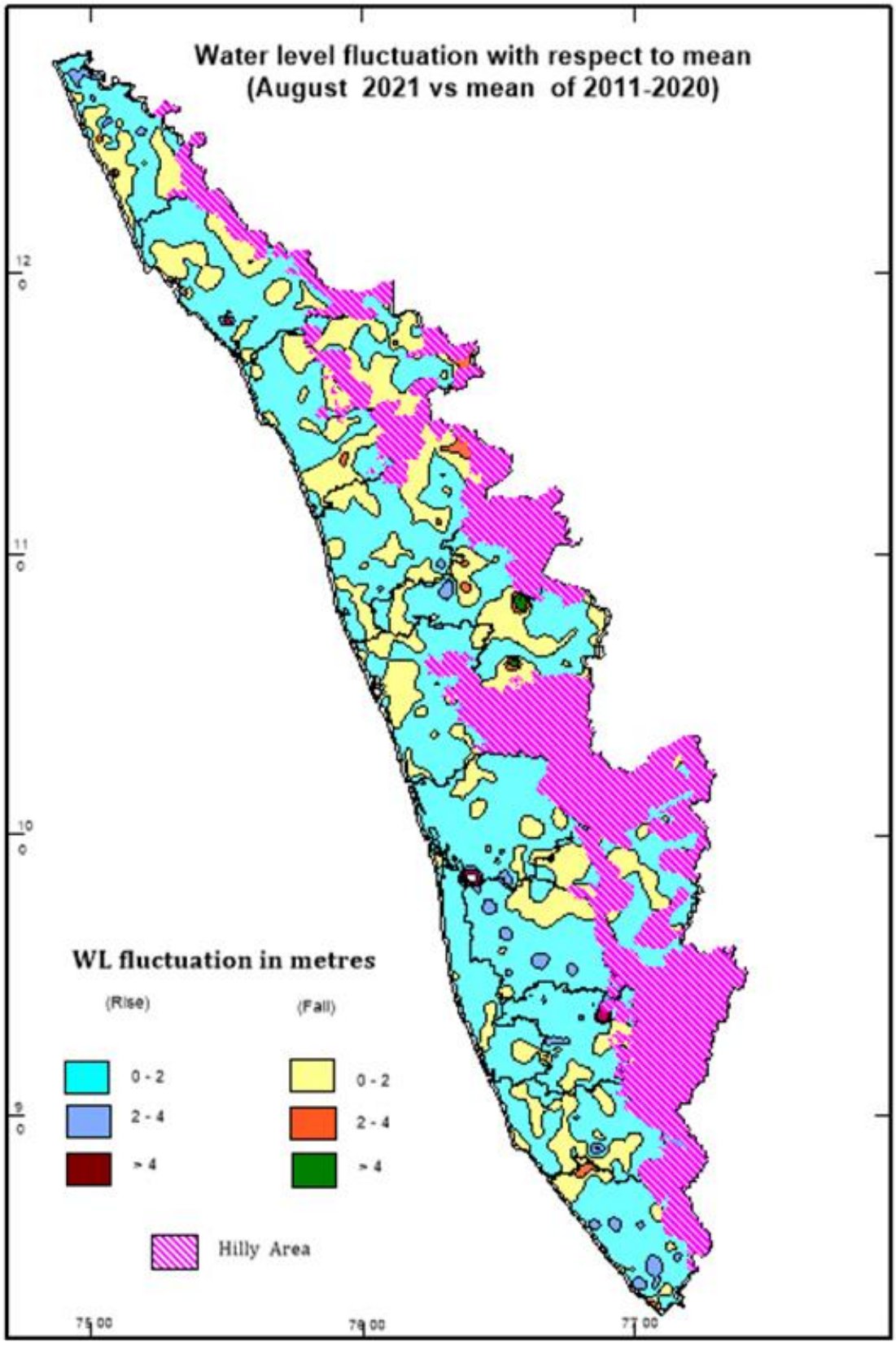

Water level fluctuation with respect to mean
(August 2021 vs mean of 2011-2020)
WL fluctuation in metres
(Rise)
(Fall)
0 - 2
2 - 4
> 4
0 - 2
2 - 4
> 4
Hilly Area
12 0
11 0
10 0
9 0
75 00
76 00
77 00

Figure 6.3

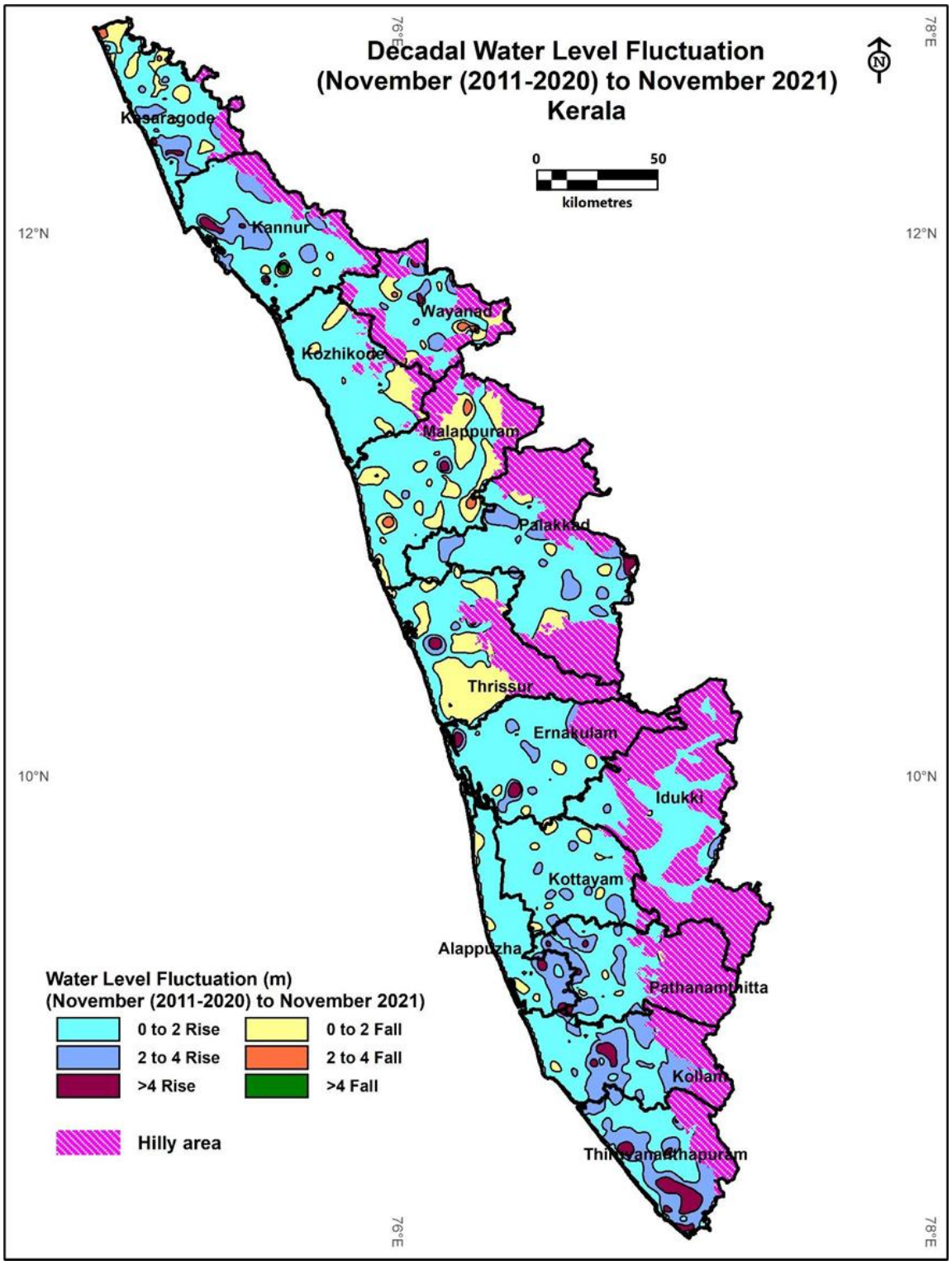

Decadal Water Level Fluctuation
(November (2011-2020) to November 2021)
Kerala
0
50
kilometres
N
76°E
78°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Water Level Fluctuation (m)
(November (2011-2020) to November 2021)
0 to 2 Rise
2 to 4 Rise
>4 Rise
0 to 2 Fall
2 to 4 Fall
>4 Fall
Hilly area

Figure 6.4

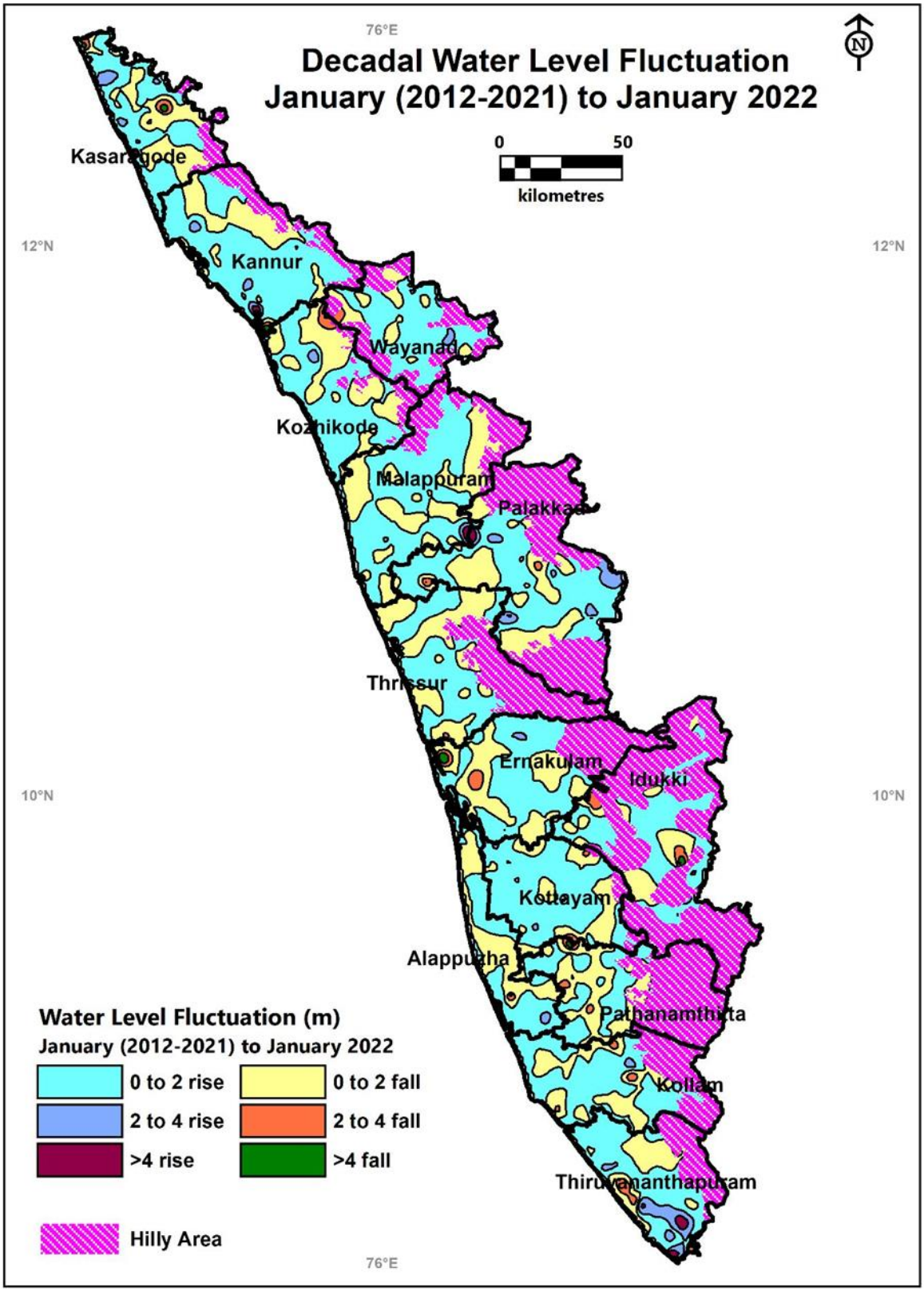

Decadal Water Level Fluctuation
January (2012-2021) to January 2022
0
50
kilometres
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
Water Level Fluctuation (m)
January (2012-2021) to January 2022
0 to 2 rise
0 to 2 fall
2 to 4 rise
2 to 4 fall
>4 rise
>4 fall
Hilly Area

Table 6.1: District wise – Water Level Fluctuation with Mean and April 2021 (April 2021 – Mean (April 2011-2020))

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	67	0.01	1.11	0.01	4.17	46	69%	0	0%	0	0%	19	28%	1	1%	1	1%	46	21
Ernakulam	118	0.01	2.46	0.01	1.26	77	65%	1	1%	0	0%	40	34%	0	0%	0	0%	78	40
Idukki	60	0.02	5.74	0.04	1.64	46	77%	2	3%	1	2%	11	18%	0	0%	0	0%	49	11
Kannur	66	0.32	9.23	0.12	0.39	34	52%	22	33%	8	12%	2	3%	0	0%	0	0%	64	2
Kasaragod	118	0.02	3.95	0.02	4.89	64	54%	6	5%	0	0%	39	33%	7	6%	2	2%	70	48
Kollam	97	0.01	6.34	0.02	2.55	63	65%	3	3%	1	1%	29	30%	1	1%	0	0%	67	30
Kottayam	91	0.02	4.72	0.01	4.93	70	77%	8	9%	1	1%	11	12%	0	0%	1	1%	79	12
Kozhikode	83	0.01	6.72	0.03	1.33	60	72%	0	0%	1	1%	22	27%	0	0%	0	0%	61	22
Malappuram	113	0.01	8.08	0.04	4.78	81	72%	7	6%	3	3%	18	16%	2	2%	2	2%	91	22
Palakkad	101	0.01	9.03	0.05	2.96	57	56%	7	7%	5	5%	26	26%	6	6%	0	0%	69	32
Pathanamthitta	85	0.02	5.15	0.01	2.29	69	81%	2	2%	1	1%	12	14%	1	1%	0	0%	72	13
Thiruvananthapuram	66	0.04	9.98	0.01	4.29	34	52%	9	14%	7	11%	14	21%	1	2%	1	2%	50	16
Thrissur	101	0.01	4.43	0.03	2.20	58	57%	3	3%	1	1%	38	38%	1	1%	0	0%	62	39
Wayanad	68	0.04	2.86	0.05	1.49	39	57%	5	7%	0	0%	24	35%	0	0%	0	0%	44	24
State Total	**1234**	**0.01**	**9.98**	**0.01**	**4.93**	**798**	**65%**	**75**	**6%**	**29**	**2%**	**305**	**24%**	**20**	**2%**	**7**	**1%**	**902**	**332**

Table 6.2: District wise – Water Level Fluctuation and Frequency distribution for different range between Decadal Mean (August 2011-2020) and August 2021

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	68	0	1.06	0.03	1.66	59	87%	0	0%	0	1%	9	13%	0	0%	0	0%	59	9
Ernakulam	122	0.01	10.34	0	4.92	91	75%	7	6%	1	0%	22	18%	0	0%	1	1%	99	23
Idukki	72	0	1.73	0.01	1.93	41	57%	0	0%	0	6%	31	43%	0	0%	0	0%	41	31
Kannur	108	0.02	7.48	0	3.09	75	69%	0	0%	1	1%	30	28%	2	2%	0	0%	76	32
Kasaragod	117	0.02	4.2	0.01	4.78	56	48%	15	13%	1	1%	40	43%	3	3%	0	0%	72	45
Kollam	98	0.01	7.77	0	4.11	52	53%	2	2%	1	1%	38	39%	3	3%	2	2%	55	43
Kottayam	99	0.10	4.26	0.01	1.37	66	67%	8	8%	1	0%	124	24%	0	0%	2	2%	75	24
Kozhikode	87	0	1.28	0	2.72	51	59%	0	0%	0	1%	34	39%	2	2%	0	0%	51	36
Malappuram	115	0	6.19	0.01	4.84	65	57%	5	4%	1	0%	41	36%	2	2%	1	1%	71	44
Palakkad	115	0.02	3.07	0.06	4.96	63	55%	3	3%	0	1%	43	37%	4	3%	2	2%	66	49
Pathanamthitta	82	0.01	7.98	0.01	2.63	55	67%	6	7%	1	2%	19	23%	1	1%	0	0%	62	20
Thiruvananthapuram	99	0.05	6.86	0.01	4.90	57	58%	9	9%	2	0%	24	24%	4	4%	2	2%	68	30
Thrissur	104	0	3.12	0.01	3.21	65	63%	2	2%	0	0%	35	34%	2	2%	0	0%	67	37
Wayanad	68	0.01	1.39	0.01	2.99	31	46%	7	10%	0	1%	34	50%	3	4%	0	0%	31	37
State Total	**1354**	**1.06**	**10.34**	**0.00**	**4.96**	**1052**	**78%**	**57**	**4%**	**9**	**1%**	**182**	**13%**	**26**	**2%**	**10**	**1%**	**893**	**460**

Table 6.3: District wise – Water Level Fluctuation with Mean and November 2021 (November 2021 – Mean (November 2011-2020))

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	55	0.09	4.72	0.18	3.03	39	71%	7	13%	2	4%	6	11%	1	2%	0	0%	48	7
Ernakulam	82	0.24	7.36	0.06	1.41	60	73%	10	12%	3	4%	9	11%	0	0%	0	0%	73	9
Idukki	64	0.03	2.85	0.05	0.68	55	86%	6	9%	0	0%	3	5%	0	0%	0	0%	61	3
Kannur	104	0.06	7.98	0.15	4.84	76	73%	15	14%	8	8%	3	3%	1	1%	1	1%	99	5
Kasaragod	116	0.08	6.32	0.01	3.29	65	56%	17	15%	4	3%	28	24%	2	2%	0	0%	86	30
Kollam	87	0.04	6.42	0.21	0.83	53	61%	23	26%	8	9%	3	3%	0	0%	0	0%	84	3
Kottayam	92	0.01	3.36	0.01	0.90	68	74%	10	11%	0	0%	14	15%	0	0%	0	0%	78	14
Kozhikode	81	0.01	5.46	0.02	0.99	66	81%	1	1%	1	1%	13	16%	0	0%	0	0%	68	13
Malappuram	116	0.01	5.57	0.02	4.65	72	62%	2	2%	3	3%	34	29%	3	3%	2	2%	77	39
Palakkad	101	0.04	8.49	0.05	4.88	69	68%	25	25%	2	2%	4	4%	0	0%	0	0%	97	4
Pathanamthitta	77	0.13	7.34	0.02	0.82	43	56%	19	25%	5	6%	10	13%	0	0%	0	0%	67	10
Thiruvananthapuram	83	0.05	7.12	0.81	2.70	44	53%	25	30%	12	14%	1	1%	1	1%	0	0%	81	2
Thrissur	101	0.02	9.20	0.02	2.94	38	38%	2	2%	5	5%	53	52%	3	3%	0	0%	45	56
Wayanad	75	0.06	6.72	0.06	4.86	50	67%	7	9%	5	7%	7	9%	3	4%	3	4%	62	13
State Total	**1234**	**0.01**	**9.20**	**0.01**	**4.88**	**798**	**65%**	**169**	**14%**	**58**	**5%**	**188**	**15%**	**14**	**1%**	**6**	**0%**	**1025**	**208**

Table 6.4: District wise – Water Level Fluctuation and frequency distribution for different ranges from January 2022 - decadal mean (January 2012-2021)

Districts	No of Wells Analysed	Range of Fluctuation (m)				No of Wells / Percentage Showing Fluctuation													
		Rise		Fall		Rise						Fall						Total No. of Wells	
						0 to 2		2 to 4		> 4		0 to 2		2 to 4		> 4			
		Min	Max	Min	Max	No	%	No	%	No	%	No	%	No	%	No	%	Rise	Fall
Alappuzha	73	0.01	5.84	0.02	1.67	43	59%	0	0%	1	1%	29	40%	0	0%	0	0%	44	29
Ernakulam	115	0.01	5.45	0.01	3.93	73	63%	2	2%	1	1%	37	32%	2	2%	0	0%	76	39
Idukki	71	0.01	3.00	0.03	4.98	53	75%	3	4%	0	0%	12	17%	2	3%	1	1%	56	15
Kannur	102	0.01	5.27	0.01	4.71	75	74%	2	2%	1	1%	21	21%	2	2%	1	1%	78	24
Kasaragod	120	0.01	6.21	0.02	4.97	69	58%	12	10%	1	1%	34	28%	0	0%	4	3%	82	38
Kollam	90	0.01	2.88	0.01	4.64	51	57%	3	3%	0	0%	31	34%	4	4%	1	1%	54	36
Kottayam	94	0.02	4.89	0.02	2.25	67	71%	3	3%	1	1%	21	22%	2	2%	0	0%	71	23
Kozhikode	86	0.01	2.99	0.02	4.73	61	71%	1	1%	0	0%	23	27%	0	0%	1	1%	62	24
Malappuram	115	0.01	6.05	0.03	2.75	76	66%	3	3%	1	1%	33	29%	2	2%	0	0%	80	35
Palakkad	115	0.01	7.01	0.01	4.03	76	66%	11	10%	2	2%	24	21%	1	1%	1	1%	89	26
Pathanamthitta	80	0.02	2.07	0.03	4.86	37	46%	2	3%	0	0%	37	46%	3	4%	1	1%	39	41
Thiruvananthapuram	101	0.01	7.55	0.01	4.04	63	62%	5	5%	8	8%	20	20%	4	4%	1	1%	76	25
Thrissur	107	0.01	6.83	0.01	4.4	60	56%	1	1%	1	1%	42	39%	1	1%	2	2%	62	45
Wayanad	65	0.01	2.49	0.01	3.75	46	71%	4	6%	0	0%	14	22%	1	2%	0	0%	50	15
State Total	**1334**	**0.01**	**7.55**	**0.01**	**4.98**	**850**	**64%**	**52**	**4%**	**17**	**1%**	**378**	**28%**	**24**	**2%**	**13**	**1%**	**919**	**415**

VII. LONG TERM GROUND WATER LEVEL TREND

The long-term water level data was analysed for the period of 2012-2021. The analysis of pre-monsoon water level trend for the last decadal period (i.e during 2012-2021) indicates that 32% of GWMWs have recorded negligible change in water level in the range of +0.05 to –0.05 m/year. 20 % of monitoring wells have recorded declining trend in the range of 0.05 to 0.2 m/year and 11 % of monitoring wells have recorded declining trend above 0.2 m/year. 23% of monitoring wells have recorded rising trend in the range of 0.05 to 0.2 m/year and 14% of monitoring wells have recorded rising trend above 0.2 m/year. Out of 1360 wells analysed declining trend in water level observed in 47% wells and rising trend in water level observed 53% wells. The maps showing pre-monsoon water level trend for the period 2012-2021 is shown in Figure 7.1

The analysis of post-monsoon water level trend for the last decadal period (i.e during 2012-2021) indicates that 24.8 % of GWMWs have recorded negligible change in water level in the range of +0.05 to –0.05 m/year. 7.7 % of monitoring wells have recorded declining trend in the range of 0.05 to 0.2 m/year and 2.3 % of monitoring wells have recorded declining trend above 0.2 m/year. 29.4 % of monitoring wells have recorded rising trend in the range of 0.05 to 0.2 m/year and 35.8 % of monitoring wells have recorded rising trend above 0.2 m/year. Out of 1387 wells analsed rising trend in water level observed in 80.2% wells and declining trend in 19.8% wells. The data analysis indicates that the long-term ground water level trend shows rising trend in major portions of the state. The maps showing post-monsoon water level trend for the period 2021-2022 is shown in Figure 7.2.

Typical hydrographs showing the negligible change in water level are depicted in Figures 8.1 & 8.2. Many of the monitoring wells which are showing declining pre-monsoon water level, have a rising or a steady post monsoon water level trend, indicating the enhanced ground water recharge to recoup to the original level (Figure 8.3 & 8.5). A few monitoring wells like Palakkad, Angadikkal North, Pathanamthitta District have shown falling trend of both pre-monsoon and post-monsoon water levels (Figure 8.9 & 8.10).

Figure 7.1

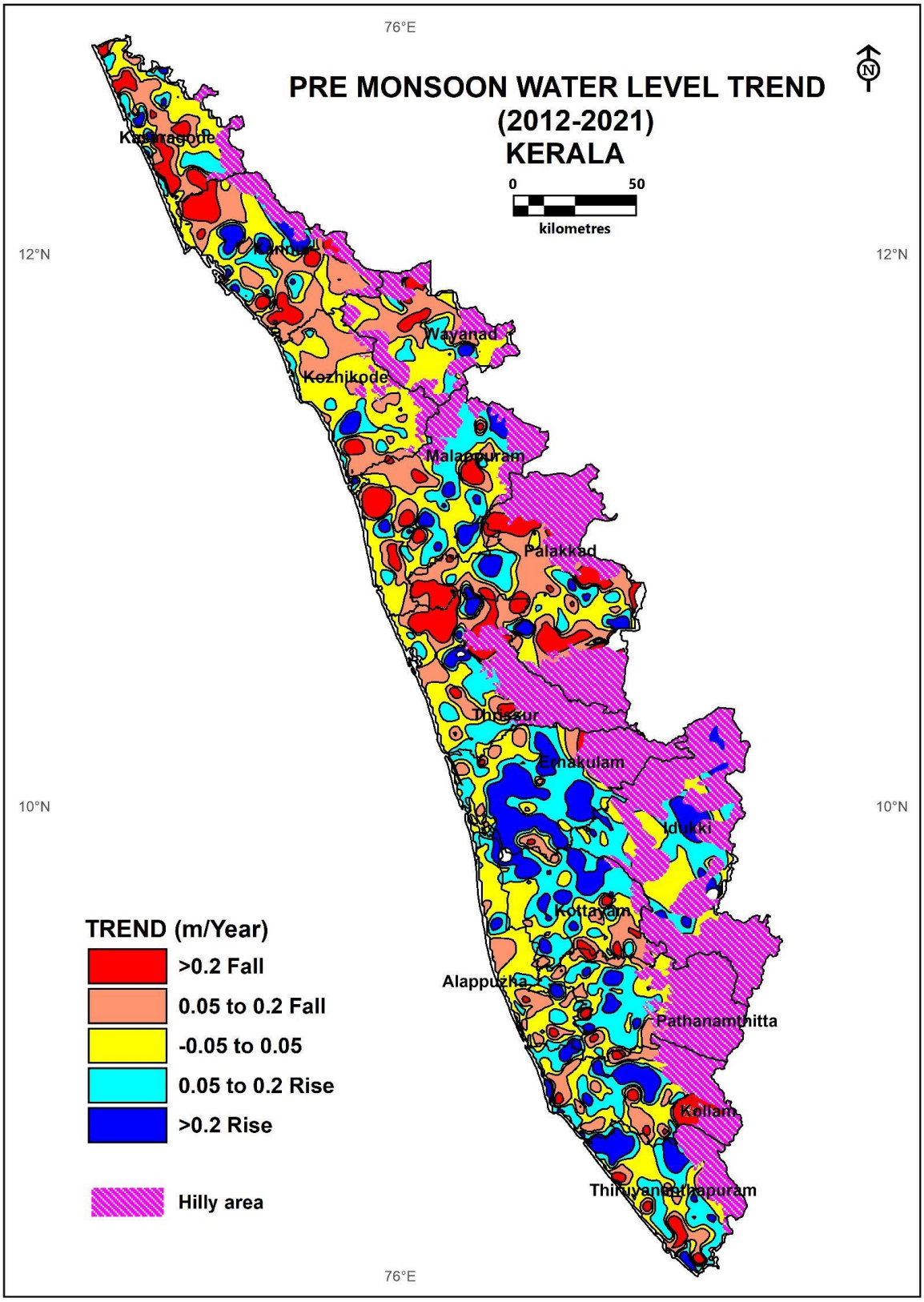

PRE MONSOON WATER LEVEL TREND
(2012-2021)
KERALA
0
50
kilometres
N
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
TREND (m/Year)
>0.2 Fall
0.05 to 0.2 Fall
-0.05 to 0.05
0.05 to 0.2 Rise
>0.2 Rise
Hilly area

Figure 7.2

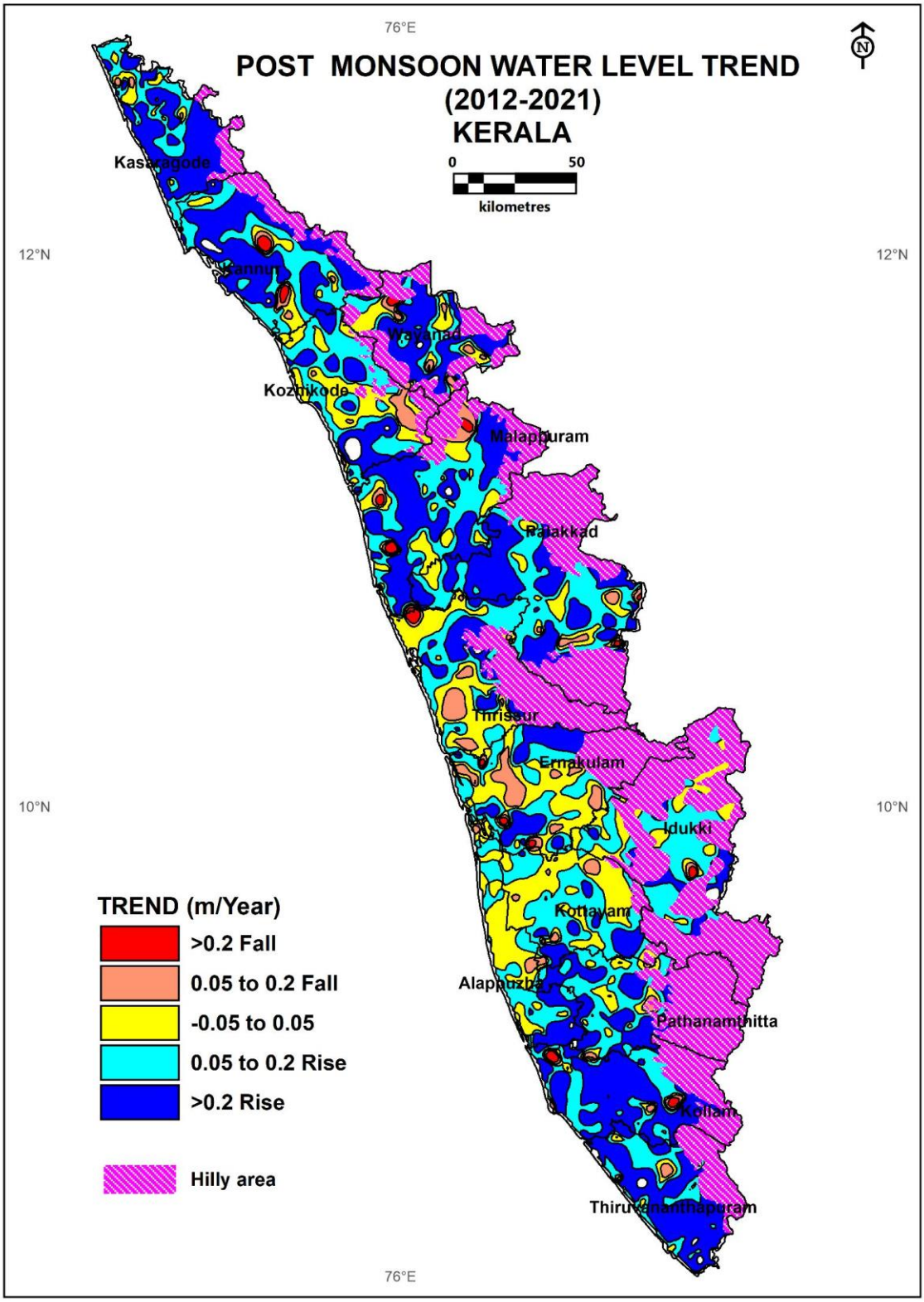

POST MONSOON WATER LEVEL TREND
(2012-2021)
KERALA
0
50
kilometres
76°E
12°N
10°N
Kasaragode
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Alappuzha
Pathanamthitta
Kollam
Thiruvananthapuram
TREND (m/Year)
>0.2 Fall
0.05 to 0.2 Fall
-0.05 to 0.05
0.05 to 0.2 Rise
>0.2 Rise
Hilly area

Figure 8.1

Hydrograph of GWMWs tapping phreatic aquifer in laterites at Arukutti, Alapuzha District

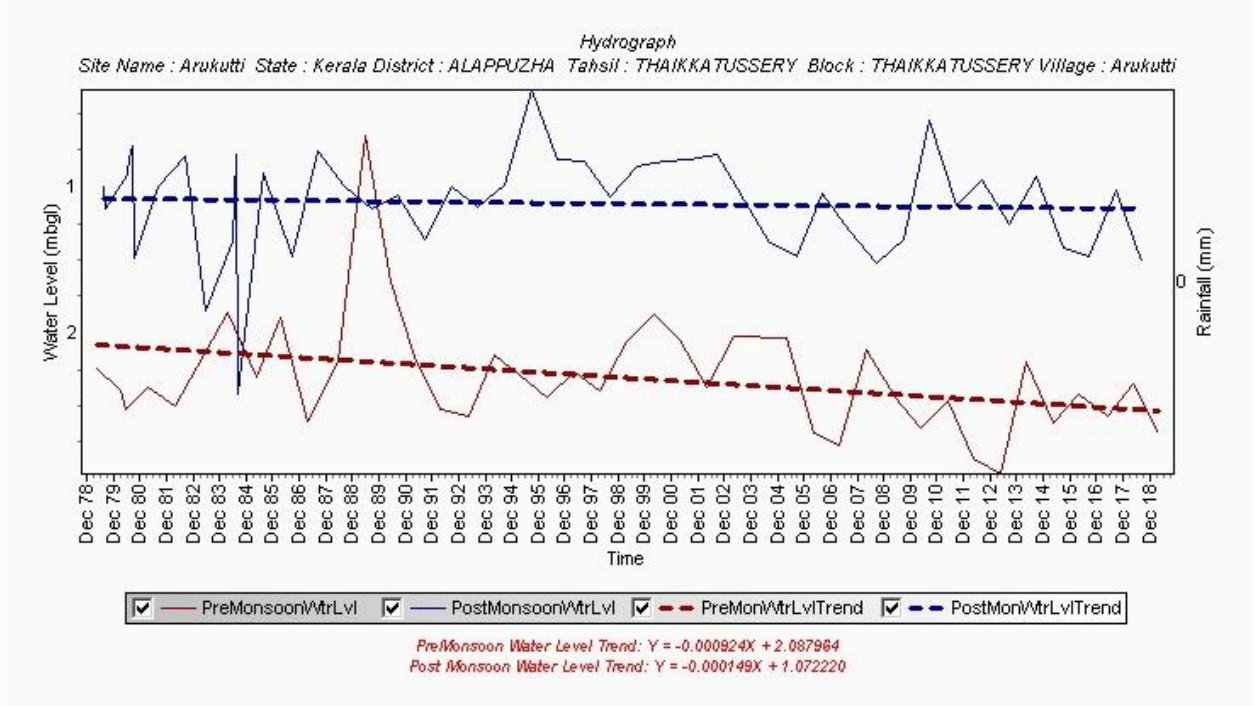


Figure 8.2

Hydrograph of GWMW tapping phreatic aquifer in laterites at Naykatti, Wayanad District

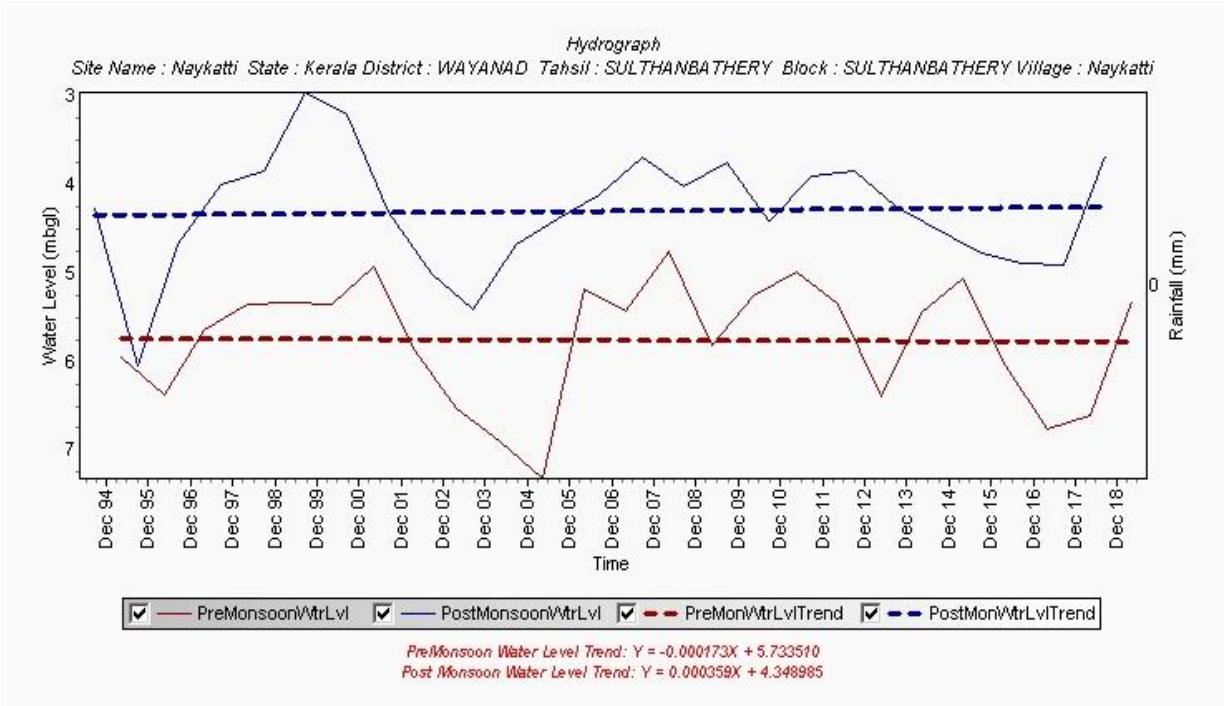


Figure 8.3

Hydrograph of GWMW tapping phreatic aquifer in laterites at Naduvathumuzhi, Pathanamthitta District

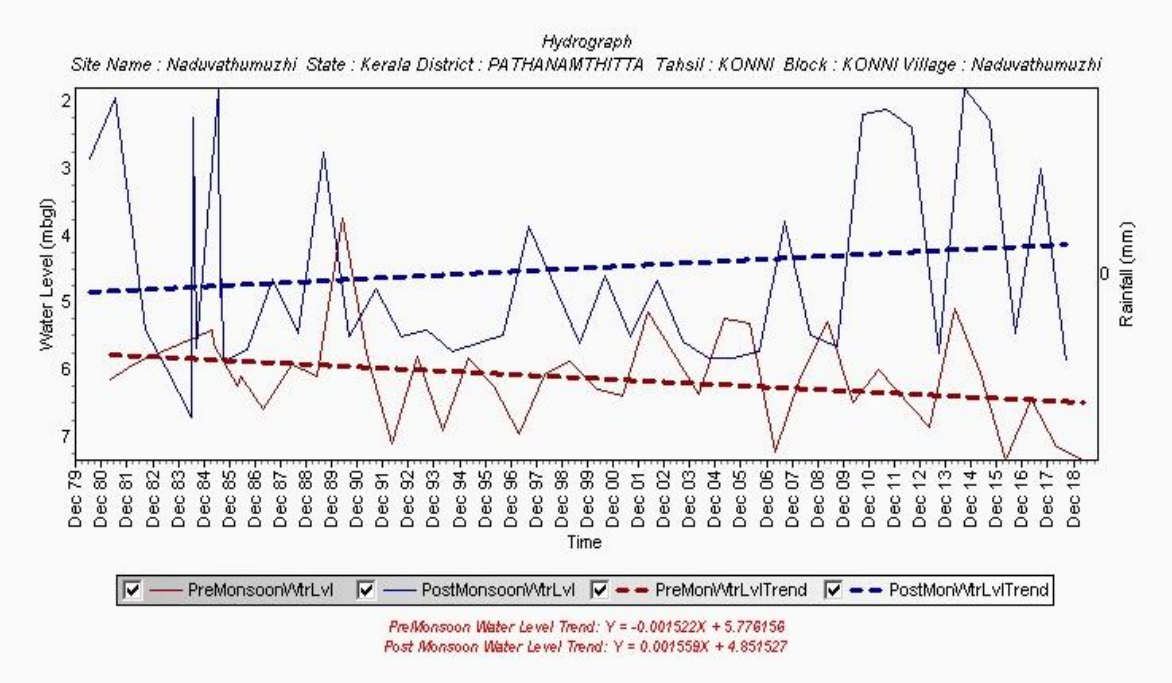


Figure 8.4

Hydrograph of GWMW tapping phreatic aquifer in laterites at Kasaragod, Kasaragod District

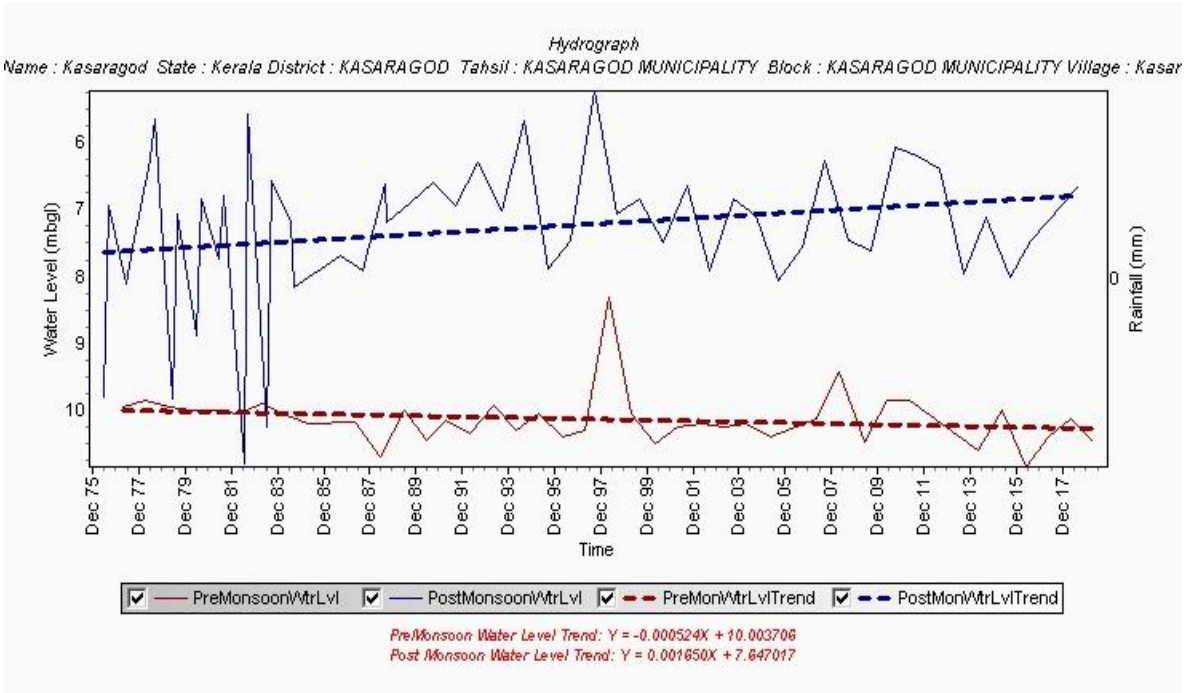


Figure 8.5

Hydrograph of GWMW tapping phreatic aquifer in laterites at Kozhikode, Kozhikode District

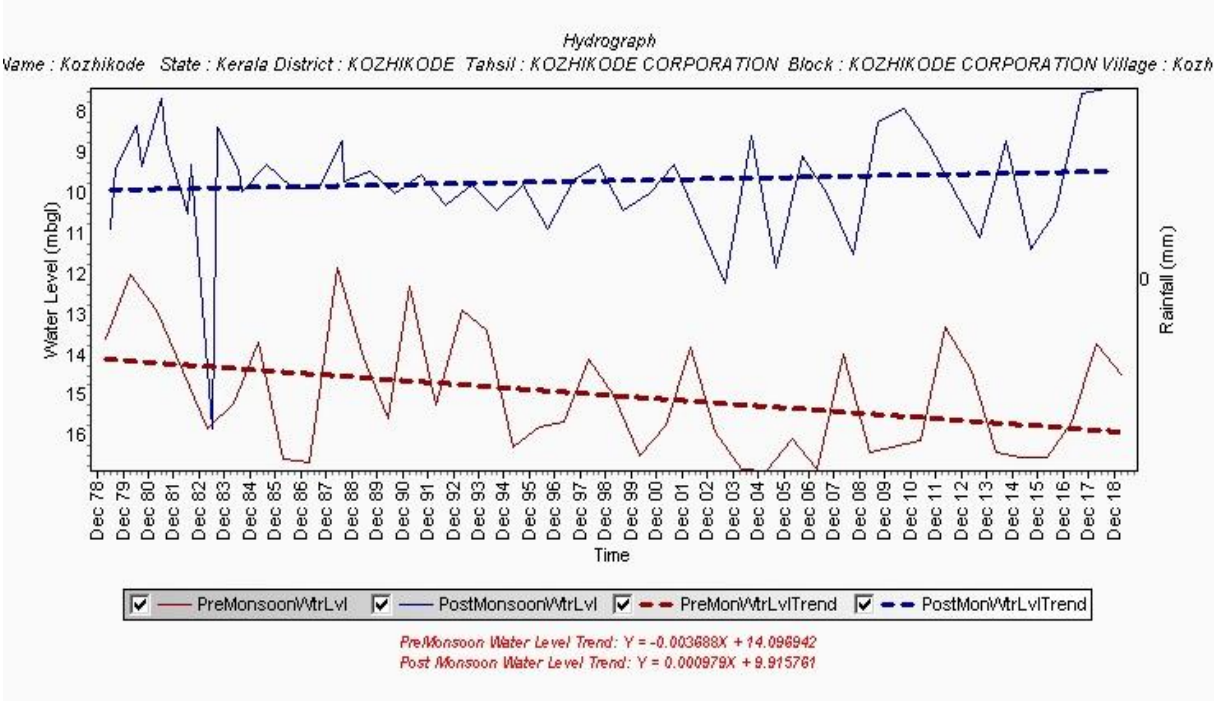


Figure 8.6

Hydrograph of GWMW tapping phreatic aquifer in weathered crystallines at Pullur, Kasaragod District

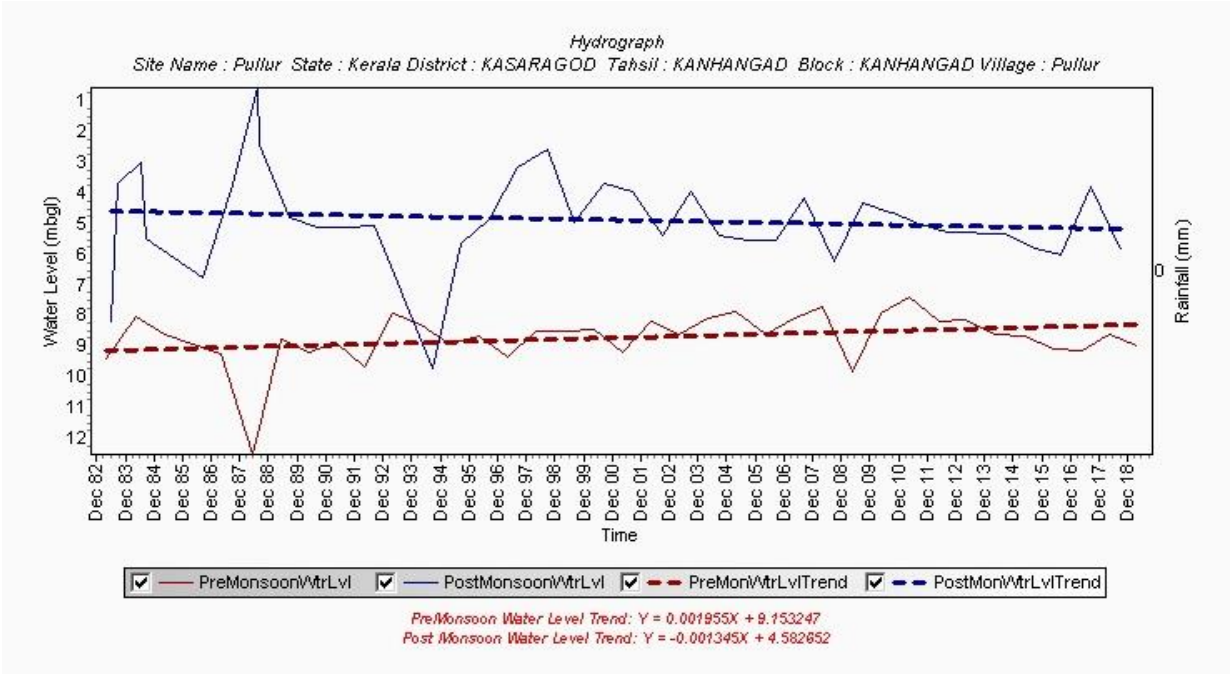


Figure 8.7

Hydrograph of GWMW tapping phreatic aquifer in laterites at Akkal, Kollam District

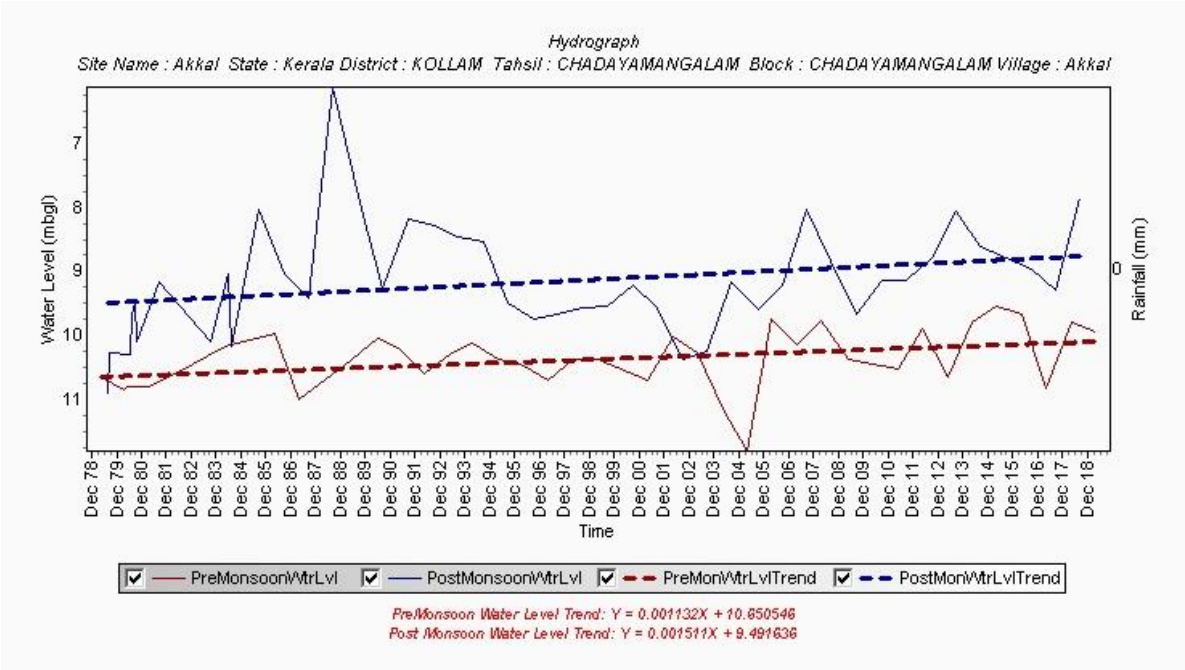


Figure 8.8

Hydrograph of GWMW tapping phreatic aquifer in laterites at Kottapadi, Ernakulam District

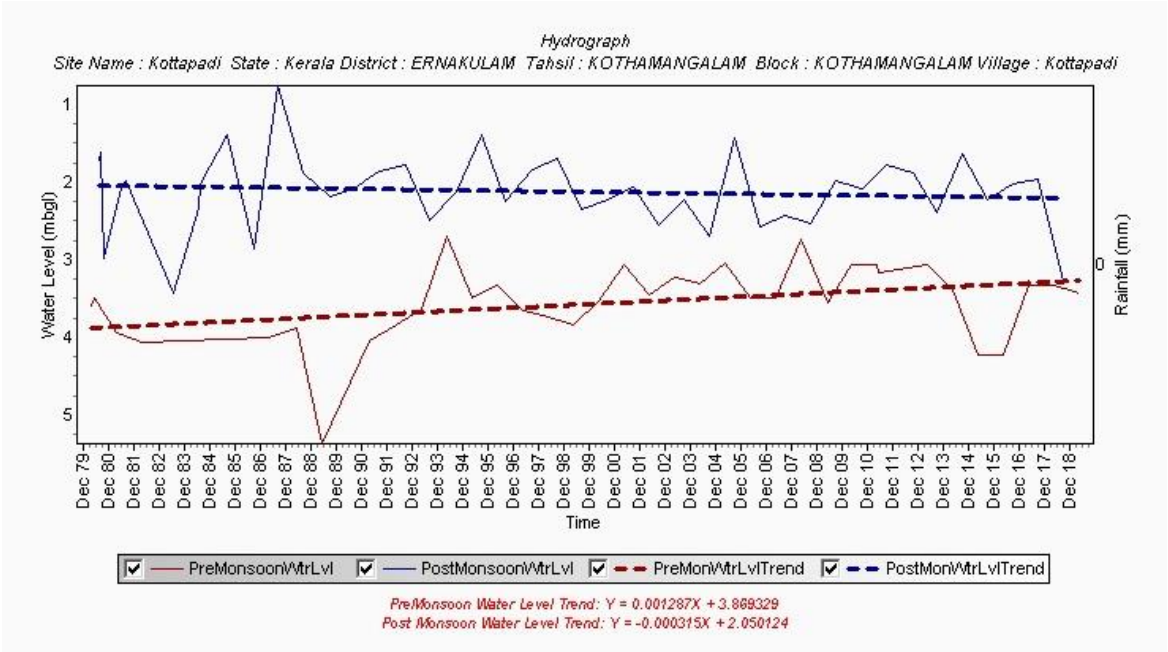


Figure 8.9

Hydrograph of GWMW tapping phreatic aquifer in laterites at Angadikkal North, Pathanamthitta District

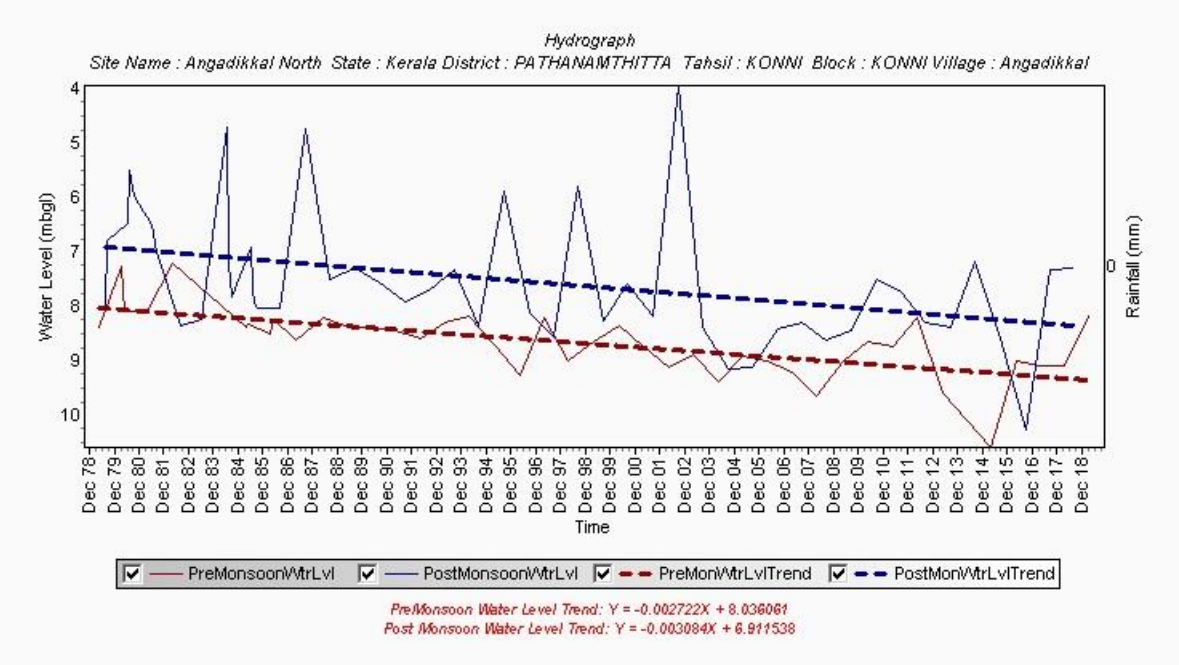
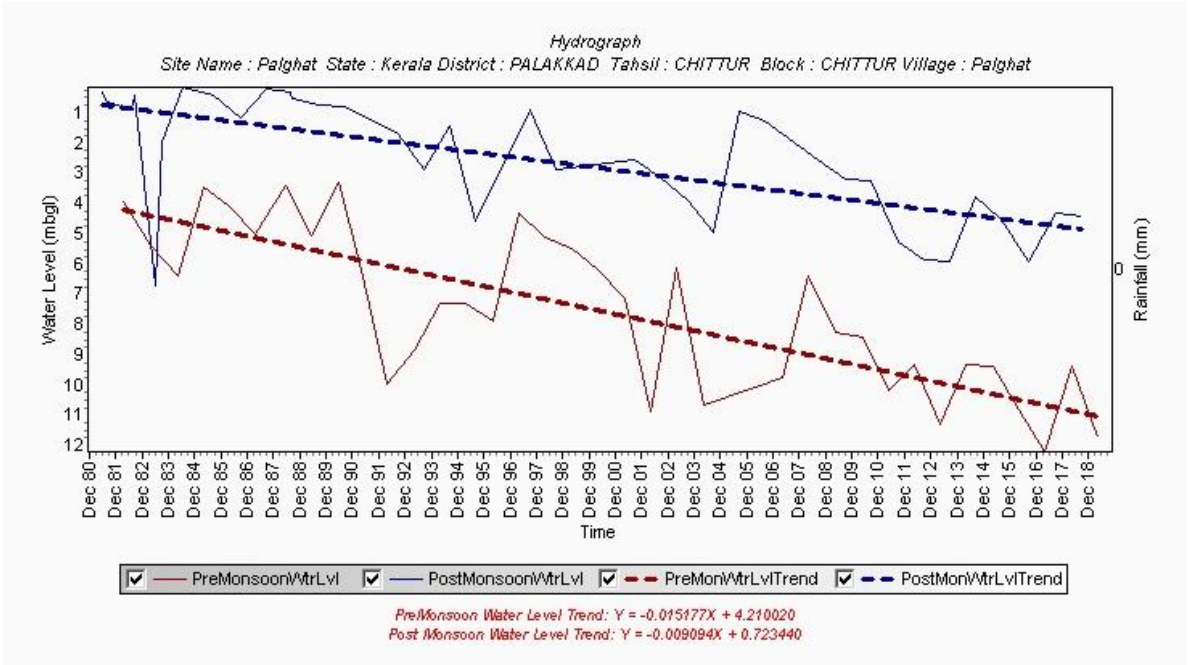


Figure 8.10

Hydrograph of GWMW tapping phreatic aquifer in laterites at Palaghat, Palakkad District



VIII. BEHAVIOUR OF PIEZOMETRIC HEADS IN DEEP AQUIFERS OF CONFINED/SEMICONFINED NATURE DURING THE YEAR 2021-2022

A total of 217 piezometers constructed by CGWB in various districts of the State are being monitored four times a year. Out of these 50 piezometers (Tube wells) are constructed in sedimentary areas. The depth range of these piezometers is from 10 m to 450 m. The remaining 167 piezometers (Bore wells) are in hard rock areas and the depth range of these wells is from 10 m. to 300 m. About 44% of these borewells are tapping shallow fracture zones within 30 metres depth. These wells were manually monitored for water level during the months of April, August, November and January 2021-2022. The analysis of the data acquired from these piezometers is discussed below.

Sedimentary area:

In the deeper aquifers of Tertiary age, ground water occurs under confined / semi-confined conditions. In the shallow aquifers in Tertiary formation in northern Kerala and in recent alluvial formations in coastal plains, ground water occurs under unconfined to semi-confined condition. The piezometric heads in these aquifers is at about 18 m. amsl in the eastern boundary of recharge areas of Tertiary beds and reduced to near MSL in coastal areas. The depth to piezometric heads in deep tube wells tapping confined aquifers ranged from 0.7 to 19.85 mbgl during April 2021 (pre monsoon) and varied from 0.64 to 17.2 mbgl during November 2021 (post monsoon). The annual fluctuation of the piezometric head in the year 2021-2022 is mostly restricted to 6 metres. Analysis of the long term piezometric head data of deeper aquifers at Karthikapally tapping Quilon and Warkali formations are showing a declining trend in both during pre-monsoon and post-monsoon. Hydrographs of piezometers at Karthikapally (Alleppey District) tapping Warkali and Quilon aquifers are shown in Figs 8.11 & 8.12.

Crystalline Area:

In hard rock areas, groundwater occurs under confined / semi-confined conditions in the deep fracture zones and unconfined to semi-confined conditions in shallow fractured zones. The depth to piezometric heads in bore wells tapping semi confined/ confined aquifers varied from 0.42 to 26.72 mbgl during April 2021(pre monsoon). The depth to piezometric head of bore wells tapping semi confined/ confined aquifers varied from ground level to 31.5 mbgl during November 2021 (post monsoon). The annual fluctuation of piezometric head (between April

and November months) is in the range of -3.08 to 16.85 metres. The hydrographs of the hard rock piezometers are given in Figs. 8.13 & 8.14.

Table 8.1 & Table 8.2 shows district wise distribution of wells tapping confined and semiconfined aquifers in both sedimentary and crystalline areas in different ranges of depth to piezometric head values. Out of 59 wells monitored 7% wells recorded depth to piezometric head in the range 0 – 2 m, 15% wells in 2 – 5 m, 32% wells in 5 – 10 m, 36% wells in 10 – 20 m and 10% wells in 20 – 40 m range during premonsoon season. Out of 65 wells monitored 12% wells recorded depth to piezometric head in the range 0 – 2 m, 22% wells in 2 – 5 m, 38% wells in 5 – 10 m, 14% wells in 10 – 20 m and 9% wells in 20 – 40 m range.

Fig 8.11 Hydrograph of Piezometer tapping Warkalai aquifer at Karthikapally, Alappuzha.

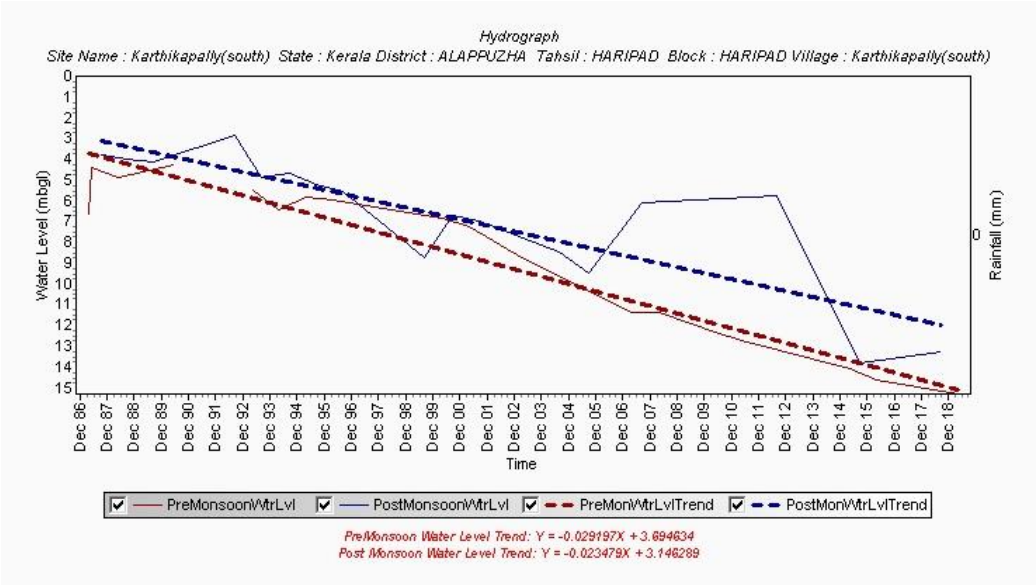


Fig 8.12 Hydrograph of Piezometer tapping Quilon aquifer at Haripad(e), Alappuzha District

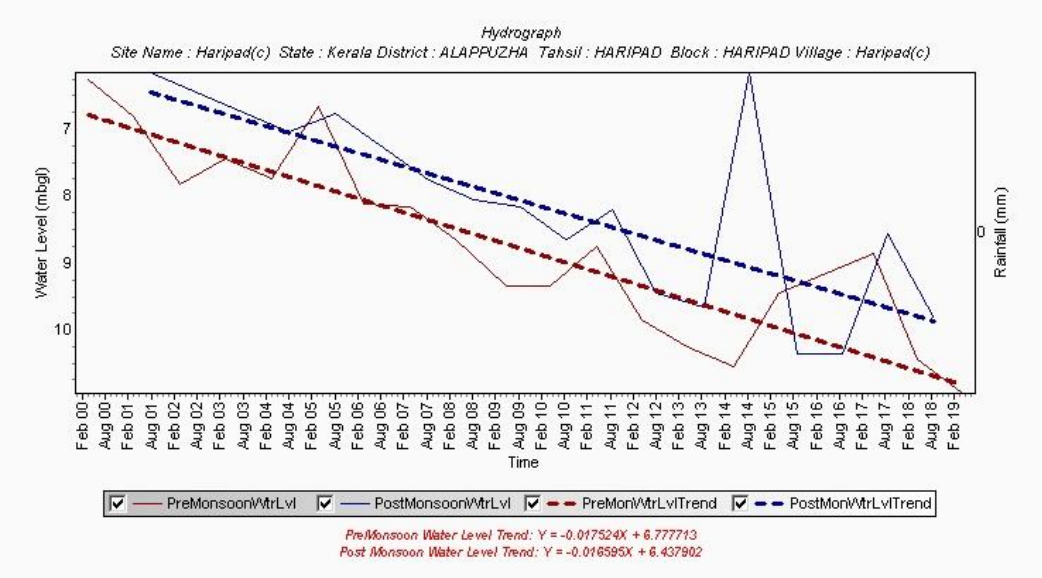


Fig 8.13 Hydrograph of Piezometer tapping fractured aquifers at Veliyanad, Ernakulam District

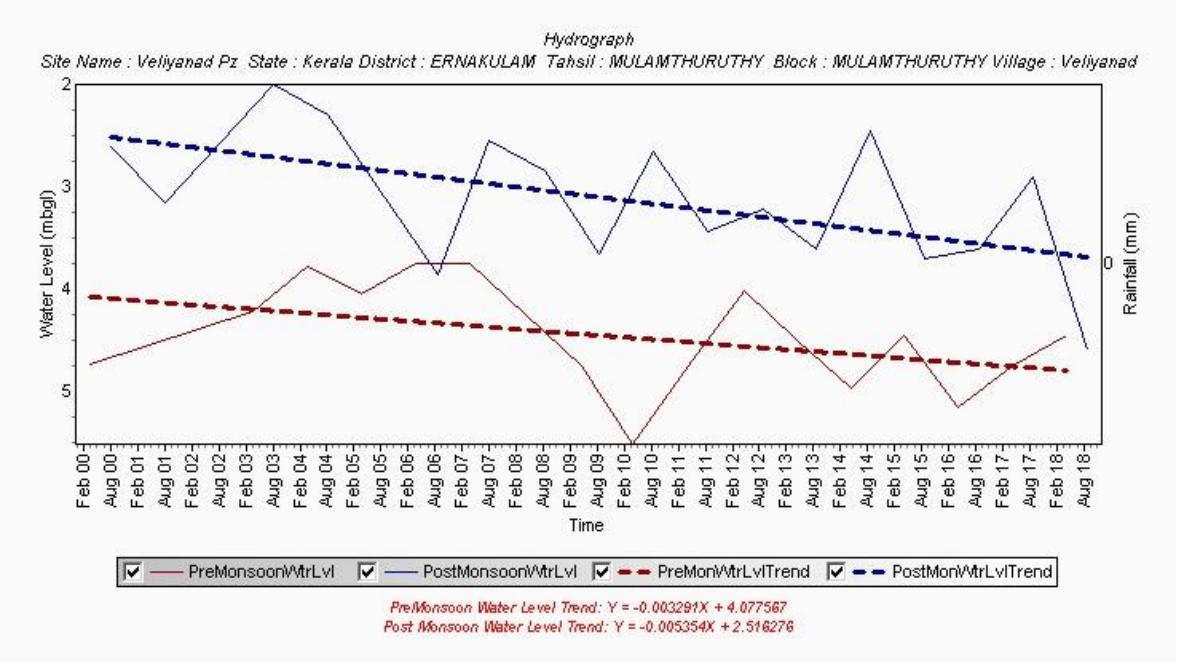


Fig. 8.14: Hydrograph of Piezometer tapping fractured aquifers at Mavoor-I, Kozhikode District

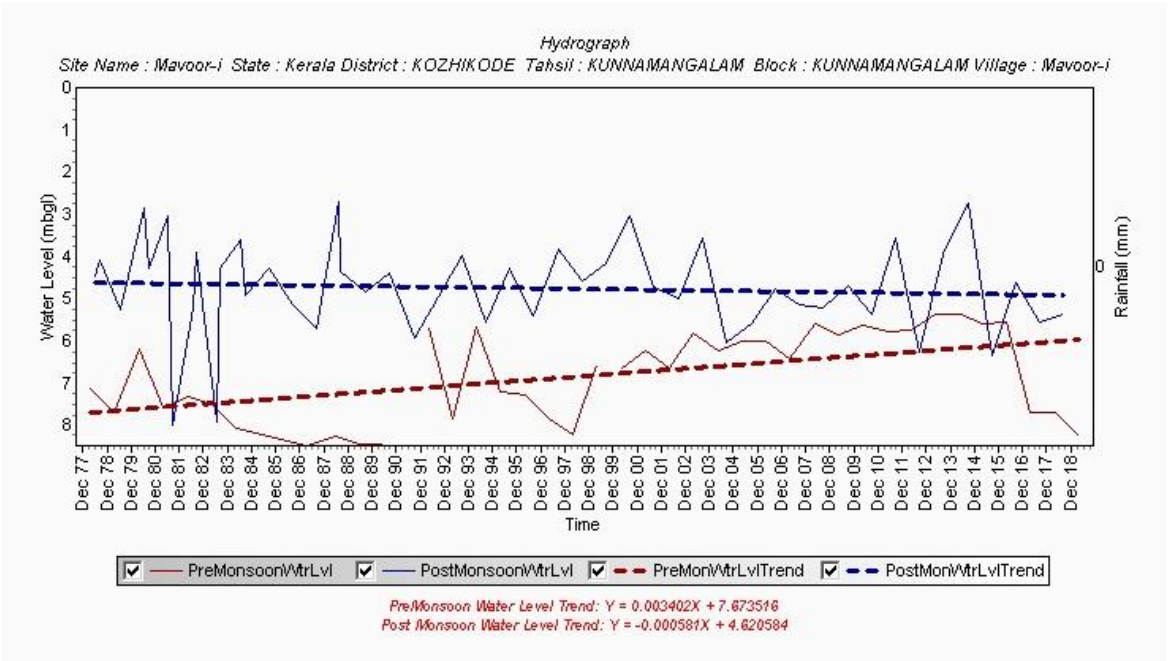


Table 8.1: District wise Distribution of Percentage of wells tapping Semi confined/Confined Aquifers in Pre-Monsoon (April, 2021)

DEPTH TO PIEZOMETRIC HEAD													
Distribution of Percentage of wells tapping Semi confined/Confined Aquifers in Pre-Monsoon (April, 2021)													
District	No of Wells Analysed	Depth to Water Table (m bgl)		No and Percentage of Wells Showing Depth to Piezometric Head (m bgl) in the Range of									
				0.0 - 2.0		2.0 - 5.0		5.0- 10.0		10.0 - 20.0		20.0 - 40.0	
		Min	Max	No	%	No	%	No	%	No	%	No	%
Alappuzha	4	5.47	17.60	-	-	-	-	2	50%	2	50%	-	-
Ernakulam	1	-	5.75	-	-	-	-	1	100%	-	-	-	-
Idukki	1	-	10.18	-	-	-	-	-	-	1	100%	-	-
Kannur	1	-	13.00	-	-	-	-	-	-	1	100%	-	-
Kasaragod	2	14.70	24.80	-	-	-	-	-	-	1	50%	1	50%
Kollam	4	0.42	15.10	2	50%	-	-	1	25%	1	25%	-	-
Kottayam	1	-	1.92	1	100%	-	-	-	-	-	-	-	-
Kozhikode	2	4.78	8.11	-	-	-	-	2	100%	-	-	-	-
Malappuram	7	2.96	25.62	-	-	1	14%	2	29%	3	43%	1	14%
Palakkad	16	3.00	26.10	-	-	3	19%	7	44%	3	19%	3	19%
Pathanamthitta	4	2.80	11.31	-	-	3	75%	-	-	1	25%	-	-
Thiruvananthapuram	4	6.6	19.85	-	-	-	-	2	50%	2	50%	-	-
Thrissur	10	8.88	26.72	1	10%	-	-	2	20%	6	60%	1	10%
Wayanad	2	2.64	2.94	-	-	2	100%	-	-	-	-	-	-
State Total	**59**	**0.42**	**26.72**	**4**	**7%**	**9**	**15%**	**19**	**32%**	**21**	**36%**	**6**	**10%**

Table 8.2: District wise Distribution of Percentage of wells tapping Semi confined/Confined Aquifers in Post-Monsoon (November, 2021)

DEPTH TO PIEZOMETRIC HEAD												
Distribution of Percentage of wells tapping Semiconfined/ Confined Aquifers in Post Monsoon (November 2021)												
District	No of Wells Analysed	Depth to Water Table (m bgl)		No and Percentage of Wells Showing Depth to Piezometric Head (m bgl) in Range of								
				0.0 - 2.0		2.0 - 5.0		5.0- 10.0		10.0 - 20.0		20.0 - 40.0	
		Min	Max	No	%	No	%	No	%	No	%	No	%
Alappuzha	4	3.88	14.81	-	-	2	50%	2	50%	-	-	-	-
Ernakulam	2	4.83	5.48	-	-	1	50%	1	50%	-	-	-	-
Idukki	1	-	6.96	-	-	-	-	1	100%	-	-	-	-
Kannur	1	-	6.80	-	-	-	-	1	100%	-	-	-	-
Kasaragod	2	6.15	22.75	-	-	-	-	1	50%	-	-	1	50%
Kollam	3	0.00	16.70	1	33%	-	-	-	-	2	67%	-	-
Kottayam	1	-	1.69	1	100%	-	-	-	-	-	-	-	-
Kozhikode	2	3.19	6.60	-	-	1	50%	1	50%	-	-	-	-
Malappuram	6	2.15	16.30	-	-	2	33%	3	50%	2	33%	2	33%
Palakkad	23	1.08	31.50	3	13%	5	22%	7	30%	-	-	2	9%
Pathanamthitta	4	1.21	8.40	1	25%	2	50%	1	25%	-	-	-	-
Thiruvananthapuram	4	6.06	13.59	-	-	-	-	2	50%	2	50%	-	-
Thrissur	10	0.64	20.98	1	10%	-	-	5	50%	3	30%	1	10%
Wayanad	2	0.78	2.25	1	50%	1	50%	-	-	-	-	-	-
State Total	**65**	**0.00**	**31.50**	**8**	**12%**	**14**	**22%**	**25**	**38%**	**9**	**14%**	**6**	**9%**

IX HYDROCHEMISTRY

Ground water is playing a leading role in the development of our Nation. Even though approximately three-fourth of the surface of the earth is covered by water, the availability of fresh water for human consumption is limited. The importance of ground water is being felt by all sectors because of the shortage of surface water sources to mitigate the growing needs of the society. Ground water resources have been exploited through irrigation and shifts in cultivation to water intensive cash crops like sugarcane. But unregulated ground water withdrawal is not the only factor leading to the scarcity of safe drinking water. Much of the water used by the population especially in the rural areas is derived from ground water. Bacterial contamination of water accounts for many diseases caused in the developing countries. Inorganic, organic and biological constituents present in water also determine its suitability for drinking purposes. Recently the problems of decline in water table, contamination of ground water, seawater intrusion etc. are being reported in various places.**1.**

1. Groundwater contamination:

Water gathers constituents from the rocks and ground through which it permeates. Groundwater generally has higher dissolved mineral concentrations than surface waters. This is due to the contact between the CO_2 bearing water and rocks and soils in the ground and availing the longer period of time for dissolution. Additionally, CO_2 may be added to the water in the soil by the activities of the soil microorganisms. As water leaves the soil zone and passes through the groundwater system, the concentration of organic matter greatly decreases (either through bacterial decay or adsorption) and the concentration of the common major ions increases. Contamination of groundwater depends on at least three factors, viz.:

1. The vulnerability of the groundwater in the particular area of contamination: This depends on types of soil and geologic characteristics of the formation, including depth to the water table, texture of the soil and bedrock characteristics. For example, groundwater underlying sandy soil is more vulnerable than groundwater under clay soil; shallow aquifers are more vulnerable than deeper aquifers.

2. Well depth and construction: with shallow wells being more susceptible to contamination than deep wells and wells that are not adequately sealed at the top or defective in construction bringing in contamination

3. The availability of excess pollutants leaching to the groundwater: which may be either due to seepage of industrial pollutants, chemical fertilizers and pesticides in agricultural fields or mineral constituents in the formation itself where ground water occurs.

2. Water Quality Monitoring:

In order to assess the real situation of ground water condition as mentioned above, it is very essential to monitor the ground water level and water quality over time and space. Evaluating ground water quality is as important as determining its quantity since quality determines its suitability for various purposes notably for domestic and agricultural use. Hence, it has become essential to generate ground water quality data of the area to be managed.

The main objectives or purposes for water quality monitoring for surface and ground water agencies is as follows:

- To establish base level background data of water quality parameters
- To observe trend in water quality changes over time and space
- Uses of water. Does water meet user requirements for quantity and quality?
- To evaluate the impact of degraded water quality and prepare remedial action plans
- To set up surveillance systems

3. Objectives and Methodology:

Water quality investigations are conducting in the Chemical Laboratory of Central Ground Water Board (CGWB), Kerala Region, Trivandrum with a view to assess the suitability of ground water for various uses like drinking, irrigation, industrial use etc. The chemical Laboratory of CGWB, Kerala Region is equipped with all the major instruments like Atomic Absorption Spectrophotometer, UV-VIS Spectrophotometer, Visible Spectrophotometer, and Flame photometer, Ion Chromatograph, pH meter and EC meter to carry out the analytical work. To determine the various parameters in the chemical laboratory, the analytical methods followed are as per Standard Methods (APHA, 2017), and are summarized in Table No.9.1.

Table -9. 1: Analytical method of the parameters analysed in CGWB, KR Laboratory

Sl.No.	Parameters	Instrument used	Methods Adopted
1	pH	pH Meter	Potentiometric
2	Electrical Conductivity	EC Meter	Conductivity Cell Potentiometric
3	Total Hardness	By Titration	EDTA Titrimetric
4	Calcium	By Titration	EDTA Titrimetric
5	Magnesium		By Computation using 'TH' and 'Ca' Data
6	Sodium	Flame Photometer	Flame Emission Photometry
7	Potassium	Flame Photometer	Flame Emission Photometry
8	Carbonate	By Titration	Volumetric Analysis

9	Bicarbonate	By Titration	Volumetric Analysis
10	Chloride	By Titration	Argentometric
11	Sulphate	Spectrophotometer& Nephelo Turbidimeter	Turbidimetric
12	Fluoride	Spectrophotometer& Ion Meter	SPADNS Method & With ION Selective Electrode
13	Nitrate	UV-VIS Spectrophotometer & Ion Chromatograph	Ultraviolet Spectrophoto metric Screening
14	Phosphate	Ion Chromatograph	Ion Chromatograph
15	Bromide	Ion Chromatograph	Ion Chromatograph
16	Heavy Metals	Atomic Absorption Spectro photometer	Flame Atomic Absorption Method

Source: APHA, 2012

During the year 2021-22, 1682 numbers of water samples were received from 14 districts of Kerala state pertains to basic (609), Uranium (552) and Heavy metals (521) analysis for different studies like NHS, National Aquifer mapping, Exploration, Pollution and other scientific studies. The location details of the study area are given in Fig 1. The chemical analysis was carried out in the Regional Chemical Laboratory, Kerala region, Trivandrum and summarized in the Table No 9.2.

Table no 9.2. Number of Samples Analyzed in Kerala Regional Laboratory.

Item	Basic analysis	Heavy Metals	Uranium
Aquifer Mapping	102	90	102
National Hydrograph stations	352	352	352
Exploration	20	0	7
others	135	79	91
TOTAL	609	521	552

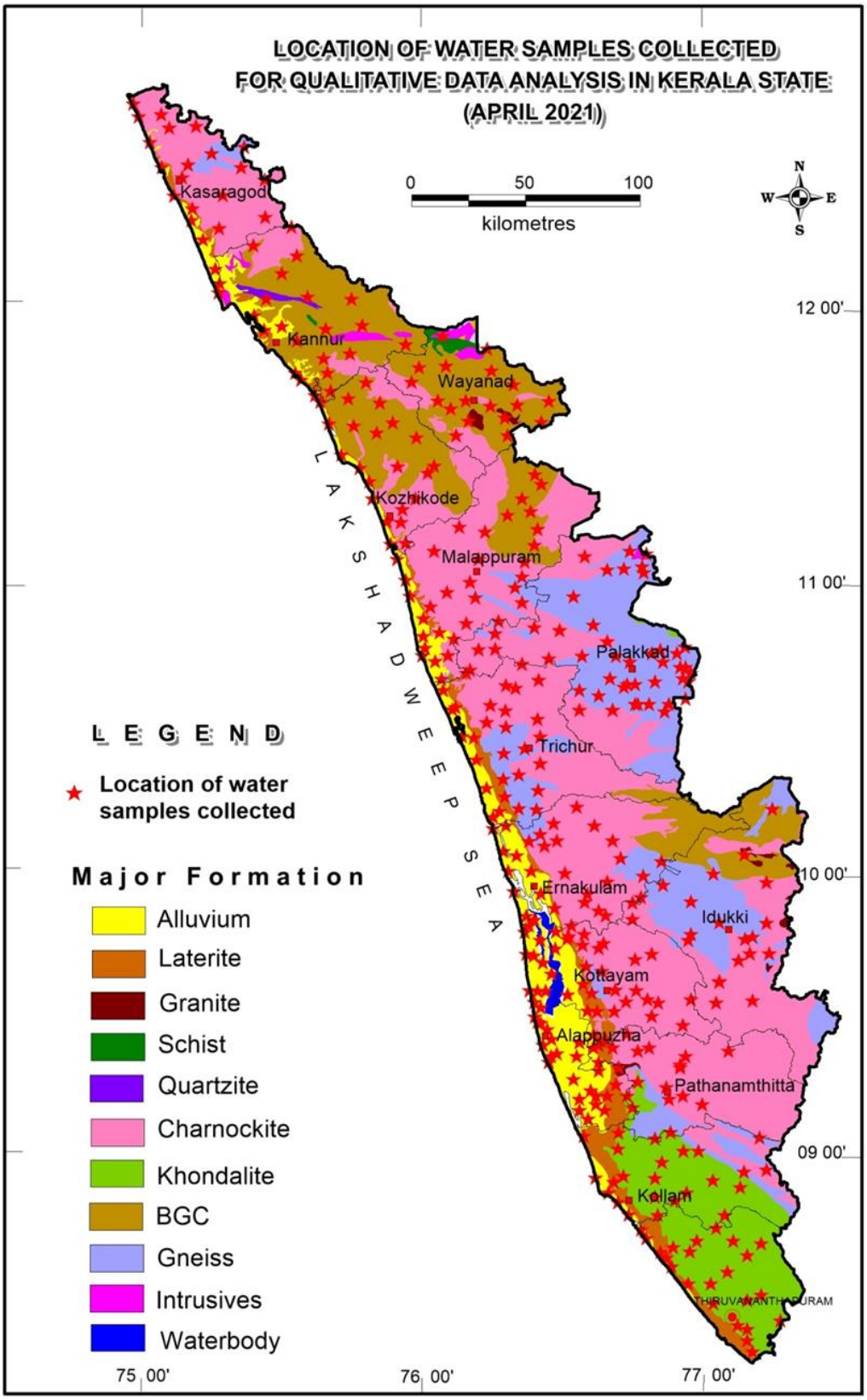


Figure 9.1. Map showing locations of water sample collected from Kerala State.

Ground water samples have been analysed and have interpreted for these study.13 chemical variables (specific conductance, pH, Total Hardness, Ca, Mg, Na, K, Cl, SO4, NO3, CO3, HCO3, and F) were analysed for water quality interpretation. The chemical quality of shallow ground water in Kerala State has been evaluated by sampling and analysing the water samples ground water, Surface water including Trend cum Surveillance at Alppuza and Palakad districts. So as to minimize the effects of biological activities and pollution from point sources the water samples are collected from the wells in the month of April. The range of chemical parameters in the study area based on the ground water data 2021-22 (i.e. 373 water samples including NHS and Trend cum Surveillance only) are given table no 9.3. Detailed Chemical analysis data of the samples summarized in annexure No II.

Table 9.3. The range of chemical parameters in the study area of CGWB –KR Region

S. NO.	PARAMETER	UNIT	RANGE		BIS STANDARD FOR DRINKING WATER	
			MIN	MAX	ACCEPTABLE LIMIT	PERMISSIBLE LIMIT
1	pH	……..	3.06	9.73	6.5-8.5	No relaxation
2	Specific Conductance	µS/cm @ 25^0C	28	2600	1000	3000
3	Chloride	mg/l	0.78	772.0	250	1000
4	Fluoride	mg/l	ND	2.00	1.0	1.5
5	Nitrate	mg/l	ND	144.0	45.0	No relaxation
6	Total hardness as CaCO3	mg/l	2.1	494.0	200.0	600.0
7	Calcium	mg/l	1.00	132.0	75	200
8	Magnesium	mg/l	ND	74.1	30	100
9	Sulphate	mg/l	0.28	236.0	200	400
10	Sodium	mg/l	0.16	394.0	-	-
11	Potassium	mg/l	ND	75.0	-	-

In Kerala State a vast majority of the area, quality of groundwater is suitable for domestic and irrigation and industrial purposes. The chemical contamination of groundwater in the State in

some parts is due to agricultural activities, industrialisation, population growth and geological activity with certain areas of Palakkad and Alappuzha districts registering relatively higher Electrical conductivity and fluoride consistently for over a decade. For effective maintenance of water quality, appropriate control measures have to be initiated and to know what extent pollution is occurred at a particular source of water, the constant analysis of physical, chemical and biological quality of water is essential. The main hydro chemical finding with different parameters in this region is as follows.

4.Specific Conductance

(i) Electrical Conductivity

The electrical conductivity of water is its ability to carry electric current. The ions of the constituents dissolved in water are responsible for conducting the electric current. Hence the electrical conductivity value is proportional to the constituents dissolved in the water and the measurement of electrical conductivity can be used to find out the total dissolved solids of the sample. Kerala state receives a very good amount of rain during the monsoon period. Because of this intense rainfall and steep topographic gradient actively flushes the products of weathering leading to low dissolved solids in ground water. Also ground water is generally filtered and purified naturally by the earth.

As per the data presented in the **Appendix I**, the shallow ground water in Kerala State is generally of good quality. Out of 373 water samples, the electrical conductivity value of 318 (85.3%) water samples are in the range 0-500 micro siemens/cm at 25^0C, 38 (10.2%) water samples are in the range of 501-1000 micro siemens/cm at 25^0C and 14 (3.7%) water samples are in the range 1001-2000 micro siemens/cm at 25^0C. The highest electrical conductivity value of > 2000microsiemens/cm at 25^0C is registered in 3 wells in Palakad and Alappuzha. The locations where the electrical conductivity value had exceeded 1000 micro siemens/cm at 25^0C in districts are all in Coastal plains. Due to closeness to sea and backwaters even during the summer months a marginal increase of dissolved solids is observed in the wells situated in coastal area.

Table 9.4. Showing Wells having Electrical conductivity > 2000 micro siemens/cm at 25^0C

S.No.	District	Village	Latitude	Longitude	EC
1	Palakkad	Koppanur	10.7600	76.7800	2300
2	Alappuza	Komalapuram-1	9.5422	76.3422	2600
3	Alappuza	Komalapuram-2	9.488	76.3422	2500

The frequency distribution of electrical conductivity data of Ground Water Monitoring Wells of Kerala State is presented in state wise and district wise in Tables No. 9.4, 9.5 and Figure No. 9.2.

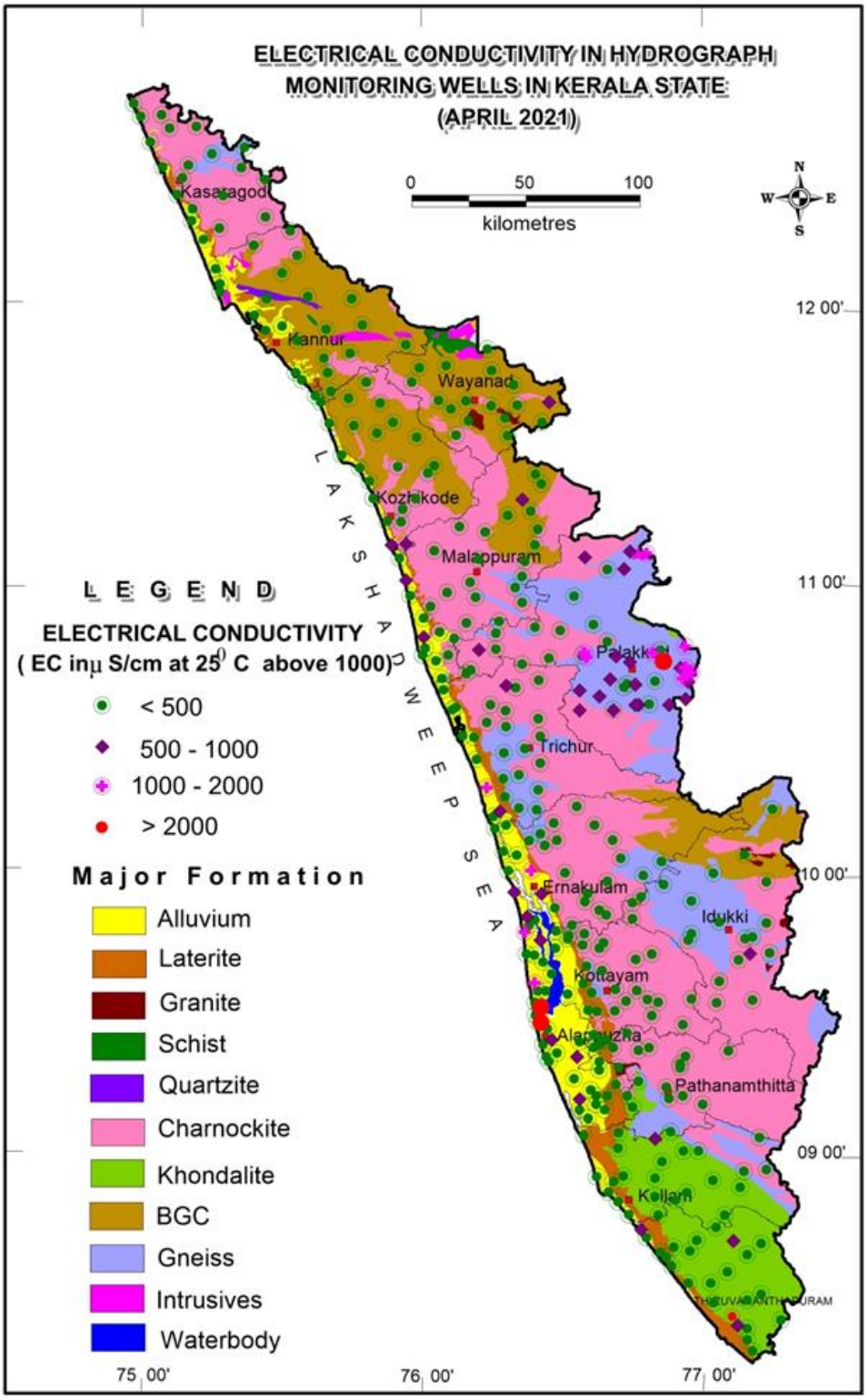


Figure 9.2. Showing distribution of Electric Conductivity in the study area

Table 9.5: Frequency Distribution of Electrical Conductivity in Ground Water Monitoring Wells in Kerala State

Electrical Conductivity Range (microsiemens/cm at 25^0C)	No. of Monitoring Wells	(%)
0-500	318	85.3
501-1000	38	10.2
>1000<2000	14	3.7
>2000	3	0.8

5.pH

pH values of the water sample from the monitoring wells ranges from 3.06 to 9.73. It shows some wells are acidic in nature some are alkaline in nature. 43 samples show pH < 6.5 while 17 samples having high pH > 8.5 and rest 313 water samples having pH within the range 6.5-8.5 prescribed by BIS for drinking purpose. The lower pH may be attributed to the high rain fall and low water table condition favors slightly acidic water in shallow aquifer system in Kerala, particularly lateritic terrains of Kerala. Very low pH also have observed in polluted area were high nitrate and sulphate are present in ground water.

6.Chloride

Chloride ranges from 0.78 to 772.0 mg/L. 98.93 % water samples reported having less than 250 mg/l of chloride and within the acceptable limit of BIS and can be used for all-purpose. Rest 4 (1.07 %) of samples has Chloride concentration more than 250 mg/l but less than 1000 mg/L Table No. 9.6.

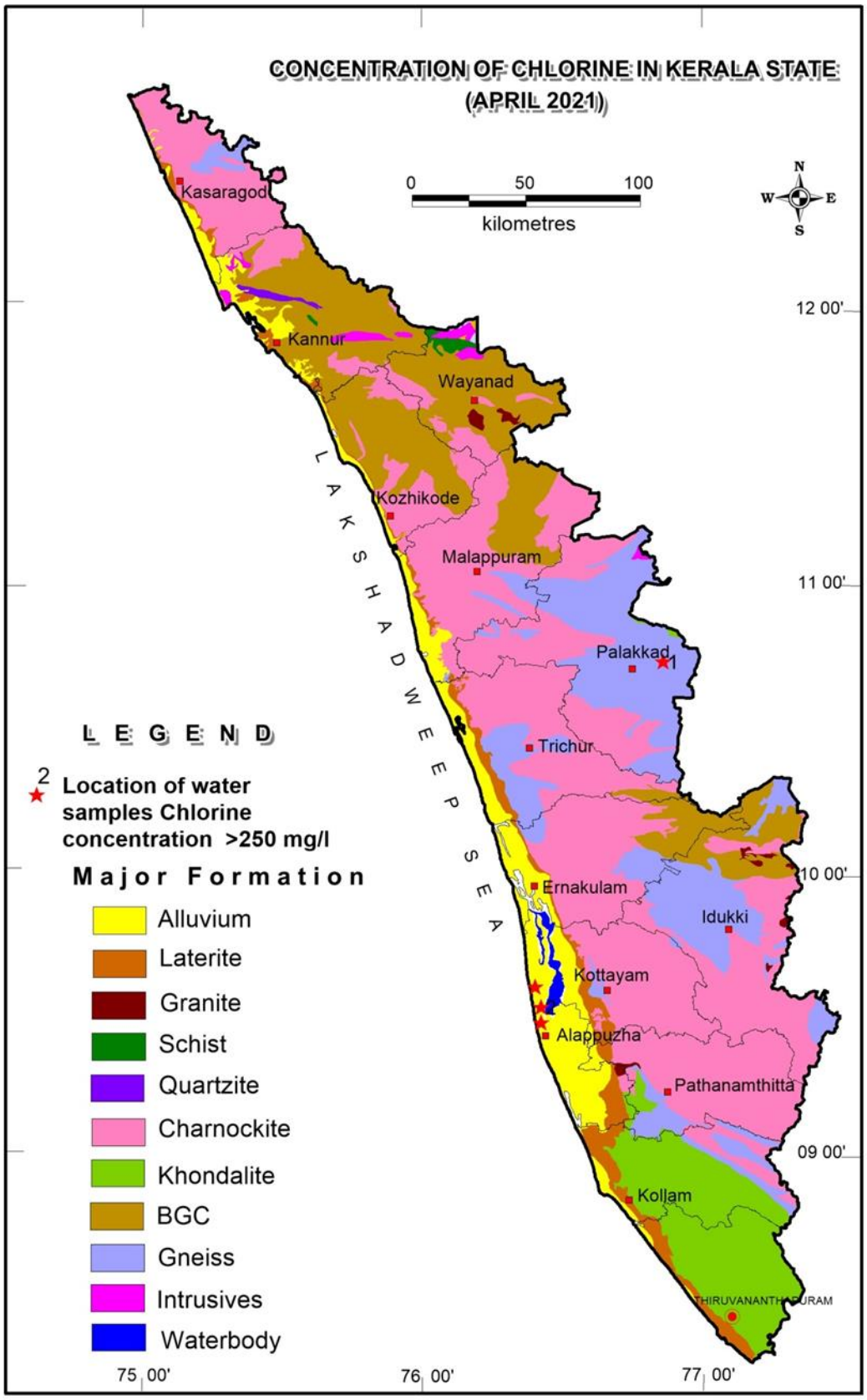


Figure 9.3. Showing distribution of Chloride concentration > 250 mg/l in the study area

Table 9.6: Locations showing the Chloride Concentration higher than BIS limit >250.0mg/L

S.No.	District	Village	Latitude	Longitude	Cl
1	Palakkad	Koppanur	10.7600	76.7800	265.00
2	Alappuza	Komalapuram-1	9.5422	76.3422	772.2
3	Alappuza	Komalapuram-2	9.488	76.3422	732.6
4	Alappuza	Chandanakkavu	9.6016	76.3027	298.4

On perusal of the chemical analysis data, it is understood that these wells are situated in the coastal plains, and chloride is more likely to be present as an impurity. Chloride concentration found to be in excess of BIS specifications in wells situated in the coastal plains is due to the tidal effects of sea. High salinity in Koppanur (Palakkad district) is due to inland salinity. The human activities might be a major factor in chloride circulation in water (Fig No. 9.3). Chloride compounds are used by humans in many applications as industrial solvents, pesticides etc. and can be added to the subsurface via industrial discharges, sewage, animal wastes and in turn they are leached in to the ground water.

7.Fluoride

Fluoride is one of the common elements in the earth crust, where it occurs in amounts comparable to carbon, nitrogen or chloride (McGraw-Hill 1987). It is the most electronegative of all the elements. Electronegativity is the relative tendency of an atom to acquire negative charge. In solutions, it forms F- ions. Fluoride ions have the same charge and nearly the same radius as hydroxide ions, thus the ions may replace each other in mineral structures.

8. Sources of Fluoride:

Fluorite (CaF_2) is the principal fluoride bearing mineral and is a common accessory mineral in granite, granite-gneisses and pegmatite. This mineral has a rather low solubility and occurs in both igneous and sedimentary rock. Apatite [Ca_5(Cl, F, OH) (PO_4)$_3$] commonly contains fluoride. Amphiboles such as hornblende and some of the micas, may contain fluoride which has replaced part of the hydroxide. Aluminium fluoride and hydroxyl-fluoride species occurring in rocks include cryolite (Na_3AlF_6) and ralstonite. The latter mineral ranges in composition from NaMgAl (F, OH) 6.H2O to Al2(F, OH)6. H2O the end member of a solid solution series. These minerals are rare but could become fluoride source during weathering.

The geochemistry and genesis of high fluoride groundwater all over India has been studied by B.K. Handa (1975) and he has derived the following general characteristics which are common to high fluoride ground water.

1. High fluoride ground waters are generally associated with low calcium content, there being a negative correlation between the two ions. This is reasonable in view of the low solubility of fluorite.
2. High fluoride ground waters are generally associated with high bicarbonate ions, and in some cases with high nitrate ions.
3. Although the ground waters are generally under saturated with respect to fluorite, in many cases they are saturated or even supersaturated with respect to this mineral
4. In many cases the ground waters appear to be saturated with respect to calcite and fluorite.

Fluoride is an important parameter for evaluating ground water quality.

The concentration of fluoride in the study area including trend cum surveillance in the Palakkad and Alappuzha districts ranges from trace to 2.0 mg/L. 96.5 % of the water samples having concentration of Fluoride is less than 1.0 mg/l. 13 samples (3.5%) having the Fluoride concentration higher than BIS limit (>1.0mg/L) (Table No.9. 7 and Figure No.9.4)

Table 9.7. Locations showing the Fluoride concentration higher than BIS limit (>1.0mg/L)

S.No.	District	Block	Village	Latitude	Longitude	F
1	Palakkad	Chittur	Gopalapuram	10.69	76.87	1.4
2	Palakkad	Kollengode	Kollengode	10.61	76.69	1.06
3	Palakkad	Kuzhalmannom	Kozhippara	10.79	76.83	1.17
4	Palakkad	Palakkad	Meenkara	10.61	76.8	1.21
5	Palakkad	Nenmara	Nadupuni	10.72	76.88	1.8
7	Palakkad	Chittur	Nadupani	11.1637	76.8861	1.8
9	Palakkad	Attappadi	Vattaluki	11.1400	76.7200	1.7
10	Palakkad	Attappadi	Naikarapady	11.1300	76.5000	1.3
11	Alappuza	Aryad	Komalapuram-1	9.5422	76.3422	1.40
12	Alappuza	Aryad	Komalapuram-2	9.488	76.3422	1.35
13	Alappuza	Alappuzha	Chandanakkavu	9.6016	76.3027	2.00

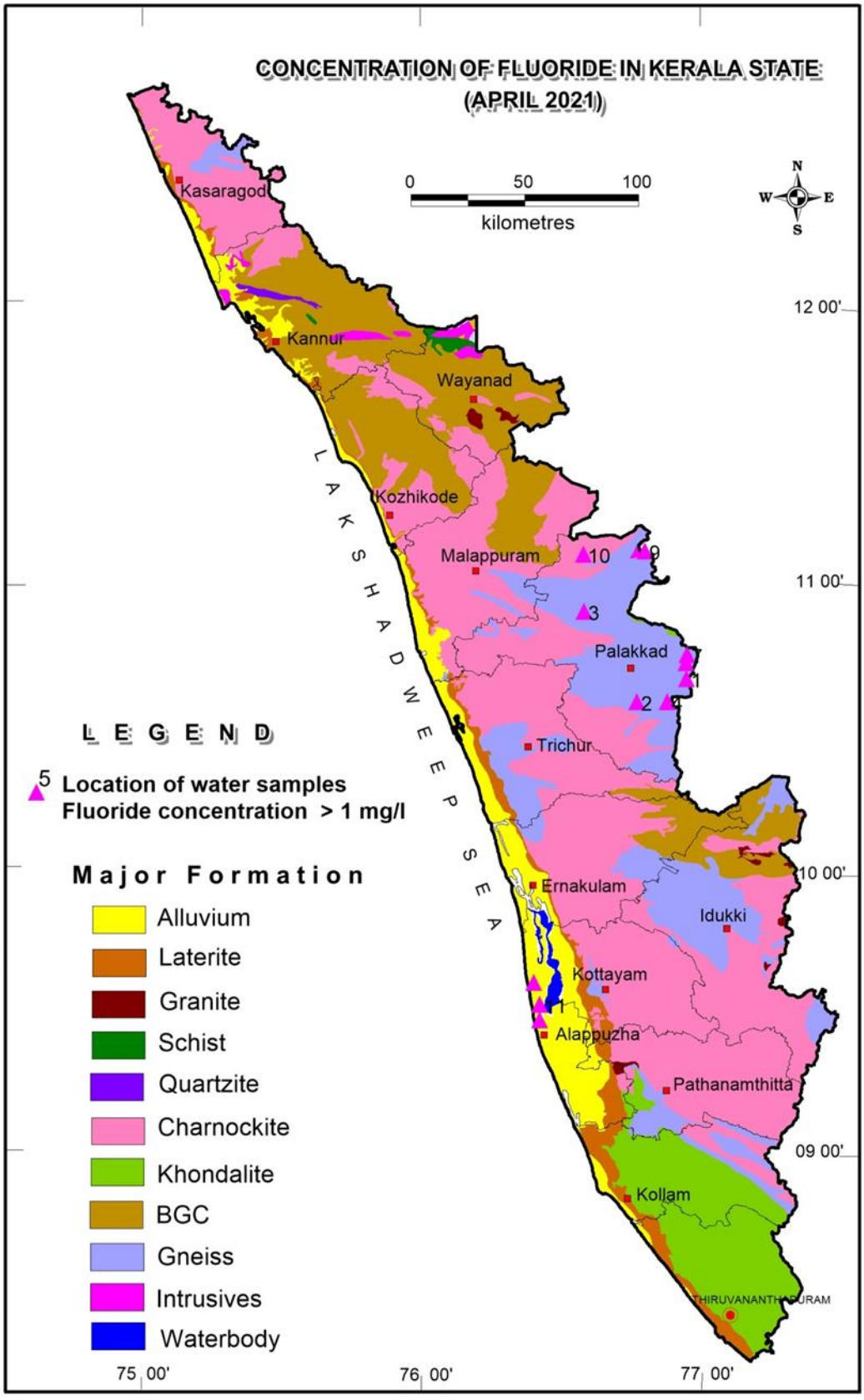


Figure 9.4. Locations showing Concentration of Fluoride > 1.0 mg/L

9. Nitrate

Nitrate is an important parameter for evaluating ground water quality, it ranges from Trace to 145mg/L. Concentration of Nitrate in 92.0 % water sample from network wells shows < 45 mg/L less than BIS limit. While 8.00% of samples are associated with nitrate concentration more than 45 mg/l (BIS). The anthropogenic wastes in the form of unregulated disposal of village sewages in open water bodies contribute Nitrate. Table No.8 and Fig No.9.5 Shows Nitrate concentration more than BIS limit (>45.0) in the study area.

Table 9.8: Samples showing Nitrate concentration more than BIS limit (>45.0mg/L)

S. No.	District	Block	Village	Latitude	Longitude	NO3
1	Ernakkulam	Palluruthy	Chellanum	9.8069	76.2847	59
2	Ernakkulam	Pampakkuda	Koothattukulam	9.8667	76.575	87.7
3	Kozhikode	Badagara	Badagara	11.59844	75.58524	53.6
4	Kozhikode	Kozhikode	Chelavur	11.29701	75.84728	62.43
5	Kozhikode	Kunnummal	Devarkoil	11.67062	75.76738	55.1
6	Idukki	Kattappana	Erattayar	9.79	77.1	64
7	Idukki	Kattappana	Kattapana	9.733	77.09	134
8	Idukki	Azhutha	Vandiperiyar	9.567	77.1	52.6
9	Palakkad	Malampuzha	Kanjikkode	10.79	76.74	50.3
10	Palakkad	Kollengode	Meenakshipuram	10.63	76.86	86.7
11	Trissur	Puzhakkal	Kecheri	10.6069	76.1617	52.8
12	Trissur	Mathilakam	Perinjanam	10.3146	76.1476	143.9
13	Kannur	Koothuparamba	Koothuparamba	11.8279	75.5649	60.6
14	Kannur	Thalasserry	Sreekandapuram	11.7520	75.4858	52.7
15	Kollam	Chadayamangalam	Akkal	8.8625	76.8236	57.5
16	Kollam	Kollam Corporation	Anchalummoodu	8.9278	76.6028	58.2
17	Malappuram	Nilambur	Chungathara1	11.3337	76.2756	51.1
18	Malappuram	Ponnani	Edappal	10.7819	76.0100	69.5
19	Malappuram	Tanur	Kottakkal	11.0040	76.0070	79.6
20	Malappuram	Thirur	Mangalam	10.8490	75.9223	100.8
21	Malappuram	Manjeri	Manjeri	11.1201	76.1201	47.3
22	Malappuram	Ponnani	Vylattur	10.9537	75.9464	49.5
23	Pathanamthitta	Parakode	Enathu	9.0800	76.75	82.4
24	Pathanamthitta	Konni	Konni	9.2300	76.8500	55.4
25	Trivandrum	Varkala	Edavai	8.76	76.70	94.9
26	Trivandrum	Attingal muncipality	Pangode	8.76528	76.9694	53.5
27	Trivandrum	Vamanapuram	Kattakkada	8.51	77.08	49.2
28	Trivandrum	Neyyattinkara Muncipality	Balaramapuram	8.42306	77.0458	106.7
29	Wayanad	Panamaram	Kamblakat	11.6784	76.0743	54.0
30	Palakkad		Vannamada	10.7000	76.8500	64.2

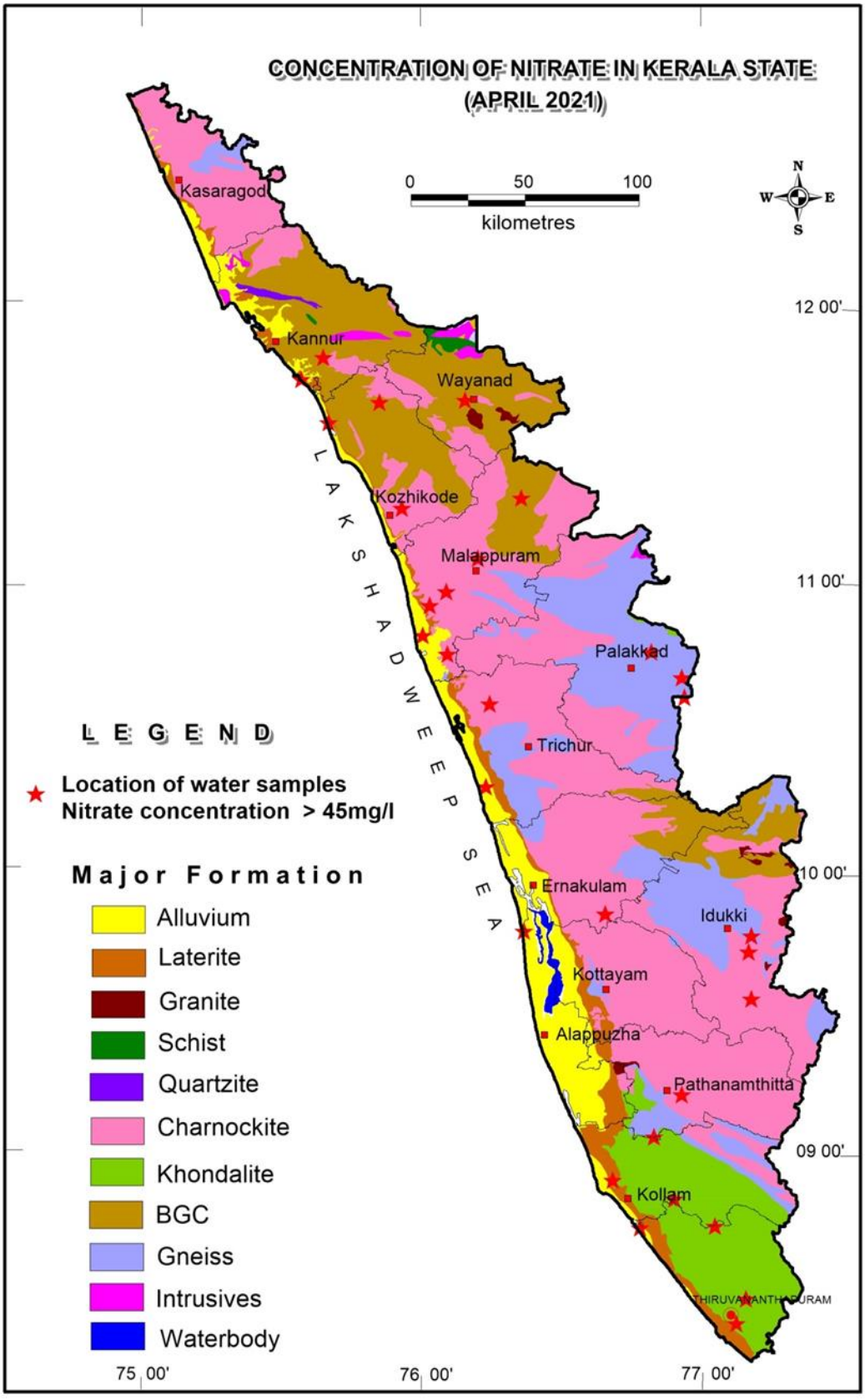


Figure 9.5. Locations showing concentration of Nitrate > 45.0 mg/L

10. Total Hardness

Hardness of the water is the capacity of water to neutralise soap. Hardness is mainly caused by Chloride, Sulphate, Carbonate & Bicarbonates of Calcium and Magnesium salts. Water hardness results from the solution of alkaline earth minerals, namely calcium and magnesium from the soil, rocks and from direct pollution by wastes. Calcium and magnesium carbonates (limestone and dolomite) are prevalent in the earth crust but are only sparingly soluble in pure water. Water that contains carbon dioxide (CO2) or other acidic constituents readily dissolves carbonate minerals. In the presence of CO2, the carbonates are converted to the more soluble bicarbonates.

$CaCO_3 + CO_2 + H_2O$ -------- > $Ca(HCO_3)_2$

Water with hardness less than 200-300 mg/L may derive practically all of their alkaline earths from carbonate rocks. Gypsiferous shale and evaporates often contain large quantities of more soluble sulphates and chlorides of calcium and magnesium. Water that traverse these deposits may have a hardness of several hundred mg/litre or more.

Classification of Hardness:

This classification is based on the value of total Hardness. Ground water may be classified in to four types Soft, Moderate hard, Hard and Very Hard (Table No 9.9).

Table 9.9: Ground water samples summarised as per classification of Hardness

Nos of Samples	Soft (0-60) mg/l	Mod. Hard (61-120) mg/l	Hard (121-180) mg/l	Very Hard more than 180 mg/l
373	189	92	47	45
Percentages	50.6	24.7	12.6	12.1

As per the classification, 50.6% of Ground water is soft in nature and 24.7 % and 12.6% of samples belong to moderately hard and hard categories respectively. 12.1 % samples fall in very hard category (Fig No 9.6).

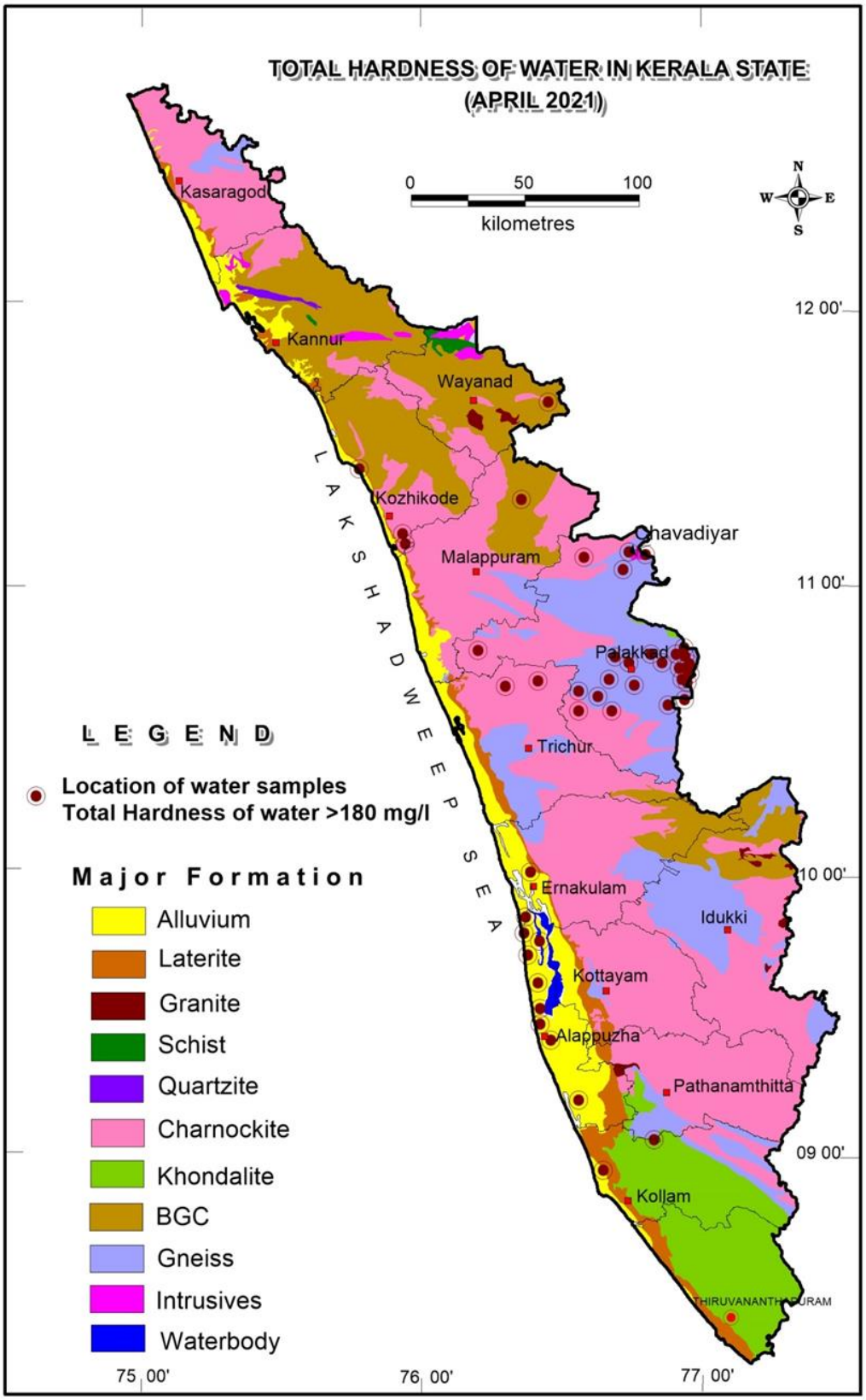


Figure No 9.6. Locations showing Hardness greater than 180 mg/L

Distribution of Trace metals in ground water

353 water samples have been collected in pre-monsoon season from of 14 district of Kerala Extensive study have been conducted with in every 3 km^2 radius in the Kerala state. The Trace metal samples were analysed by AAS PG 8000A for Copper , Nickel , Lead, Iron, Manganese Cadmium and Uranium (by LED Fluorometer LF-2) . The ranges of these trace metals in the study areas have appended in Table No 9.11. Nickel, Copper, Cadmium and Uranium found in permissible limit Whereas, Iron Manganese and Lead found beyond permissible limit in some isolated pockets as shown in table 9.12, 9.13 and 9.14 and Figure No 9.7 & 9.8.

Table 9.10. The ranges of heavy metal distribution in the study area

Parameter	Range	Maximum permissible limit as per BIS
Copper	ND-0.074 mg/l.	0.05 mg/l
Nickel	ND-0.093 mg/l.	5.0 mg/l
Lead	ND-0.204mg/l.	0.01 mg/l
Iron	ND-20.50 mg/l.	1.0 mg/l
Manganese	ND-6.01 mg/l.	0.30 mg/l
Cadmium	ND	0.003 mg/l
Uranium	ND	30mg/L

Table 9.11. The location details of the wells where concentration Iron above permissible limit (>1.0 ppm)

S.No.	District	Block	Village	Fe mg/l
1	Ernakkulam	Vypin	Edavanakkad	3.210
2	Ernakkulam	Palluruthy	Kumbalangi	1.780
3	Ernakkulam	Tripunithura	Tripunithura	1.406
4	Kozhikode	Kozhikode	Ramanattukara	2.582
5	Idukki	Elamdesom	Chinikuzhi	1.765
6	Palakkad	Chittur	Chittor	9.000
7	Palakkad	Malampuzha	Chullimada	1.160
8	Trissur	Cherpu	Cherpu	10.500
9	Trissur	Guruvayur Municipality	Guruvayur	1.900
10	Trissur	Kodakara	Kallur	1.040
11	Trissur	Thrissur Corporation	Thrissur	20.500
12	Trissur	Wadakkancherry Municipality	Wadakkancherry	1.040

13	Allapuzha	Veliyanad	Edathua1	10.500
14	Allapuzha	Muthukulam	Kayamkulam	1.900
15	Allapuzha	Ambalapuzha	Nirkunnam(R2)	1.040
16	Allapuzha	Chengannur	Thannirmukkom	20.500
17	Kannur	Irikkur	Chelery	1.350
18	Kannur	Koothuparamba	Kannavam	1.030
19	Kasargod	Kardka	Mulleria	2.050
20	Kasargod	Manjeshwar	Paivalige	1.290
21	Kasargod	Manjeshwar	Uppala	11.130
22	Kottayam	Pallom	Kumarakom	4.300
23	Kottayam	Pala Municipality	Pala	9.025
24	Kottayam	Vaikom Municipality	Vaikom	1.110
25	Kottayam	Madappally	Edinjillam	6.420
26	Malappuram	Andathode	Kanjiramukku	4.170
27	Malappuram	Manjeri	Manjeri	5.500
28	Trivandrum	Trivandrum corporation	Trivandrum	6.000
29	Wayanad	Sulthans' Bathery	Nool Puzha	2.825

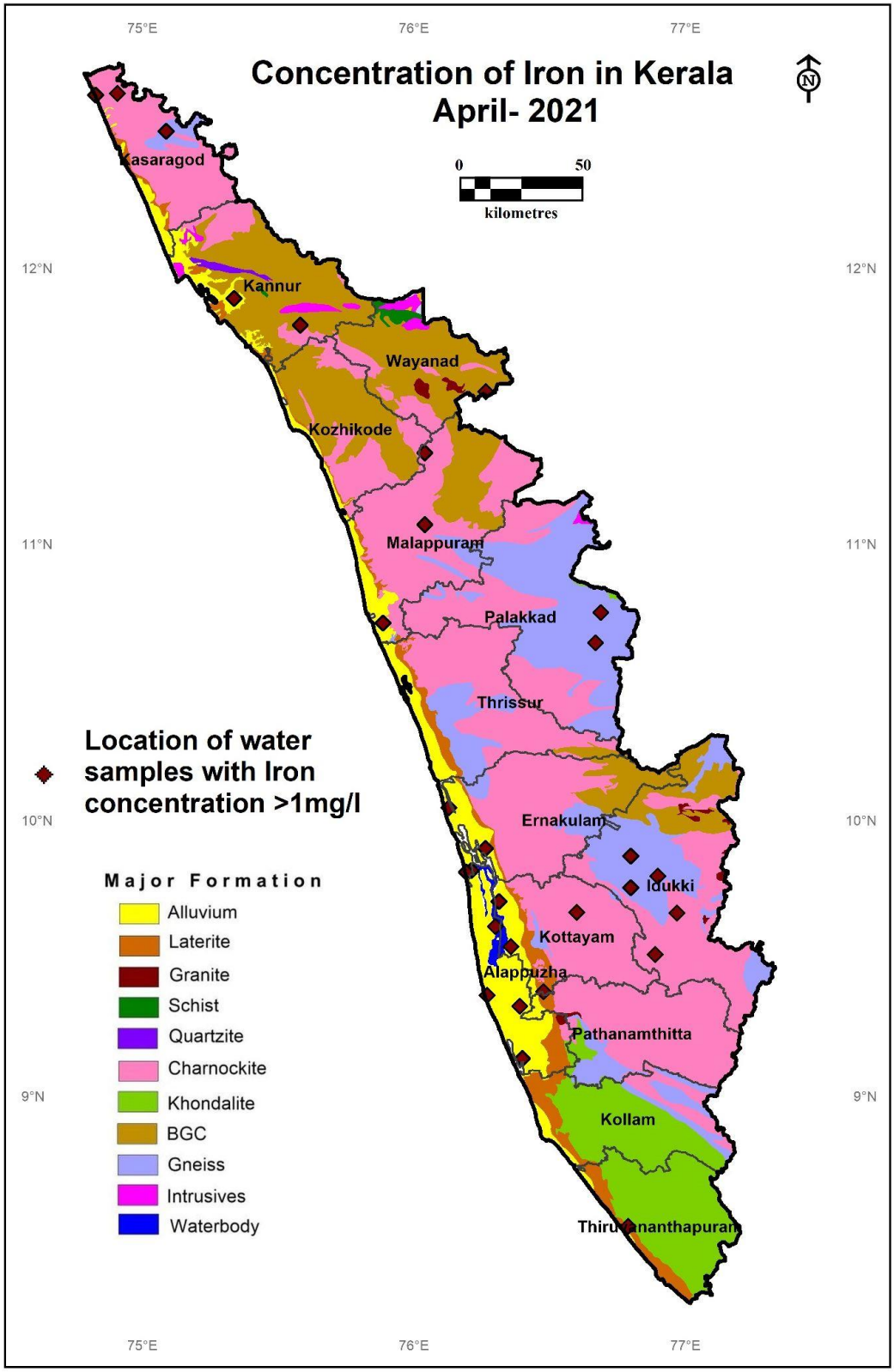


Figure 9.7: Locations showing Iron Concentration greater than 1 mg/L

Table 9.12. The location details of the wells where concentration of Manganese is above permissible limit (>0.3 ppm)

S.No.	District	Block	Village	Latitude	Longitude	Mn mg/l
1	Ernakkulam	Vypin	Edavanakkad	10.0917	76.2083	0.660
2	Kozhikode	Kunnummal	Devarkoil	9.851969	76.38752	0.355
3	Idukki	Azhutha	Elapara	9.633	76.98	0.320
4	Idukki	Kattappana	Kattapana	9.733	77.09	1.307
5	Idukki	Azhutha	kuttikanam1	9.558	76.97	1.092
6	Palakkad	Alathur	Athipeta	10.66	76.48	0.569
7	Palakkad	Chittur	Chittor	10.69	76.75	1.446
8	Palakkad	Nenmara	Nadupuni	10.72	76.88	0.362
9	Palakkad	Pattambi	Palakkad	10.76	76.66	0.476
10	Trissur	Cherpu	Cherpu	9.842	76.98	0.409
11	Trissur	Thrissur Corporation	Thrissur	11.38.32	76.12.52	0.483
12	Allapuzha	Veliyanad	Edathua1	9.3700	76.4700	0.409
13	Allapuzha	Chengannur	Thannirmukkom	9.6600	76.3800	0.483
14	Kasargod	Nileshwar	Choyankode	12.2867	75.1911	0.438
15	Kasargod	Nileshwar	Chittarikkal	12.3252	75.3568	0.464
16	Kasargod	Kanhangad	Kasaragod-DW	12.5010	74.9875	0.438
17	Kasargod	Manjeshwar	Manjeswaram-DW	12.7250	74.8855	0.695
18	Kasargod	Nileshwar	Neeleswaram	12.2471	75.1341	0.593
19	Kasargod	Manjeshwar	Uppala	12.6803	74.9046	0.371
20	Kollam	Chadayamangalam	Akkal	8.8625	76.8236	0.398
21	Kottayam	Kaduthuruthy	Kaduthuruthi	9.76139	76.4922	0.470
22	Malappuram	Andathode	Kanjiramukku	10.7617	75.9653	2.031
23	Malappuram	Manjeri	Manjeri	11.1201	76.1201	0.486
24	Malappuram	Nilambur	Vazhikadavu	11.3858	76.3432	0.448
25	Pathanamthitta	Konni	Konni	9.2300	76.8500	0.705
26	Pathanamthitta	Ranni	Nilakkkal	9.3883	77.0133	6.050
27	Trivandrum	Chirayinkil	Varkala	8.68	76.77	0.308
28	Trivandrum	Trivandrum corporation	Nedumangad	8.57	76.95	0.360
29	Trivandrum	Attingal muncipality	Pangode	8.70	76.82	0.412
30	Trivandrum	Pudukurichi	Kazhakuttom	8.61111	76.8069	0.386
31	Trivandrum	Trivandrum corporation	Trivandrum	8.57	76.87	6.000
32	Trivandrum	Trivandrum corporation	Vithura	8.50	76.96	0.308
33	Trivandrum	Vamanapuram	Kattakkada	8.71	77.13	0.485

34	Trivandrum	Perumkadavila	Kallikkad	8.51	77.08	0.495
35	Trivandrum	Neyyattinkara Muncipality	Balaramapuram	8.41	77.080	0.784
36	Wayanad	Sulthans' Bathery	Nool Puzha	11.6031	76.3449	2.466
37	Wayanad	Kalpetta	Vaduvanchal	11.5559	76.2238	0.368

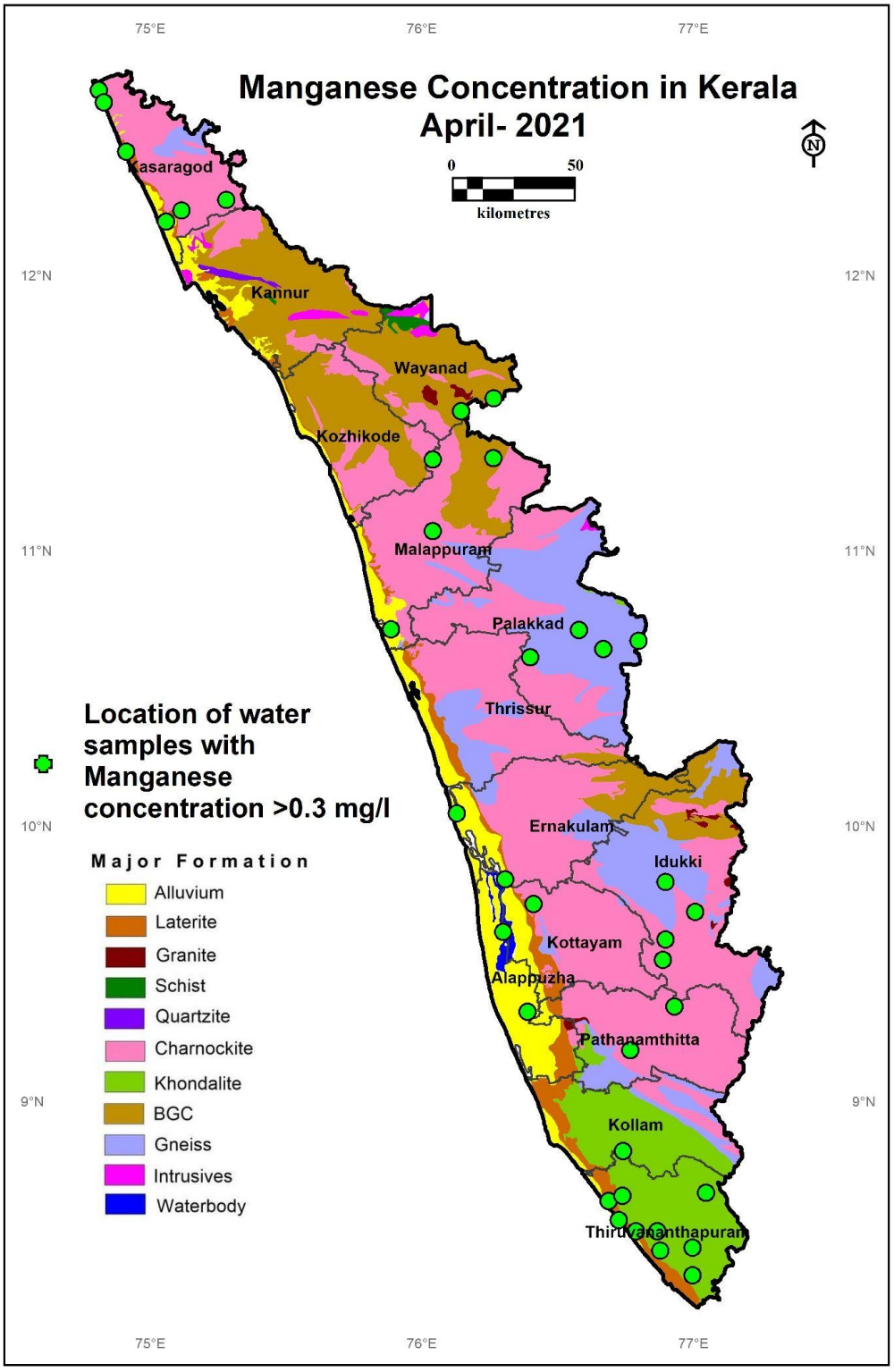


Figure 9.8: Locations showing Manganese Concentration greater than 0.3 mg/L

Table 9.13. The location details of the wells where concentration of Lead above permissible limit (> 0.01 ppm)

S.No.	District	Block	Village	Latitude	Longitude	Pb mg/l
1	Idukki	Nedumkandam	Koilkadavu	10.24	77.17	0.204
2	Kollam	Punalur Municipality	Punalur	9.0361	76.9056	0.014
3	Kollam	Kollam Corporation	Quilon	8.89	76.5833	0.014
4	Kollam	Ochira	Vallikavu	9.0903	76.4958	0.149
5	Kollam	Anchal	Yeroor	8.9322	76.9569	0.149
6	Wayanad	Sulthans' Bathery	Ambalavayal	11.6184	76.213	0.149
7	Wayanad	Panamaram	Perikallur	11.8611	76.1501	0.014

The localised concentration of Lead is due to point source contamination in the wells like pipe rusting, paper, chemical, automobile batteries, and electronics devises Fig No 9 and Table No 14. The observed higher concentration of Iron and manganese may be of Geogenic in nature. Suitable iron removal method may be adopted if this water using for drinking purpose.

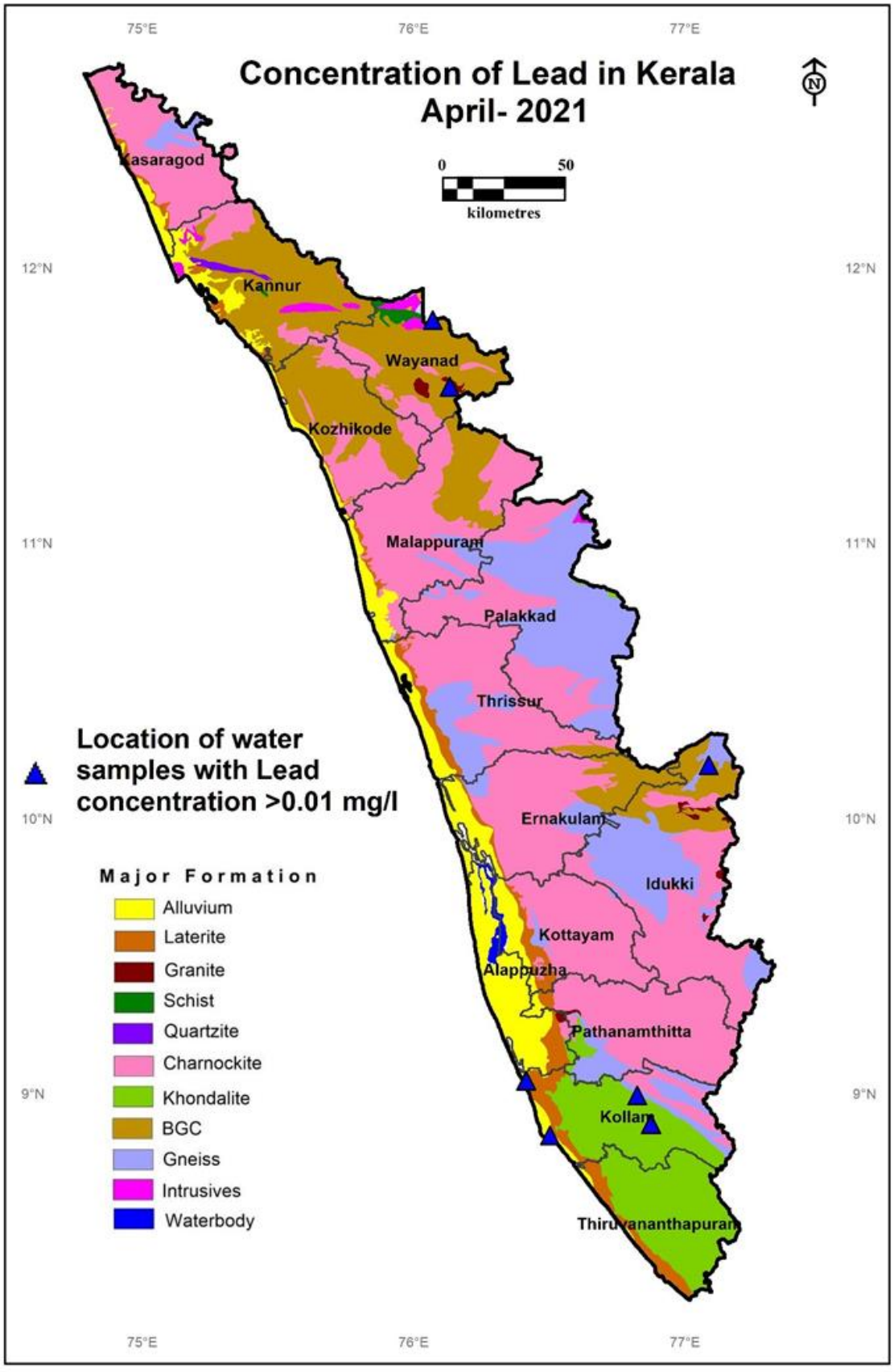


Figure 9.9: Locations showing Lead Concentration greater than 0.01 mg/L

SUM UP

1. The total number of Ground Water Monitoring Wells (GWMW) in Kerala State as on 31.03.2021 was 1591. These monitoring wells include 1374 dug-wells tapping phreatic aquifers and 217 piezometers tapping phreatic zones and deeper aquifers in sedimentary as well as hard rock terrains the water level monitoring was carried out in the months of April, August and November 2021 and January 2022. Water sampling was carried out in 351 GWMWs (dug-wells) during the month of April 2021.

2. The monitoring wells are spread over in all the physiographic regions of the State. 62 % of which fall in the midland region, 18 % in coastal plains, 15 % in high lands and 5 % in plateau region.

3. Out of the monitoring wells tapping phreatic aquifer, 65% of the well are tapping lateritic aquifer which is the widely distributed aquifer in the state, 17% tapping weathered and fractured crystallines followed by coastal alluvium and river alluvium represented by 15 % and 3 % respectively.

4. The total rainfall received varied from 2391 mm in Palakkad district to 4756 mm in Pathanamthitta district during the period from April 2021 to March 2022 with state average of 3505 mm. During the southwest monsoon season, Thiruvananthapuram district recorded the lowest rainfall of 745.7 mm and Kasaragod district recorded the highest rainfall of 2398.6 mm. Wayanad district recorded the lowest rainfall of 569.8 mm and Pathanamthitta district recorded the highest rainfall of 1695.4 mm.

5. Southwest monsoon was normal during the year 2021. During the southwest monsoon season from June to September 2021, the departure percentage of rainfall from normal varied from -32% in Wayanad district to 4% in Pathanamthitta district with state average of -16%. Five districts of the state received deficient rainfall and remaining 9 districts of the stae received normall rainfall during the period as per IMD Classification.
6. During the northeast monsoon season from October to December 2021, the state received large excess rainfall (1026 mm, 109% above normal). Departure percentage from normal varied from 58 % in Alappuzha district to 181% in Pathanamthitta district. Thirteen districts of the state received large excess rainfall (60% & above normal) and the remaining one district Alappuzha received excess rainfall during the period.

7. During the months April-May 2021 (Pre-monsoon season), the state received large excess rainfall. The departure percentage of pre-monsoon rainfall from normal varied from 74% in Kasaragode district to 181% in Pathanamthitta district with an average state departure percentage of 113%.
8. During the months of January to February 2022 (Winter season), the state received deficient rainfall (14.9 mm, 33% below normal). The departure percentage of rainfall varied from -100 % (No rain) to 54 % in Thiruvananthapuram district.
9. The depth to water level mostly depends on the hydrogeological conditions of the area as well as topography, rainfall pattern etc. In coastal plains the depth to water level is generally restricted to 6 mbgl. In midland areas, where the undulating topography is seen, the depth to water level generally varies from near ground level to 25 mbgl. The variation is mostly due to topographical variations, thickness of lateritic overburden etc. In areas where laterites are underlain by sedimentary aquifers of Tertiary age, the water level goes very deep, even to the extent of 55 mbgl. In highlands the depth to water level is in the range of few cm to 10 mbgl depending on the topography and thickness of overburden (weathered zone).

10. During the month of April 2021, the depth to water level in Kerala State in dug wells varied widely from 0.13 mbgl to 55.00 mbgl. The analysis of the data of 1390 wells reveals that 10% of the monitoring wells (GWMWs) shows water level within the range of ground level to 2 mbgl, 31% wells within the range of 2 to 5 mbgl, 41 % wells within the range of 5 to 10 mbgl and 17% wells in the rage of 10 to 20 mbgl.

11. During the month of November 2021, the depth to water level in Kerala State in dug wells varied widely from ground level to 56.31 mbgl. The analysis of the data of 1485 wells reveals that 92 % of the monitoring wells (GWMWs) shows water level within the range of ground level to 10 mbgl. Deeper water level (> 20 mbgl) is mainly observed in Thiruvananthapuram, Kasargod, Palakkad, Malappuram and Thrissur districts as isolated pockets.

12. Seasonal water level fluctuation has been calculated by comparing the water level data during November 2021 with April 2021. Analysis of data of 1387 wells shows that 94% wells (1290 wells) recorded rise in water level covering 96% area of the state and

remaining 6% wells (97 wells) recorded fall in water level covering 4% area of the state. The Comparison of data shows that water level rise is in the order of 0.01 to 23.27 m and fall is in the order of 0.01 to 9.22 m.

13. Comparison of water level data of the year 2021-2022 with the decadal mean value of the period 2012-2021 shows that 73 % wells recorded rise in water level and remaining 27% wells recorded fall in water level during April 2021. During post monsoon November 2021, 84% wells recorded rise in water level covering 89% area of the state and remaining 16% wells recorded fall in water level covering 11% area of the state.

14. The analysis of pre-monsoon water level trend for the last decadal period (i.e during 2012-2021) indicates that 32% of GWMWs have recorded negligible change in water level in the range of +0.05 to –0.05 m/year. 20 % of monitoring wells have recorded declining trend in the range of 0.05 to 0.2 m/year and 11 % of monitoring wells have recorded declining trend above 0.2 m/year. 23% of monitoring wells have recorded rising trend in the range of 0.05 to 0.2 m/year and 14% of monitoring wells have recorded rising trend above 0.2 m/year. Out of 1360 wells analysed declining trend in water level observed in 47% wells and rising trend in water level observed 53% wells.

15. The analysis of post-monsoon water level trend for the last decadal period (i.e during 2012-2021) indicates that 24.8 % of GWMWs have recorded negligible change in water level in the range of +0.05 to –0.05 m/year. 7.7 % of monitoring wells have recorded declining trend in the range of 0.05 to 0.2 m/year and 2.3 % of monitoring wells have recorded declining trend above 0.2 m/year. 29.4 % of monitoring wells have recorded rising trend in the range of 0.05 to 0.2 m/year and 35.8 % of monitoring wells have recorded rising trend above 0.2 m/year. Out of 1387 wells analsed increasing trend in water level observed in 80.2% wells and decreasing trend in 19.8% wells. The data analysis indicates that the long-term ground water level trend shows rising trend in major portions of the state.

16. Ground water in Kerala state in fresh and potable in most of the areas. Water supply in this state is mainly dependant on surface water and dug well. Proper protection measures need to be taken to avoid contamination of ground water.

17. Ground water in Kerala state in fresh and potable in most of the areas. Water supply in this state is mainly dependant on surface water and Dug well. Proper protection measures need to be taken to avoid contamination of ground water.
18 Fast developing urban & industrial areas need special attention/quality surveillance the State government authorities.
19 There is lack of proper sewage and sanitation in all over the state resulting into ground water and surface water contaminations. This issue needs to be addressed immediately by the authorities. Village sewages shall be disposed of properly after proper treatment. In water logging areas, where ground water is being contaminated by polluted surface water, proper drainage shall be created for avoiding the water logging conditions.
20 Ground water contamination by improper disposal of domestic and industrial solid wastes is of another concern. Special efforts shall be made to address this problem.
21 There is an urgent need to takeup comprehensive studies on ground water quality of both shallow and deep ground waters analyzing major elements, heavy metals, pesticides, microbial contamination is the need of the hour. Areas identified in this report where higher concentrations of heavy metals, nitrates and fluorides need to be given special attentions.
22 The existing data base on quality with different organizations like CGWB, PHED, State pollution control board, academic institutions need to integrated and a comprehensive data base need to be established.

23 Scientific research projects on ground water contamination especially geo-genic contamination like Iron, gasses and fluoride need to be taken up immediately.
24 Proper management strategies need to be drawn up to combat the problems of geo-genic contamination. Cost effective community level treatment plants need to be established. The treatment plants as recommended in this report shall be constructed with trained manpower as in charges so that these treatment plants may work efficiently for longer periods.

****

Annexure I

Ground Water Level Data of GWMW's in Kerala State during 2021-22

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
ALAPPUZHA	Adikattukulangara	Dug Well	5.13	3.05	2.8	4.66
	Alapuzha Town	Dug Well	4.05	3.37	3.07	3.8
	Alleppey	Dug Well	2.29	1.73	1.46	1.88
	Ambalapuzha	Dug Well	2.17	0.26	0.14	1.55
	Aranootimangalam (R1)	Dug Well	11.82	6.5	4.54	10.77
	Arukutti	Dug Well	2.55	0.87	1.07	2.21
	Arur	Dug Well	1.9	0.38	0.48	1.26
	Champakulam	Dug Well	1.4			1.25
	Chandirur (R1)	Dug Well	2.21	0.48	0.79	1.76
	Charummoodu	Dug Well	6.39	7.9	6.49	11.27
	Chelakkad	Dug Well	2.1	0.46	0.9	1.3
	Chengannur	Dug Well	7.9	3.5	2.6	7.3
	Chennithala South	Dug Well				3.22
	Cherthalai	Dug Well	0.97	0.67	0.62	0.68
	Cheruvaranam	Dug Well	2.6	0.59	0.75	1.89
	Chettikulangara	Dug Well	1.3	0.53	0.68	1.15
	Edathua(R2)	Dug Well	0.89	1.4	0.11	1.86
	Eramallur	Dug Well	2.37	0.91	1.06	1.68
	Haripad	Dug Well	2.4	0.13	0.37	1.28
	Idakunnam	Dug Well	12.7	9.2	8.31	11.61
	Kadaikadu (Cheriyanad)	Dug Well	5.2	2.87	2.4	5.3
	Kaidavana-R1	Dug Well	1.35	0.08	0.1	0.72
	Kalavamkodam	Dug Well	1.82	0.97	0.85	1.82
	Kalavur	Dug Well	1.61	0.43	0.37	1.27
	Kallissery	Dug Well	3.72	1.5	0.93	3.8
	Kandiyur (R1)	Dug Well	0	1.35	1.35	2.31
	Kanichukulangara	Dug Well			1	2.18
	Karuvatta (R1)	Dug Well	2.5	0.4		1.38
	Kattanam	Dug Well	11.85	9.86	9.65	11.15
	Kattoor (R1)	Dug Well	1.6	0.63	0.54	1.25
	Kayamkulam	Dug Well	0.8	0.22	0.05	0.44
	Kayippuram (Muhamma)	Dug Well	2.5	0.45	0.52	1.4
	Kokkothamangalam	Dug Well	2.67	0.63	0.91	1.77
	Kudassanad	Dug Well	5.53			5.75
	Kuttitheruvu (Kayamkulam)	Dug Well	4.1	0.75	2.9	
	Kuzhamathu	Dug Well	12.6	9.2	7.1	1.81
	Mancombu	Dug Well	0.13			11.8
	Mannanchery	Dug Well	2.68	0.92	1.4	1.95

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Mannar	Dug Well	7.1	2.45	1.63	3.3
	Mavelikara	Dug Well	3.09	1		1.91
	Mulakuzha (R1)	Dug Well	4.9	3.1	2.05	7
	Muthukulam	Dug Well	3	0.2	2.1	1.35
	Muttam	Dug Well	2.5	0.7		1.27
	Naduvattom	Dug Well	1.65	0.57	0.5	
	Nangiarkulangara	Dug Well	0.96	1.05		1.35
	Nedumudi (pupalli)	Dug Well	1.01	0		0.27
	Neerkunnam(R1)	Dug Well	2.94	1.09	0.93	2.05
	Neerkunnam(R2)	Dug Well				
	Nooranad	Dug Well	5.92	8.2	6.95	9.38
	Oachira1 (Krishnapuram) (R1)	Dug Well	3.77	0.94	1.57	2.32
	Ottappunna	Dug Well				2.36
	Pacha (R3)	Dug Well	1	0.23	0.1	1
	Pallarimangalam	Dug Well	1.89	0.38	0.95	1.35
	Panavally	Dug Well	1.73	0.67	0.72	1.4
	Pandanad	Dug Well	3.35	1.76	0.4	3.16
	Panurkara	Dug Well	1.95		1.2	2.1
	Parayakkad	Dug Well	2.2	0.4	1.02	2.62
	Parumala (R1)	Dug Well	6.51	3.2	1.92	
	Pathiyur (R1)	Dug Well	1.12	0.17	0	0.97
	Pattanakad	Dug Well	1.57	0.49	1	2.42
	Punnapra (R1)	Dug Well	1.68	0.42	0.58	1.58
	Purakkad (R1)	Dug Well	2.57	1.81	1.49	2.58
	Ramankari (R1)	Dug Well	1.1			1.7
	Thaikattusseri (R1)	Dug Well	1.93	0.37	0.57	2.32
	Thakazhi	Dug Well	1.67	0.1	0.46	0.95
	Thalavadi (R1)	Dug Well	6.4	0.05		1.7
	Thamarakulam	Dug Well	3.1	2.1		3.47
	Thaneermukkam	Dug Well	1.11	0.66	0.27	1.02
	Thevery	Dug Well	1.54	0.4		1.48
	Thuravur (R1)	Dug Well	2.07	0.77	0.84	1.67
	Thyckal Beach	Dug Well	2.12	0.4	1.2	1.13
	Trikkunnapuzha (R2)	Dug Well	0.77	0.29	0.48	1.2
	Valavanad (R1)	Dug Well	2.17	0	1.69	1.36
	Vallikunnam	Dug Well	2.9	1	0.7	1.55
	Vanaswargam	Dug Well	1.1	0.67	0.58	1.43
	Vandanam	Dug Well				1
	Venmani (R1)	Dug Well	2.45			
	Ezhupunna Pz	Tube Well	1.2	0.74	0.5	1.3
	Haripad(c)	Tube Well	13.86	9.47	9.35	9.71
	Haripad(n)	Tube Well	9.7	8.8	8.87	10.02

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kalarkode(w)	Tube Well	14.4	14.41	14.81	15.29
	Karthikapally(south)	Tube Well				14.03
	Kattanam1	Tube Well	11.5	9.51	9.1	11.2
	Krishnapuram(n)	Tube Well	17.6	17.3	17.2	17.3
	Krishnapuram(s)	Tube Well	5.91	4.7	4.56	5.38
	Mannar	Tube Well	7.1	2.45	1.63	3.3
	Muthukulam Pz	Tube Well	0.7			0.5
	Muttam(south)	Tube Well	5.47	4.43	3.88	4.9
ERNAKULAM	Arakuzha Pz	Bore Well	5.75	5.1	4.83	5.82
	Edakkattuvoyal PZ	Bore Well	9.6	7.1	8.76	9.18
	Kanjiramattom	Bore Well	13.66	10.7	11.94	13.76
	Kizhakombu	Bore Well	4.25	1.89	1.67	5.41
	Kodussery	Bore Well	8.04	7.41	7.12	7.7
	Malayattur1	Bore Well	9.33	8.89	8.65	8.86
	Mullankunnu	Bore Well	15.46	14.74	14.53	13.78
	Namakuzhi Pz	Bore Well	8.76	2.37	3.71	8.95
	Poothrikka Pz	Bore Well	10.6	7.93	7.39	9.87
	Punnakad Pz	Bore Well	2.54	1.24	1.32	
	Vazhakam Pz	Bore Well	4.36	4.27	4.17	4.55
	Veliyanad Pz	Bore Well	4.12	2.03	3.53	4.32
	Aikaranad	Dug Well	6.8	5.13	5.66	5.35
	Alwaye (Aluva)	Dug Well	12.32	8.02	8.14	
	Anchalpetty-R1	Dug Well	6.18	5.75	5.63	6.14
	Angamali (R1)	Dug Well	7.13	5.75	4.88	7.25
	Anicadu	Dug Well	2.51	1.51	1.3	2.14
	Arakunnam	Dug Well		7.2	8.75	
	Arakuzha	Dug Well	6.29	5.26	4.25	6.28
	Attara (Kokunnu)	Dug Well	6.46	6.77	6.15	6.6
	Chalakka	Dug Well	1.82	1.78	2	3.04
	Chellanum South	Dug Well	0.81	0.49	1.04	
	Chengamanad	Dug Well	9.27	7.5	8.35	9.28
	Cherai South	Dug Well	1.55	1	1.56	1.55
	Cheria Kadavu	Dug Well	0.8	0.35	1.04	0.59
	Cherukadapuram	Dug Well	1.75	1.38	1.93	1.85
	Chowara (R1)	Dug Well	6.36	4.4	6.7	7.02
	Chulli (R1)	Dug Well	4.59	1.15	2.06	
	East Marady	Dug Well	5.83	5.3	4.59	5.88
	Edakkatuvayal	Dug Well	11.65	7.66	9.51	11.08
	Edapally	Dug Well	2	1.19	1.03	1.81
	Edavanakad	Dug Well	0.52	0.17	0	0.63
	Elur North (R1)	Dug Well	1.9	1.45	1.34	1.8
	Fort cochin	Dug Well	2.11	1.15	0.95	2.01

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Ilanji	Dug Well	7.38	1.38	3.3	7.43
	Illithodu	Dug Well		5.22	5.55	4.62
	Irumbanam (R1)	Dug Well	2.81	0.48	0.65	1.97
	Kadavoor	Dug Well		3.38		
	Kalady (R1)	Dug Well	5.33	4.35	3.03	5.45
	Kallorkad	Dug Well	3.48	2.99	2.91	3.28
	Kalur	Dug Well	6.73	3.8	3	6.13
	Kandakadavu	Dug Well	0.84	0.54	0.67	0.8
	Kanjiramattom DW	Dug Well	7.05	2.36	3.76	7
	Kanjur	Dug Well	6.59	6.12	5.8	6.55
	Kapprassery	Dug Well	2.65	1.1	1.2	2.77
	Karukadam (R1)	Dug Well	3.69	2.52	2.1	
	Karukutti	Dug Well	8.9	6.95	6.67	
	Keerampara	Dug Well	1.07	1.24	1.24	1.14
	Keezhillam	Dug Well	7.68	6.35	5.23	6.19
	Kizhakkambalam (R1)	Dug Well	6.33	4.3	4.42	6.27
	Kizhakombu DW	Dug Well	5.03	1.97	1.85	5.08
	Kodanad	Dug Well	3.34	1.6	1.52	3.23
	Kodussery (R1)	Dug Well	9.36	7.59	7.35	8.35
	Koothattukulam (R1)	Dug Well	4.1	3.21	2.98	4.86
	Koovapady	Dug Well	6.19	4.87	4.12	6.37
	Kothamangalam (R3)	Dug Well	4.69	3.54	3.38	4.57
	Kottapadi	Dug Well	3.44	2.01	1.96	
	Kottapuram (Alangadu)	Dug Well	2.9	1.4	1.29	
	Kottapuram (Veliyanad)	Dug Well	6.06	2.45	4.44	6.18
	Kumbalangi (R2)	Dug Well	1.37	0.36	0.31	1.18
	Kundannur (R1)	Dug Well	0.63	0.02	0.1	2.78
	Kunnukara	Dug Well	5.93	6.29	6.18	6.16
	Kurumassery	Dug Well	8.43	7.34	7.17	8.52
	Kuruppampady	Dug Well	5.35	4.49	3.35	5.62
	Kuthukuzhi	Dug Well	4.64	1.9	1.45	5.42
	Malayattur	Dug Well	8.11	5.91	5.68	6.92
	Malipuram	Dug Well	0.78	0.16		0.81
	Mallussery	Dug Well	4.79	3.66	3.47	4.62
	Mamala	Dug Well	5.3	2.15	3.18	4.55
	Mamallassery (R1)	Dug Well	5.58	2.6	2.41	4.5
	Manjapra	Dug Well	4.75	4.6	3.88	2.68
	Mannur	Dug Well	3.61	2.73	2.4	4.21
	Maradu	Dug Well	1.65		0	0.94
	Mulanthuruthi	Dug Well	8.81	3.9	5.26	8.69
	Mullankunnu	Dug Well	15.46	14.74	14.53	13.78
	Munambam (R1)	Dug Well	1.05	0.1		1.02

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Muvattupuzha	Dug Well	6.32	3.67	3.53	6.54
	Nallimolam (R1)	Dug Well	6.75	4.69	3.52	6.27
	Namakuzhi	Dug Well	6.68	1.8	3.7	5.68
	Nayarambalam	Dug Well	1.33	0.95	0.55	1.3
	Nellikuzhi (R1)	Dug Well	4.52	3.49	2.5	3.55
	Neriyamangalam (R1)	Dug Well	8.01	4.94	4.79	7.34
	Njarakkal	Dug Well	0.95	0.4	0.17	0.84
	North Parur	Dug Well	0.82		0	0.8
	Okkal	Dug Well	3.47	2.25	3.09	4.36
	Oonnukal	Dug Well	6.12	3.9	3.57	6.3
	Paingottur	Dug Well	5.35	3.74	3.26	5.5
	Palakuzha North	Dug Well	6.4	4.03	3.03	6.45
	Pallikara-Chittanadu (wonderla)	Dug Well	7.33	6.45	6.5	7.31
	Palluruthy	Dug Well	1.91			
	Pambakuda	Dug Well	4.67	3.85	3.6	6.28
	Parakkadavu	Dug Well	3.04	1.46	1.22	2.83
	Paravur	Dug Well	2.25	0.54	0.25	
	Pattimattom (R2)	Dug Well	6.26	4.97	5.05	6.08
	Payyal	Dug Well	4.2	2.39	2.4	4.23
	Peechanikad (R1)	Dug Well	6.3	5.55	4.72	6.1
	Perumbadavam	Dug Well	6.94	2.2	3.7	6.06
	Perumbavoor (R2)	Dug Well	4.88	3.64	2.33	5.5
	Pezhakkappally	Dug Well	4.47	3.25	3.35	4.65
	Pindimana	Dug Well	4.48	0.21	0.19	
	Piravom	Dug Well	5.76	5.11	5.55	5.93
	Poothotta	Dug Well	3.03	0.98	0.98	2.4
	Poothrikka	Dug Well	8.2	7.32	6.35	8.05
	Pothanikad (R2)	Dug Well	4.56	2.42	1.8	5.05
	Pulluvazhi	Dug Well	5.18	4.55	3.9	5.46
	Punithura	Dug Well	1.17	0.53	0.6	1.78
	Punnakad1	Dug Well	1.1	0.39	0.42	1.65
	Puthankurissu (Neriyamangalam Road)	Dug Well	5.34	4.43	4.36	3.66
	Puthankurisu (R1) (Kolencherry)	Dug Well	3.42	2.96	2.95	4.9
	Ramamangalam	Dug Well	6.52	5.72	5.7	6.55
	Randar	Dug Well	4.54	3.54	3.38	4.93
	Sreemoolanagaram	Dug Well	10.73	7.73	7.45	9.65
	Thabore	Dug Well	6.42	4.17	3.9	5.9
	Thaikkattukara	Dug Well	3	0.93	1.04	
	Thalakode	Dug Well	4.31	3.5		4.1
	Thattekad (R1)	Dug Well	1.35	2.65	2.88	3.04

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Thirumaradi DW	Dug Well	4.63	3.05	2.88	5.4
	Thrikkalathur	Dug Well	3.86	3.72	3.44	5.4
	Thuruthi	Dug Well	2.94	2.43	2.07	3.17
	Trikkakara	Dug Well	9.7	7.88	8.36	13.13
	Tripunithura New	Dug Well	3.01	1.37	1.75	2.93
	Udayamperoor	Dug Well	4.03	1.86	1.94	3.29
	Vadavucode (Kolencherry)	Dug Well	1.55	1.05	1.05	1.61
	Valakam	Dug Well	6.02	5.55	5.51	6
	Valayanchirangara	Dug Well	7.98	6.32	5.92	7.17
	Vallom (R2)	Dug Well		5.12		
	Varapuzha	Dug Well	2.22	0.1	0	1.4
	Vazhakkulam North	Dug Well	6.87	4.71	4.51	6.82
	Veliyanad	Dug Well	7.22	2.78	5.15	6.29
	Vypeen	Dug Well	0.42	0.15	0.15	0.39
	Vytila	Dug Well	2.15	0.84	0.99	
	Kadavanthra	Tube Well		6.1	5.48	5.65
IDUKKI	Alakode	Bore Well	4.34	3.46	3.36	3.79
	Anakkara	Bore Well	7.01	6.19	5.68	6.43
	Karimkunnam2	Bore Well	2.28	2.19	1.46	2.51
	Karumannur	Bore Well	3.99	3.62	1.98	3.98
	Kattappana	Bore Well	10.18	7.35	6.96	8.45
	Thankamoni	Bore Well	2.66	1.59	1.89	2.36
	Adimali	Dug Well	4.48	3.9	4.32	5.8
	Alakkode DW	Dug Well	4.02	3.88	3.56	4.1
	Ambazhachal	Dug Well	2.96	4.02	3.57	4.21
	Amravathi	Dug Well	5.25	2.43	1.79	2.54
	Anakkara	Dug Well	7.01	6.19	5.68	6.43
	Anavilasam	Dug Well	6.63	4.54	4.39	5.19
	Arikuzha	Dug Well	4.95	3.82	1.67	4.88
	Balagram (Third camp)	Dug Well	3.29	2.48	1.88	2.41
	Byson Valley	Dug Well	9.58	8.94	8.91	9.34
	Carady Goody Estate	Dug Well	2.23	0.75	0.91	1.56
	Chathurangapara	Dug Well	0.39	0.64	0.51	0.31
	Cheenikuzhi	Dug Well	2.71	1.03	0.79	2.33
	Cheriyar	Dug Well	2	2.46	2.36	2.05
	Chittoor	Dug Well	3.82	3.38	2.07	3.91
	Churuli	Dug Well	2.36	1.85	1.94	1.96
	Cumbummettu	Dug Well	4.87	3.07	1.39	2.59
	Devikulam	Dug Well	3.19	2.57	2.5	2.87
	Elamdesom	Dug Well	5.87	4.58	2.87	5.35
	Elappara	Dug Well	1.53	1.14	1.2	3.36

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Idukki	Dug Well	4.58	2.59	2.71	2.22
	Irattayar (R1)	Dug Well	2.6	2.09	2.28	5.22
	Kaliyar	Dug Well	5.22	3.94	3.8	8.67
	Kanchiyar	Dug Well		8.35		
	Karimkunnam (R1)	Dug Well	3.17	1.99	2.66	3.29
	Karumanoor DW	Dug Well	3.53	3.08	1.49	3.65
	Kattapana	Dug Well	3.04	1.73	1.72	2.32
	Kochera	Dug Well	3.76	2.35	0.96	1.698
	Kodikulam east	Dug Well	4.18	3.47	2.61	4.46
	Kolani	Dug Well	4.18	2.34	0.94	4.59
	Kolapra	Dug Well	5.07	3.94	3.69	4.16
	Kulamavu	Dug Well	7.99	4.79	4.08	6.17
	Kumaramangalam	Dug Well	3.89	3.49	2.99	3.88
	Kumili	Dug Well	3.07	1.63	1.49	1.73
	Kuttikanam (R1)	Dug Well	5.92	2.48	4.38	6.27
	Machiplavu	Dug Well	8.73	6.04	6.35	7.75
	Manjappara	Dug Well	2.06	2.19	1.11	1.35
	Marykulam	Dug Well	4.49	2.58	1.57	3.52
	Memala	Dug Well	4.49	2.62	3.53	4.16
	Moolamattam	Dug Well	4.99	4.67	3.4	5.32
	Mundiyeruma	Dug Well	5.39	3.55	3.23	4.31
	Munnar	Dug Well	1.19	0.29	0.47	0.89
	Murikkassery	Dug Well	10.32	9.44	9.19	9.66
	Murukkady	Dug Well	0	0.64	0.16	1.79
	Nedumkandam	Dug Well	3.48	2.87	2.89	3.02
	Nirmala City	Dug Well	1.25	0.58	0.49	0.82
	Njarukutty	Dug Well	3.59	1.53	1.02	3.24
	Pambadumpara	Dug Well	2.8	1.66	1.35	2.29
	Pampanar	Dug Well	2.05	0.63	0.72	1.2
	Pannimattom	Dug Well	3.72	2.75	2.81	3.42
	Peerumedu	Dug Well	2.82	2.69	2.73	2.75
	Perumuttom	Dug Well	2.81	4.13	3.12	4.4
	Peruvanthanam	Dug Well	2.7	0.23	1.82	2.48
	Poopara	Dug Well	1.05	0.71	0.57	0.77
	Rajakkad	Dug Well	3.44	7.74	7.99	8.96
	Thankamani	Dug Well	2.21	1.08	1.11	1.92
	Thodupuzha	Dug Well	7.38	7.2	6.11	8.02
	Thumbachi	Dug Well	4.94	2.78	2.97	3.41
	Udumbanchola	Dug Well	9.32	5.1	4.91	6.06
	Udumbannur	Dug Well	7.56	3.18	2.03	6.08
	Valara (R2)	Dug Well	8.72	6.69	8.31	8.55
	Vallakadavu	Dug Well	4.69	2.58	2.36	3.04
	Vandanmedu (R1)	Dug Well	1.06	1.82	0.52	0.68

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Vandiperiyar	Dug Well	6.9	5.77	5.44	6.91
	Vazhithala	Dug Well	4.74	0.86	0.53	4.06
	Vellilamkandam	Dug Well	6.2	3.57	3.48	4.33
KANNUR	Kakkeyamkadu	Bore Well	4.4	1.95	1.23	2.35
	Kankole1	Bore Well	9	4.65	6.06	7.21
	Karumathur	Bore Well	8.25		5.87	6.83
	Kizhallur	Bore Well	11.3	1.65	4.11	4.3
	Kolacheri	Bore Well	8.3	7	6.91	7.47
	Kommery	Bore Well	3.23	2.15	3.1	3.65
	Kottayampoyil	Bore Well	13.75	9.25	9.35	11.05
	Manathana	Bore Well	6.7	3.3	4.4	6.47
	Munderi	Bore Well	8	2.3	3.18	3.95
	Panoor	Bore Well		0.95	2.46	3.8
	Parassinikadavu	Bore Well	22.3	19.85	19.99	20.5
	Pulingome1	Bore Well	7.7	3.65	4.7	6.24
	Alacode (R1)	Dug Well	11.6	7.8	6.35	10.8
	Alavil	Dug Well	8.4	3.25	2.88	5.95
	Ambilad	Dug Well	4.8	2.86	3.05	13.61
	Andoor	Dug Well	6.2	4.85	1.4	8.6
	Anjarakandi	Dug Well	10.3	4.9	5.3	7.68
	Chakkarakkale	Dug Well	10.2	6.3	6.85	8.75
	Chala	Dug Well	9.5	5.51	7.61	8.72
	Chalad	Dug Well	7.15	2		5.36
	Chavassery	Dug Well	4.2	2.4	2.58	3.95
	Cheleri	Dug Well	16.3	9.1	9.95	11.7
	Chepparapadavu	Dug Well	3.75	2.31	2.1	3.19
	Cherupuzha	Dug Well	5.2	3.5	3.97	4.95
	Cheruthazam	Dug Well	10.05	7.05	6.83	8.66
	Chundaparambu	Dug Well	7.6	6.25	5.75	6.85
	Chural	Dug Well	11.55	3.2	3.95	7.03
	Dharmadam	Dug Well	3.2	1.4	1.55	2.51
	Echilamvayal	Dug Well	5.8	1.08	1.75	4.13
	Edakkad	Dug Well	1.76	0.74	0.46	1.67
	Edayannur	Dug Well	5.1	2.55	3.36	4.22
	Edoor	Dug Well	3.82	1.85	2.45	4.13
	Elambara	Dug Well	5	2.98	3.25	4.23
	Ettikkulam	Dug Well	10.5	6.8	8.05	9
	Ezhilode	Dug Well	14.5	9.05	10.31	12.64
	Irikkur	Dug Well	5.15	2.35	3	5.1
	Kadannapally	Dug Well	12.35	8.75	9.1	11.4
	Kakkathodu	Dug Well	4.1	5.35	3.2	3.65
	Kalliassery	Dug Well	11.1	5.75		7.7

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kallumutty	Dug Well	5.2	5.75	6.15	4.13
	Kanhirangad	Dug Well	14.2	10.95	8.9	13
	Kannapuram	Dug Well	2.85	1.35	1.23	2.25
	Kannavam	Dug Well	5.86	2.45	4.6	5.3
	Kannur	Dug Well	9.35	6.8	6.8	8.75
	Kannur-Thana	Dug Well	9.4	7.5	7.45	9.8
	Karikottakari	Dug Well	5.91	2.35	4.85	6.36
	Kelakam	Dug Well	9.8	5.65	7.85	10.2
	Kizhpalli	Dug Well	6.4	3.75	4.55	5.79
	Kolachery	Dug Well	9.1	7.4	5.7	8.8
	Kolakkad	Dug Well	8.81	7.65	6.28	9.63
	Kolayad	Dug Well	7.35	4.1	6.6	7.35
	Kommeri	Dug Well	3.4	2.4	3.7	4.41
	Koothuparamba	Dug Well	14.07	5.8	7.2	12.15
	Koottummukham	Dug Well	6.2	5.3	5.2	5.71
	Kottayampoil	Dug Well	8.8	4.1	6.1	7.5
	Kottiyur	Dug Well	7.15	7	7.01	7.15
	Kotty	Dug Well	2.6	1.4	1.8	2.25
	Kozhichal	Dug Well	6.3	4.18	4.4	5.71
	Kunnaru	Dug Well	2.5	0.5	0.65	1.8
	Kunnoth	Dug Well	6.4	1.2	2.72	6.25
	Kuppam	Dug Well	2.3	1.45	1.45	1.91
	Kuyilur	Dug Well	4.4	1.3	2.4	3.8
	Mahe (R1)	Dug Well	1.75	0.89	0.95	1.65
	Manantheri	Dug Well	8.08	4.5	6.1	7.05
	Manattana	Dug Well	3.18	1.55	4.76	4.2
	Mathamangalam (R1)	Dug Well	6.6	0.05	1.83	6.3
	Mathil	Dug Well	11.7	6	6.85	8.92
	Mattanur	Dug Well	8	3.84	5	7.42
	Mayyil	Dug Well	11.15	10.08	7.85	10.3
	Mekunnu	Dug Well	5.9	6.7	4.6	4.88
	Mele Chovva	Dug Well	8.2	7.3	7	7.85
	Melepukkom	Dug Well	9.07	5.7	7.15	7.98
	Melur	Dug Well		1.9	2.11	3.15
	Meruvambayi	Dug Well	5.73	1.82	11.22	5.42
	Mokeri	Dug Well	13.72	5.75	7.9	11.3
	Munderi	Dug Well	8	2.3	3.18	3.95
	Muzhakunnu	Dug Well	4.61	4.05	1.21	4.48
	Nayattupara	Dug Well	10	6.1	5.9	9.41
	Nellunni	Dug Well		3.1	3.3	3.22
	Neruvambram	Dug Well	15.1	11.25	6.58	15.11
	Nuchiyad	Dug Well	8.8	5.3	6.2	7.88
	Oduvalli	Dug Well	19.3	14.9	14.8	17.2

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Palleri	Dug Well		4.71	4.52	7.7
	Pallikkuni	Dug Well				8.8
	Palloor (Mahe)	Dug Well	8.31	6.55	7.28	3.95
	Pannoor	Dug Well	4.84	1.44	2.2	3.95
	Panunda	Dug Well	15.6	9.13	9.78	11.8
	Pappinissery West	Dug Well	3.2	0.53	0.5	1.75
	Parassinikadavu DW	Dug Well	14.4	12.91	12.7	14.21
	Pariyaram	Dug Well	13.5	10.55	8.02	13
	Pathiriyad	Dug Well	8.7	4.68	5.92	7.61
	Pattiyam	Dug Well	2.12	0.73	0.91	1.68
	Pattuvam	Dug Well	13.5	9.25	9.9	15.41
	Payyannur	Dug Well	5.6	3.15	4.13	5.1
	Pazhayangadi	Dug Well		1.24	0.7	1.7
	Peravoor	Dug Well	4.8	3.7	3.01	4.78
	Peringome (R1)	Dug Well	8.95	4.25	5.95	8.16
	Pinarayi	Dug Well	11.6	7.35	10.31	10.7
	Pukkundu	Dug Well	9.7	6.85	4.6	10.3
	Pulingome	Dug Well	6.4	3.65	4.76	6.23
	Puthiyatheru	Dug Well	8.1	3.14	3.55	7.4
	Ramantalai	Dug Well	9.3	4.42	6.9	8.75
	Sreekandapuram	Dug Well	8.9	4.69	4.5	7.45
	Taliparamba	Dug Well	10.2	8.15	6.05	9.5
	Thalassery	Dug Well	5	2.15	3	4.46
	Thazhe Chovva	Dug Well	1.5	0.25	0.06	0.98
	Ulikkal (R1)	Dug Well	5.1	2.25	3.35	5.81
	Vaaram	Dug Well	5.9	2.65	2.7	5.45
	Valakkai	Dug Well	3.85	3.7	3.05	4.59
	Valapattanam	Dug Well	5.33	3.38	4.28	5.13
	Vattiyamthodu	Dug Well	6.6	3.75	4.25	5.54
	Vayyakara	Dug Well	20.35	17.95	18.87	19.55
	Vengad	Dug Well	15	11.14	11.4	13.65
	Cannanore1	Tube Well	13	8.5	6.8	9.54
KASARAGOD	Bella	Bore Well	13.8	9.4	7.8	8.5
	Bovikkanam	Bore Well	16.3	7.4	11.4	11.8
	Chalingal Pz	Bore Well	11.6	4.9	5.1	5.7
	Chattanchal	Bore Well	15.75	10.61	13.3	13.8
	Cherkala	Bore Well	14.25	4.65	7.05	7.75
	Karindalam	Bore Well	24.8	22.3	22.75	23.3
	Kumbala	Bore Well	21	2.3	7.4	8.4
	Kundamkuzhi	Bore Well	11.7	5.85	6.3	7.4
	Kuniya	Bore Well	13.8	0	4.05	5.1
	Madhur	Bore Well	9.4	1.6	4.5	5.4
	Mangad	Bore Well	16.4	0	4.05	4.4

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Manjeshwar	Bore Well	11.05	3.85	8.25	9.05
	Mylatti	Bore Well	9.5	1.05	2.15	3.2
	Pachakkad CPCRI	Bore Well	9.7	5.4	7.5	8.4
	Pallikkara	Bore Well	8.2	5.7	5.98	6.5
	Periye Pz	Bore Well	14.7		6.15	6.9
	Seethamgulli	Bore Well	8.2	5	6.9	7.3
	Vidyanagar	Bore Well	10.3	4.8	18.4	20
	Adhuru (R1)	Dug Well	9.85	3.85	6.85	7.85
	Adkasthala	Dug Well	8.6	7.8	10.1	10.7
	Adoor	Dug Well	12.45	6.65	10.25	11.55
	Ajannur DW	Dug Well	12.4	8.3	3.7	2.75
	Ambalathara	Dug Well	6.1	1.4	1.8	4.6
	Anangoor	Dug Well	9.5	4.15	9	10
	Angadimogar	Dug Well	10.55	4.15	8.15	10.25
	Arladuka	Dug Well	16.8	13.3	13.8	13.8
	Badiadka-R1	Dug Well	14.47	11.97	11.9	12.07
	Bandadka	Dug Well	11.15	11.15	10.65	10.45
	Bangathadka	Dug Well	17.9	12.72	15.9	15.1
	Banputhadka	Dug Well	9.2	5.8	7.8	7.7
	Bayar	Dug Well	14.4	3.95	7.5	10.1
	Bedadka-R1	Dug Well	13.05	11.69	10.75	12.05
	Bedradka	Dug Well	13	7	9.4	11
	Bedrampalla (R1)	Dug Well	8.4	0.3	3.2	5.5
	Bekal	Dug Well	9.9	6.5	7.4	9.2
	Bela (R1)	Dug Well	13	11.9	11.1	10.7
	Bethoorpara	Dug Well	12.35	5.39	9.85	12.85
	Bhimanadi (R1)	Dug Well	10.18	3.53	7.98	9.58
	Bhimanadi-II	Dug Well	5.8	7.9	4.9	5.1
	Chalingal	Dug Well	11.7	4.6	5.6	8.2
	Chamundikunnu DW	Dug Well	10.9	10	9.85	10.6
	Chattanchal DW	Dug Well	14.4	12.6	13	13
	Cheemeni	Dug Well	8.5	3.6	4.5	7.6
	Cherkala	Dug Well	11.6	3.3	8.2	10.5
	Chittarikal	Dug Well	6.4	4.9	5	6
	Choyankod (R1)	Dug Well	8.1	1.4	1.7	6.3
	Dharmathadka	Dug Well	10.1	4.7	9.3	9.95
	Elambachi	Dug Well	5.05	1.85	2.35	3.55
	Iriyani	Dug Well	10.8	9	9	9.6
	Jodukallu	Dug Well	10.9	2.8	8.1	8.9
	Kadambar	Dug Well	12.9	6.7	12.2	12.85
	Kadappallam	Dug Well	16.6	12	10.14	10.6
	Kakkadavu (R1)	Dug Well	11.7			12.3
	Kalathur	Dug Well	12.3	5.6	7.3	10.1

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kalichanadukkam	Dug Well	5.55	4.4	2.6	5.8
	Kalikadavu	Dug Well	6.4	1.8	3.65	4.95
	Kanhangad Coast (R1)	Dug Well	2.9	1.1	2.4	2.75
	Kanhangad Town	Dug Well	9.15	6.15	6.55	8.8
	Kaniyala	Dug Well	5.8	0.9	2.9	4.8
	Kannadipara	Dug Well	12	7.5	8.1	10.7
	Karinthalam	Dug Well		8.25		11.5
	Kasaragod	Dug Well	10	7.6	9.2	9.2
	Kayyur	Dug Well	7.9	3.8	4.3	7.6
	Kinningar	Dug Well	7.25	1.55	4.4	4.4
	Kolichal	Dug Well	4.4	4.1	4.4	4.8
	Koliyarpadavu (R1)	Dug Well	12	7.5	9.6	9.1
	Koolom Road	Dug Well	11.1	5.4	4.2	9.4
	Kottiyadi	Dug Well	11	5.7	8.1	8.5
	Kovval	Dug Well	12.2	3.2	5.4	7
	Kudlu	Dug Well	9.8	8.3	8.3	10.3
	Kumbadaje	Dug Well	11.2	7.2	8.2	9.2
	Kumbla (R1)	Dug Well	13.4	4	9.5	9.6
	Kundamkuzhy	Dug Well	7.6	1.4	2.4	10.4
	Kuttikol	Dug Well	15.05	15.29	15	15.15
	Madhur	Dug Well		2	4.5	7.4
	Mandecap	Dug Well	8.4	3.3	6	6.6
	Mangad	Dug Well		6.8	7.2	10.8
	Mangalpady (R1)	Dug Well	12.1	7.3	11.1	11.5
	Manjeswar	Dug Well	14.7	6.1	9.2	10.2
	Mavinakatta	Dug Well	23	21.7	25	23
	Mavungal	Dug Well	9.2	2.2	2.1	6.1
	Melparamba	Dug Well	15.25	9.34	10.2	12.8
	Miyapadavu	Dug Well	13	8.5	11.5	11.7
	Mogral (R1)	Dug Well	11	1.4	4.8	9.6
	Mogral Puthur	Dug Well	10.5	5.3		
	Movvar	Dug Well	14.95	13.15	11.15	14.15
	Muligadde	Dug Well	10.55	2.75	8.35	9.45
	Muliyar	Dug Well	7	2.7	5.8	6.2
	Mulleria	Dug Well	17.3	16.7	17.8	17.3
	Munnad	Dug Well	13.5	8.1	9.9	10.6
	Naimarmoola	Dug Well	9.7	8.3	8.3	9.05
	Nattakkal	Dug Well	12.5	12	10.1	12.4
	Nellikatta	Dug Well	10.4	1.4	6.4	7.5
	Nileshwar	Dug Well	5.8	2.75	3	4.2
	Odayanchal	Dug Well	3.55	2.05	2.15	2.85
	Pachambla	Dug Well	9.9	5	7.2	8.2
	Padiyathadka	Dug Well	8.6	3.9	7	7.4

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Paivalike	Dug Well	9.3	6.1	7.9	8.9
	Pallam	Dug Well	9.7	3.55	5.4	7.5
	Panathur	Dug Well	11.25	6.95	10.45	11.05
	Parappa north	Dug Well	9.2	5.3	8.7	8.7
	Peraladkam	Dug Well	6.45	3.15	4.6	6.95
	Periyattadukkam	Dug Well	10.2	4	4.6	8.4
	Periye	Dug Well	11.85	7	7.8	8.9
	Perla	Dug Well	8.1	5	9.5	7.5
	Poinachi-R1	Dug Well	14.1	11.1	14	14.1
	Pookatta	Dug Well	16.5	12.2	10	10.6
	Povval	Dug Well	13.2	11.3	12.8	12.8
	Pullur	Dug Well	8.9	10.5	6.7	7.6
	Putheriyadukkam	Dug Well	10.2	7.8	10.75	11
	Puthige	Dug Well	15.25	4.45	10.25	9.45
	Rajapuram	Dug Well	6.05	4.55	5.85	5.7
	Ramdas Nagar (Kudlu)	Dug Well	14.5	8.1	8.7	11.9
	Sasthangode (Sastha Nagar)	Dug Well	24.1	19.1	21.4	22.1
	Sorga	Dug Well	8.65	1.55	6.65	7.25
	Thachangad	Dug Well	11.4	6.4	6.55	10
	Thaniyadi	Dug Well	5.4	2.75	5.35	4.75
	Thoyammel	Dug Well	12.55	8.5	8.8	10
	Trikaripur	Dug Well	4.1	0.7	1.4	2.5
	Udinur Central	Dug Well	4.55	1.75	2.15	3.05
	Ukkinadka	Dug Well	6.6	2.9	5.4	5.65
	Uppla	Dug Well	12.5	6.2	7.2	9.9
	Vorkady	Dug Well	13.8	7.7	11.7	12.6
	Yethadka	Dug Well	5.8	1.9	5.3	5.1
	Ajannur(s2)	Tube Well	2.25	1.15	0.54	
	Ajannur(s4)	Tube Well	2.4	1	1.6	
KOLLAM	Anchal	Bore Well	9.03	7.13	5.38	7.43
	Chadayamangalam Pz	Bore Well	0.54	0.42		0.54
	Kalluvathukkal	Bore Well		4.2	6	5.06
	Koovakad	Bore Well	4.59	1.12		5.13
	Pathanapuram	Bore Well	0.42			
	Ummmannur	Bore Well	12	8.9	6.9	9.97
	Vazhathopu	Bore Well	6.75	4.62	2.4	4.9
	Yeroor1	Bore Well	5.95		1.38	5.48
	Achenkovil (R1)	Dug Well	6.16	3.35		
	Ailara	Dug Well	2.45	1.68	1.25	2.06
	Akkal	Dug Well	9.76	9.08	6.46	8.61
	Alayamon	Dug Well	8.71	6.66	4.75	7.52

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Alumoodu	Dug Well	8.76	6.72	3.05	8.55
	Anayadi	Dug Well	11.59	7.57	9	13.36
	Anchal DW	Dug Well	9.03	4.4	3.08	7.8
	Anchalammud (R1)	Dug Well	9.45	6.93	8.08	8.51
	Ariyankavu	Dug Well	6.77	1.05		5.05
	Avaneswaram	Dug Well	5.48	4.1	1.85	4.65
	Ayathil	Dug Well	7.65	5.37	5.47	
	Ayur	Dug Well	10.35	5.62	5.15	9.6
	Bharathipuram	Dug Well	9.7	8.21	7.05	9.04
	Bhoothakulam	Dug Well	10.65	9.22	9.72	10.74
	Chadayamangalam (R1)	Dug Well	10.67	6.6	4.82	9.15
	Chakkuvalli	Dug Well	8.65	5.21	4.15	6.89
	Channapetta	Dug Well	10.79	10.22	8.8	10.28
	Chathannur	Dug Well	11.04	8.47	7.3	8.84
	Chenkulam	Dug Well	5.4		1.95	
	Chithara	Dug Well	7.76	6.85	5.13	8.03
	Choorakulam Jn	Dug Well	7.44	6.2	5.16	6.54
	Cinemaparambu (R1)	Dug Well	11.93	7.92	5.27	9.78
	East Kallada	Dug Well	5	3.07	1.91	
	Edamon	Dug Well	9.47	7.51		8.62
	Edamulakkal	Dug Well	5.92	5.85	5.13	5.83
	Edayam	Dug Well	13.03	10.6	7.41	11.13
	Ezhamkulam	Dug Well	6.66	6.22	5.31	7
	Ezhukone	Dug Well				3.69
	Ezhukone (R1)	Dug Well	4.34	2.19	0.64	3.69
	Iravipuram (R1)	Dug Well	3.63	1.83		2.63
	Ithikara	Dug Well	16.47	14.81	13.9	
	Kadakkal	Dug Well	7.61	6.88	5.42	7.76
	Kadapuzha	Dug Well	2.49	2.25	3.3	2.55
	Kalluvathukkal	Dug Well		4.2	6	5.06
	Kalluvettumkuzhi	Dug Well	9.76	7.23	5.18	8.96
	Kamukanchery	Dug Well	9.44	8.2	7.39	8.87
	Kangathumukku	Dug Well	5.72	7.16	4.38	6.2
	Kanjiramkode	Dug Well	6.67	4.09	3.87	5.9
	Kanjiramvila	Dug Well	5.94	6.86	6.03	8.47
	Karamkode	Dug Well	11.35	10.06	8.28	10.25
	Karavaloor	Dug Well				9.25
	Karukone	Dug Well	8.04	6.8	4.3	7.35
	Karunagapally	Dug Well	3.54	1.1	1.5	2.24
	Karunthalakode	Dug Well	1.63	1.84	0.11	1.1
	Kollam(Quilon)	Dug Well	8.95	7.1	6.82	
	Kottamkulangara	Dug Well	1.98	0.47	0.57	1.55

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kottarakara (R1)	Dug Well	16.52	12.48	8.6	13.56
	Kottathala	Dug Well				7.35
	Kottiyam	Dug Well	9.87	7.57	5.69	8.76
	Kulakada	Dug Well			3.35	
	Kulapadam	Dug Well	7.76	7.3	5.12	6.2
	Kulathupuzha	Dug Well	6.06	4.18	2.71	4.94
	Kumbalam (R1)	Dug Well	20.78		17.32	20.47
	Kunnada	Dug Well	12.7	7.64	6.44	9.22
	Kunnathur	Dug Well	18.6	15.34	12.57	15.05
	Kuripalli	Dug Well	8.85	6.6	5.41	9.46
	Kurungapalli	Dug Well	1.96		0.54	
	Kutavettur	Dug Well	6.76	6.13	1.31	6.2
	Madathara	Dug Well	5.34	4.47	3.41	5.28
	Manakarakavu-Vendar	Dug Well	7.97	6.34	4.97	7.4
	Manapalli	Dug Well		4.21	5.23	
	Mayyanad	Dug Well	6.1		3.38	
	Meenad	Dug Well	5.24	4.17	3.86	4.66
	Meenkulam	Dug Well	8.7	7.91	6.35	8.12
	Mulavana	Dug Well	11.2	9	8.88	10.84
	Muthukumel	Dug Well	6.5	5.29	4.32	6.15
	Mynagapalli	Dug Well	10.45	6.48	5.78	9.16
	Nallila	Dug Well	6.6	7.4	5.42	5.96
	Nedungolam	Dug Well	11.74	7.28	6.11	10.7
	Neendakara (R1)	Dug Well	0.93	0.43	0.4	1.02
	Nellikunnam DW	Dug Well	1.06	1.1		1.5
	Nilamel	Dug Well	4.71	3.8	2.48	4.67
	Oachira1	Dug Well	1.32	0.49	0.46	1.1
	Odanavattom	Dug Well	5.5	4.11	3.22	
	Ottakkal	Dug Well	7.18	5.1		6.62
	Oyur	Dug Well	9.95	7.1	4.6	8.17
	Palamoodu	Dug Well	11.13	8.01		
	Pallickal	Dug Well	5.37	5.13	2.28	6
	Pangalukadu	Dug Well	7	5.46	4.92	6.87
	Panmana-Manayil	Dug Well	3.4		0.3	2.6
	Paravur	Dug Well	2.25	0.54	6.07	7.7
	Paripally (R1)	Dug Well	9.45	8.58	6.08	
	Pattanapuram	Dug Well	7.24	7.69	5.75	10.46
	Pavitreswaram	Dug Well	4.66	3.45	3.93	4.12
	Perinad	Dug Well	6.69	6.17	5.07	
	Perumkulam	Dug Well	8.16	6.65	3.68	6.78
	Pozhikara	Dug Well	5.98	4.23	3.66	5.42
	Punalur-I (R1)	Dug Well	11.02	7.12		7.59
	Punnala (R1)	Dug Well	8.27	6.05	5.3	7.59

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Puthoor	Dug Well	5.78	5.06	3.35	8.17
	Roduvila	Dug Well		8.33		0
	Sasthamkottah (R1)	Dug Well	6.53	4.79	4	5.78
	Sooranadu	Dug Well	5.93	5.59	4.3	5.18
	Tadicaud (R1)	Dug Well	8.13	5.94	4.9	7.15
	Tevalakara	Dug Well				8.22
	Thattamala	Dug Well			1.15	
	Thenmala	Dug Well	7.15	5.33		
	Thodiyur	Dug Well	3.09	0.79	0.48	2
	Ummannur	Dug Well	9.45	7.12	4.55	7.86
	Vallikavu	Dug Well	1	0.38		
	Vazhathoppu	Dug Well	7.85	5.33	3.08	7.16
	Veliyam	Dug Well	9.75	7.45	4.95	8.62
	Vilakkupara	Dug Well	12.82	7.7	6.2	8.55
	Yeroor	Dug Well	2.75	0.95	1.03	2.6
	Manappalli	Tube Well		18.52	16.7	
	Trikkadavur	Tube Well		10.68	6.48	14.25
	Vayyankara	Tube Well	15.1	14.76	12.3	15.82
KOTTAYAM	Ettumannur	Bore Well	0.39	0.04	0.19	0.36
	Kidangoor	Bore Well	7.38	4.2	4.27	8.22
	Kuravilangad	Bore Well	4.02	3.17	2.24	4.3
	Poonjar	Bore Well	4.8	1.77	4.17	
	Anandasram	Dug Well	7.21	6.69	7.01	7.6
	Arunuttimangalam	Dug Well	5.85	4.03	4.65	5.9
	Ayamkudi	Dug Well	8.46	3.62		8.09
	Ayarkunnam	Dug Well	6.04	1.66	3.41	5.56
	Brahmamangalam	Dug Well	4.93	3.45	4.74	5.82
	Chamampathal	Dug Well	2.08	2.67	2.87	3.16
	Changanasserry	Dug Well	3.03	2.71	2.75	3.15
	Chempu	Dug Well	2.74	0.67	1.06	2.01
	Chengalam South	Dug Well	1.48	0.48	0.25	1.14
	Cheruthikara	Dug Well	508	2.26	2.3	4.74
	Cheruvalli	Dug Well	5.82	3.96	5.26	5.99
	Chotti	Dug Well	6.09	0.98	2.4	5.9
	Chungam	Dug Well	3.63	2.6	1.94	3.48
	Edakadathy	Dug Well	9.05	6.44	8.99	9.19
	Edamaruku	Dug Well	3.18	3.36	1.84	4.06
	Edinjillam	Dug Well	3.05	2.22	2.31	3.16
	Elamkulam	Dug Well	4.76	1.5	2.24	3.68
	Erumeli	Dug Well	1.31	0.96	1	2.14
	Ethakuzhy (Kallara)	Dug Well	3.42		1.63	2.9
	Iykarakunnam	Dug Well	8.09	5.07	5.11	7.97

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kadaplamattom	Dug Well	5.34	5.2	4.79	5.49
	Kaduthuruthi	Dug Well	6.08	3.59	4.23	5.5
	Kalakatty	Dug Well	4.14	2.93	3.65	4.28
	Kalathipady	Dug Well	8.96	5.67	6.36	8.52
	Kalathur	Dug Well	12.3	5.6	7.3	10.1
	Kangazha	Dug Well	6.13	2.77	4.79	6.14
	Kanjirapally	Dug Well	7.52	4.04	6.52	8.16
	Kidangur-R1	Dug Well	4.18	1.15	1.41	4.72
	Kollappally	Dug Well	3.33	3.24	3.06	3.62
	Kooroppada	Dug Well	4.37	1.71	3.23	4.25
	Koothrappally	Dug Well	4.2	2.6	3.09	4.58
	Kottayam (R1)	Dug Well	12.53	9.74	9.05	10.69
	Kozha	Dug Well	1.84	1.68	1.42	2.17
	Kozhuvanal	Dug Well	4.52	2.97	4.26	4.45
	Kudavechur	Dug Well	2.82	1.02	1.49	1.89
	Kumarakom	Dug Well	1.16	0.09	0.24	0.73
	Kummannur	Dug Well	5.37	4.81	5.1	5.53
	Kuravilangad1	Dug Well	4.39	3.36	2.5	4.84
	Kurichy (Sachivothamapuram)	Dug Well	6.43	2.98	6.37	8.14
	Kuruppanthara	Dug Well	1.41	0.77	1.59	1.45
	Kuttikal-R1	Dug Well	3.25	1.68	2.25	3.4
	Kuvapalli	Dug Well	6.16	2.1	2.41	6.3
	Madapally	Dug Well	2.55	0.79	1.04	1.63
	Manimala	Dug Well	4.43	3.21	3.73	5.33
	Mannanam	Dug Well	6.12	1.51	3.39	6.29
	Marangattupalli	Dug Well	2.96	2.51	2.45	2.83
	Melukavu Mattom	Dug Well	5.36	4.32	2.49	5.22
	Mevellur	Dug Well	3.01	2.31	2.38	2.59
	Monipalli	Dug Well	2.26	2.13	1.96	2.36
	Mukkada	Dug Well	7.52	3.32	4.04	7.67
	Mukkoottuthara	Dug Well	2.76	1.86	1.93	2.98
	Mundakayam	Dug Well	7.43	1.84	3.43	4.54
	Mundukuzhi	Dug Well	8.99	5.66	5.44	7.9
	Mutholi	Dug Well	5.89	5.81	5.06	6.21
	Narianganam	Dug Well	2.42	4.12	3.11	5.09
	Nedumkunnam	Dug Well	6.17	3.04	4.37	6.73
	Neendur	Dug Well	3.94	1.29	1.66	3.26
	Paippad	Dug Well	7.19	6.67	5.85	8.05
	Palai	Dug Well	4.44	4.74	4.13	4.83
	Palamkadavu	Dug Well	1.89	0.78	1.07	1.59
	Pallikkathodu (R1)	Dug Well	6.03	2.84	3.44	5.88
	Pallom (nattagam)	Dug Well	6.66	4.5	4.92	6.73

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Pambadi	Dug Well	5.14	1.47	3.44	5.24
	Panackapalam Jn	Dug Well	4.59	3.49	4.61	4.84
	Paruthumpara	Dug Well	7.02	5.51	6.46	6.62
	Plakkalpadi	Dug Well	6.05	3.93	4.38	5.25
	Ponad	Dug Well	7.65	6.09	3.11	7.12
	Ponthanpuzha	Dug Well	4.51	2.87	2.79	4.62
	Poovathilappu	Dug Well	4.07	2.26	3.33	4.09
	Pravithanam	Dug Well	4.39	4.59	3.36	5.02
	Pulikkal Kavala	Dug Well	3.43	2.76	3.06	3.47
	Pulikuttisseri	Dug Well	0.97	0.14	0.04	0.7
	Punjar	Dug Well	0.15	0.04	0.14	1.9
	Puthupally	Dug Well	6.86	2.71	2.89	6.91
	Ramapuram (R1)	Dug Well	3.77	3.49	3.31	4.18
	Teekoy	Dug Well	4.12	3.94	3.94	4.93
	Thalayolaparambu (R1)	Dug Well	2.92	1.18	1.8	2.95
	Thazhathangadi	Dug Well	2.07	1.38	0.87	1.96
	Thekethukavala	Dug Well	5.24	0.8	2.57	6.3
	Thidanad	Dug Well		2.67		6.5
	Thiruvanchoor	Dug Well	3.73	0.91	2.05	3.79
	Thiruvarpu	Dug Well	1.84	0.32	0.68	
	Thottakam	Dug Well	2.98	1.11	1.39	2.09
	Thottakkad	Dug Well	5.78	2.86	4.86	6.01
	Trikodithanam	Dug Well	12.66	10.34	10.28	11.88
	Udayanapuram	Dug Well	1.67	0.32	0.79	1.35
	Urulikunnam	Dug Well	3.66	2.66	2.97	3.87
	Uzhavoor (R1)	Dug Well	2.74	2.07	1.95	2.82
	Vaikom	Dug Well	1.92	0.69	1.61	1.71
	Vakathanam	Dug Well	5.73	2.26	4.99	5.91
	Vazhur	Dug Well	4.84	1.56	1.26	3.76
	Vechur	Dug Well	2.28	0.49	0.89	1.56
	Vellur-III	Dug Well	3.01	1.11	1.61	2.71
	Vempalle	Dug Well	1.68	1.26	1.43	1.73
	Veyilkanampara (Kondur)	Dug Well	4.13	3.07	3.82	4.84
	Chempu- West	Tube Well	1.92	1.85	1.69	
KOZHIKODE	Balussery pz	Bore Well	8.11	5.38	6.6	7.53
	Cheruvannur pz	Bore Well	7.26	3.8	4.17	6.65
	Chevayur pz	Bore Well		25.24		30.08
	Kalikadavu pz	Bore Well		1.91		
	Karuvannur pz	Bore Well	0.72	0.27	0.49	1.3
	Kokallur pz	Bore Well		6.78		7.13
	Thodannur(west)	Bore Well	6.19	3.6	3.44	5.85

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Thuneri pz	Bore Well	479	2.25	3.19	4.24
	Vellimadakunnu pz	Bore Well	19.73	19.52	6.1	19.65
	Atholi	Dug Well	4.5	1.83	2.4	4.05
	Azhinjilam	Dug Well	1.85	0.6	0.58	1.58
	Badagara (Vadakara)	Dug Well	5.78	3.84	4.46	5.44
	Balusseri	Dug Well	6.93	3.78	5.73	7.09
	Beypore	Dug Well	3.58	0.7	1.01	2.55
	Bhumivathukkal	Dug Well	7.9	4.18	5.85	6.95
	Calicut Beach	Dug Well	3.07	1.85	2.07	2.89
	Chaliyam	Dug Well	2.42	1.3	1.89	2.84
	Chelavur	Dug Well	8.52	6.48	7.58	8.05
	Chemencheri	Dug Well	3.92	0.63	1.27	2.64
	Cheruvannur West	Dug Well	3.93	3.05	3.15	4.02
	Chevayur	Dug Well	12.02	12.55	11.05	11.4
	Chiulavi (Niravamal)	Dug Well	8.61	5.13	6.38	7.58
	Chulur	Dug Well	5.7	5.18	5.05	5.58
	Devarkoil	Dug Well	6.8	5.47	7.48	8.05
	Elattur	Dug Well	3.71	1.44	1.52	2.82
	Feroke DW	Dug Well	11.64	11.7	11.72	12.05
	Iringallur	Dug Well	3.15	1.98	2.08	3.16
	Kakkayam	Dug Well	3.1	2.95	3.13	3.1
	Kallachi	Dug Well	0.89	0.38	0.35	0.66
	Kallai	Dug Well	4.68	2.88	3.2	4.17
	Kannankara (Chelannur)	Dug Well	1.74	0.65	0.75	1.75
	Kannoor	Dug Well	4.95	3.77	4.1	4.67
	Karaparamba	Dug Well	3.19	2.18	2.34	3.22
	Kariyathumpara	Dug Well	2.65	2.05	3.05	2.88
	Karuvannur	Dug Well	3.18	2.9	2.95	3.38
	Kayapanachi	Dug Well	4.9	3.06	3.77	4.18
	Kodencherry	Dug Well	0.82	0.95	1.94	1.03
	Koduvalli	Dug Well	7.94	5.03	6.65	8.11
	Koduvalli North	Dug Well		0.45		4.35
	Koothali	Dug Well	4.6	2.77	3.65	5.08
	Kottakadavu	Dug Well	13.13	11.65	12.34	14.77
	Kozhikode	Dug Well	12.82	9.75	10.95	11.43
	Kunnamangalam	Dug Well	9.68	7.5	8.19	10.37
	Kunnumakkara	Dug Well	2.53	0.8	1.05	1.8
	Kurachund	Dug Well	3.83	4.3	5.04	5.59
	Kuttiyadi	Dug Well	7.94	6.04	7.73	7.98
	Malayamma	Dug Well	5.65	4.05	2.03	4.62
	Manassery	Dug Well	3.68	1.2	2.05	3.56
	Mattanodu	Dug Well	8.91	6.3	7.3	9.04

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Mavoor-i	Dug Well	7.27	5.95	5.77	6.58
	Mavoor-ii	Dug Well	10.35	7.3	8.16	9.4
	Melady 1	Dug Well	1.82	0.61	0.85	1.51
	Meppayur	Dug Well	4.07	2	2.73	3.9
	Mukkali	Dug Well	5.2	1.9	2.67	4.3
	Muliyangal	Dug Well	2.44	1.12	1.23	2.4
	Mullankunnu	Dug Well	15.46	14.74	0.68	13.78
	Murampathy	Dug Well	6.09	6.02	6.1	6.4
	Nadapuram	Dug Well	3.76	1.11	1.65	2.67
	Naduvannur	Dug Well	7.15	4.14	6.03	6.8
	Naduvattom	Dug Well	1.65	0.57	4.82	0
	Nallalam	Dug Well	3.46	1.56	1.43	2.66
	Nanminda	Dug Well	6.55	3.52	4.37	6.21
	Narikuni	Dug Well	2.47	0.3	0.93	2.17
	Nayarkuzhi	Dug Well	6.55	5.45	5.7	6.37
	Orkattery	Dug Well	3.03	1.35	1.5	4.03
	Pavangad	Dug Well	3.21	0.61	1.05	2.7
	Perambra	Dug Well	4.93	1.84	2.1	2.99
	Perumpally	Dug Well	4.23	1.07	2.34	3.67
	Peruvayal	Dug Well	7.13	4.2		0
	Pudukayam	Dug Well	9.64	6.28	7.2	7.94
	Pudupadi	Dug Well	2.63	2	2.2	2.27
	Pudupanam	Dug Well	4.97	3.65	4.19	4.94
	Punnasseri	Dug Well	7.46	4.43	5.59	7.18
	Quilandy	Dug Well	6.33	3.43	3.75	5.37
	Ramanattukara (R2)	Dug Well	4.54	1.65	1.81	2.8
	Tamarasseri	Dug Well	1.5	0.72	0.79	1
	Thenamkuzhi	Dug Well	3.8	1.33	2.18	3.87
	Thikkodi	Dug Well	6.71	3.5	3.57	5.45
	Thiruvallur	Dug Well	1.73	0.37	1.02	1.82
	Thiruvambady	Dug Well	3.88	2.85	3.1	3.82
	Thodannur	Dug Well	6.6	4.77	6.14	6.3
	Thuneri1	Dug Well	4.4	2.7	3.35	4.04
	Ulliyeri	Dug Well	3.43	1.9	2.33	3.32
	Unnikulam	Dug Well	4.15	2.9	3.6	3.98
	Valayam	Dug Well	6.45	4.05	5.4	6.43
	Vattoli	Dug Well	4.46	2	3.85	4.95
	Vellimadakunnu	Dug Well	13.06	12.5	12.85	12.63
	Villyapalli	Dug Well	7.11	5.55	6.1	6.57
	West Pudupadi	Dug Well	4.63	1.97	3.32	4.45
	Chombala(pz)	Tube Well	5.45	2.65	2.62	4.38
	Chombala(w1)	Tube Well	4.95	1.28	2	3.98
	Chombala(w2)	Tube Well	4.85	1.15	1.95	3.8

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Chombala(w3)	Tube Well	5.05	1.25	1.84	4.03
	Chombala(w4)	Tube Well	5.05	1.31	1.85	4.02
	Meladi	Tube Well	1.82	0.42	0.72	1.43
MALAPPURAM	Ammnikad Pz	Bore Well	10.94	2.35	2.68	4.32
	Edakkara (Karunechi)	Bore Well	17.54	16.3	14.48	15.6
	Edakkulam	Bore Well	8.05	2.15	1.35	6.11
	Kaladi (Kadancherry) Pz	Bore Well	8.89	6.59	7	7.61
	Karavarakundu Pz	Bore Well	12.76	9.69	10.8	12.05
	Karulayi	Bore Well	3.53	1.18	2.01	2.59
	Mankeri Pz	Bore Well	22.74	2.78	5.2	11.97
	Nediyirippu Pz	Bore Well		0.45		1.11
	Othukkungal	Bore Well	37.07	21.98	21.44	29.2
	Pandalur	Bore Well	7.28	5.88	6.42	7.88
	Parambilpeedika	Bore Well	35.26	22.92	28.74	31.53
	Puzhakkattkiri	Bore Well	5.39			
	Thelakkad	Bore Well	15.02	3.07	8.8	11.34
	Thiruvali	Bore Well	6.61	4.75	5.3	5.79
	Thozhuvannur	Bore Well	25.62	0	8.77	14.19
	Thuvur	Bore Well	9.64	12.79	8.27	10.01
	Valancheri Pz	Bore Well	18.18	16.04	16.3	18.07
	Akkaparambu	Dug Well	9.78	7.45	8.45	9.4
	Amminikad	Dug Well	4.51	2.74	3.97	3.77
	Anakkayam	Dug Well	8.56	7	7.27	7.8
	Angadipuram	Dug Well	8.56	5.74	6.14	7.39
	Anjuvadi	Dug Well	2.41	1.75	2.25	2.62
	Arikode	Dug Well	9.46	5.99	7.31	7.88
	Ariyallur	Dug Well	3.68	1.17	1.75	2.6
	Athanikal- Vallikunnu	Dug Well	5.31	2.28	12.69	13.31
	Athanikkal	Dug Well	14.73	12.85	4.25	4.66
	Athirumada	Dug Well	14.38	11.64	12.05	11.7
	Beeranchira	Dug Well	9.33	6.67	7.15	7.65
	Buliyampadam (Velumbiampadam) (R1)	Dug Well	13.12	9.72	8.6	9.89
	Chamravattom	Dug Well	1.92	1.17	2.08	1.8
	Chemmalassery	Dug Well	5.69	4.28	4.77	6.25
	Cherani	Dug Well	5.34	2.57	4.95	5.48
	Cherukara	Dug Well	6.33	6.18	6.28	6.8
	Cherukode	Dug Well	6.94	5.82	5.95	6.45
	Cherukulam	Dug Well	11.88	8.6	10	10.69
	Chokkad	Dug Well	3.96	1.95	3.25	4.23

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Chungathara (R1)	Dug Well	3.44	1.37	2	2.83
	Edappal	Dug Well	11.7	11.5	11.4	12.4
	Edavanna (R1)	Dug Well	9.84		3.98	9.57
	Edayur	Dug Well	7.54	5.61	6.83	7.25
	Eriyad	Dug Well	3.4	2.24	2.9	3.03
	Iswaramangalam	Dug Well	3.65	0.58	1.1	2.23
	Kadalundi	Dug Well	3.98	3.65	4.11	4.31
	Kadampuzha	Dug Well	11.28	8.37	9.89	10.65
	Kadannamanna	Dug Well	5.59		5.04	6.22
	Kadungapuram	Dug Well	8.08	5.82	6.81	9
	Kalikavu	Dug Well	5.37	3.44	3.94	4.91
	Kanjiramukku	Dug Well	6.22	3.33	4.08	4.95
	Karathur	Dug Well		8.2	8.7	
	Kariavattam	Dug Well	8.59	5.8	7	7.73
	Karipol	Dug Well	9.53	9.23	9.48	10.36
	Karulai	Dug Well	7.84	6.81	7	8.6
	Karumbil	Dug Well	12.9	11.09	11.71	11.4
	Karunechi	Dug Well	19.55	19.12	16.28	16.98
	Karuvankallu	Dug Well	8.7	7.27	8.03	8.25
	Karuvarakundu	Dug Well	2.85	1.99	2.56	12.05
	Kattumunda (R1)	Dug Well	12.99	7.81	10.28	11.35
	Kavanur1	Dug Well	10.96	7.09	7.38	10.16
	Kizhumuri - Oorakam	Dug Well	10.18	9.12	9.65	9.85
	Kondotty	Dug Well	3.3	1.21	1.9	2.6
	Kottakkal	Dug Well	8.28	7.96	8.25	8.51
	Kottapuram	Dug Well	7.06	4.17	5.8	8.07
	Krishnapuram Puthentheru	Dug Well	3.66	1.07	1.65	2.65
	Kulattur	Dug Well	5	1.91	3.83	5.03
	Kunnumpuram	Dug Well	13.79	11.97	12.58	13.5
	Kuruva (Padaparamba)	Dug Well	12.13	10.98	11.25	12.13
	Kuttipuram	Dug Well	4.94	0.6	1.1	2.48
	Malappuram	Dug Well	7.05	6.63	7.6	8.32
	Mangalam (R1)	Dug Well	2.98	1.38	1.61	2.19
	Manjeri	Dug Well	4.03	1.48	3.95	4.4
	Mankeri	Dug Well	6.81	2.19	4.1	5.58
	Marancheri	Dug Well	7.69	4.39	5.41	6.41
	Marutha (R1)	Dug Well	10.02	5.66	5.68	8
	Meenedathur	Dug Well	2.7	0.64	1.29	2.02
	Melattur	Dug Well	6.44	5.49	6.46	7.16
	Moochikkal (Clari Moochikkal)	Dug Well	1.69	0.48	0.65	0.95
	Moothedam	Dug Well	4.23		1.85	2.83

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Mudikode	Dug Well	5.06	1.8	4.58	5.2
	Narokavu	Dug Well	14.61	11.22	11.55	13.01
	Nediyirippu	Dug Well		1.17		2.07
	Nellikuth	Dug Well	6.73	5.48	6.08	6.26
	Nilambur (R1)	Dug Well	4.13	3.28	4.45	3.93
	Olavattur	Dug Well	7.61	6.16	7.1	8.07
	Othukkungal DW	Dug Well	10.76	7.33	9.11	13.87
	Padikkal	Dug Well	9.62	6.54	9.35	9.35
	Pandalur DW	Dug Well	7.21	3.28	6.97	7.48
	Pandikkad (R1)	Dug Well	4.32		4.25	4.65
	Paral	Dug Well	6.15	4.95	5.86	6.97
	Parambilpeedika	Dug Well	12.56	11.84	11.58	12.7
	Parappanangadi	Dug Well	2.78	0.72	1.3	2.05
	Parappur	Dug Well	12.01	11.02	11.82	12.1
	Paravana	Dug Well	4.92	3.53	1.74	3.58
	Pathiriyal	Dug Well	7.19	5.32	7.25	7.47
	Payyanad	Dug Well	7.92	5.79	7.3	8.15
	Perinthalmanna (R1)	Dug Well	6.28	6.17	6.25	6.21
	Perumpadappu	Dug Well	6.49	1.18	3.05	4.85
	Peruvakkad	Dug Well	6.42	4.53	5.67	6.11
	Ponnani (R1)	Dug Well	1.71	1.21	1.42	1.68
	Pookottoor	Dug Well	2.22	0.15	0.38	1.13
	Pookottumpadam	Dug Well	4.26	2.26	3	3.62
	Pukattery	Dug Well	9.16	3.45	8.23	6.71
	Pukothu	Dug Well	7.01	4.83	5.78	6.7
	Pulamantol	Dug Well	8.99	6.87	7.15	8.5
	Purathur	Dug Well	1.79	1.13	1.37	1.65
	Puthenkulam	Dug Well	2.37	1.49	1.93	2.97
	Puzhakkatteri	Dug Well	5.39	2.64	5.08	6.82
	Ramankulam	Dug Well	6.56	2.7	6.03	6.29
	Ramapuram	Dug Well	5.65	4.24	4.87	5.85
	Tachinganedam	Dug Well	5.36	3.83	5.08	6.5
	Tanur	Dug Well	5.23	2.54	3.4	4.1
	Tenjippalam (R1)	Dug Well	15.02	10.74	12.85	13.85
	Thavanur	Dug Well	11.48	8.57	8.93	9.65
	Thazhekkode Kappumugham	Dug Well	6.94	1.7	6.18	7.81
	Thazhekode	Dug Well	7.38	6.4	6.85	7.1
	Thirunavaya	Dug Well	5.53	3.56	4.42	5.33
	ThiruvaliDW	Dug Well	2.29	0.67	0.93	1.5
	Thrikkalangode	Dug Well	4.84	0.14	1.55	2.41
	Thuvur DW	Dug Well	10.03	6.71	8.15	9.75
	Tirukkad	Dug Well	6.89	5.17	6.23	7.48

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Tirur	Dug Well	12.08	11.89	12.03	12.15
	Tirurangadi	Dug Well	12.23	11.68	11.95	12.15
	Tripanachi	Dug Well	11.55	8.5	9.51	10.55
	Uppada	Dug Well	3.2	1.06	4.58	2.07
	Vadakkemanna	Dug Well	8.34	5.04	6.28	7.53
	Valancheri (R1)	Dug Well	9.58	7.68	8.8	9.55
	Valavannur	Dug Well	13.56	8.12	12.05	14.58
	Valiyakunnu	Dug Well	7.01	6.67	6.9	7.08
	Vaniyambalam	Dug Well	7.37	2.73	4.72	6.28
	Vazhakkad	Dug Well	4.39	3.83	4.23	4.35
	Vazhikadavu	Dug Well	6.27	6.65	7.3	5.44
	Vellila (R1)	Dug Well	6.69	5.78	5.18	6.11
	Vengad	Dug Well	15	11.14	11.4	13.65
	Venniyur	Dug Well	8.24	7.34	8.28	8.53
	Vettom1	Dug Well	3.06	1.41	1.99	3.02
	Vylattur (R2)	Dug Well	11.22	2.28	7.86	8.2
	Wandur	Dug Well	9.45	7.378	9.25	8.97
	Vettom	Tube Well	2.96	1.41	2.15	2.43
PALAKKAD	Chullimada Pz	Bore Well	3.1		2.08	
	Kallepully	Bore Well			12.61	
	Kanjikode(FCRI)	Bore Well	9.6	4.7	6.03	6.87
	Kannadi	Bore Well	2	0.3	0	1.09
	Karimpuzha	Bore Well			1.3	
	Koduvayur	Bore Well	7.72	3.62	2.26	4.53
	Kongad	Bore Well	5.55		2.03	5.1
	Kozhipara Pz	Bore Well	3.95	1.6	1.34	5.84
	Kunnamkattupathy Pz	Bore Well				
	Kunnissery	Bore Well	8.7	7.6	5.9	8.5
	Lakkidi Thekkumangalam	Bore Well	24	16.12	12.76	17.3
	Malampuzha OW	Bore Well	3		6.08	
	Malampuzha Pz	Bore Well				6.1
	Melarkode	Bore Well	24.6	12.3	5.7	19.89
	Moochangundu	Bore Well			17.45	20
	Mundur Pz	Bore Well	9.42	31.98	31.5	2.64
	Muttikulangara Pz	Bore Well	10.17		11.78	0
	Nanniyodu Pz	Bore Well				0
	Nellikattiri Pz	Bore Well	25.84		6.2	0
	Nemmara1	Bore Well				3.31
	Padur	Bore Well	11.7		7.75	7.23
	Panayur(Athikodu) Pz	Bore Well	4.4	3.5	3.06	5.1
	Pattambi Pz	Bore Well	9.4		4.8	7.03

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Peringottukurissu	Bore Well	12.45	11.5	11	10.7
	Plachimada	Bore Well	13.2	7.17	8.1	9.45
	Pullundassery	Bore Well	5.05	3.25	2.1	4.14
	Thenkara	Bore Well	6.7	0.5	1.45	1.89
	Thirumittacode	Bore Well				10.2
	Trithala Pz	Bore Well	6.8	6.65	5.92	4.28
	Vadakarapathy Pz	Bore Well	26.1		2.83	3.7
	Villooni	Bore Well	55	16.2	14.99	22.5
	Alanallur	Dug Well		6.82	7.1	9.4
	Alathur	Dug Well	4.58	1.26	1.66	2.16
	Ariyur (R1)	Dug Well	11.7	9.75	6.9	8.65
	Athikode	Dug Well	6.7	2.37	1.6	4.28
	Athipetta	Dug Well	3.57	1.17	1	2.39
	Banglow Kunnu	Dug Well	9.6	6.9	6.55	8.05
	Chalisseri	Dug Well	9.8	6.27	6.52	8.2
	Chemmampathi	Dug Well	10.4	8.45	5.13	5.65
	Cherpulassery (R1)	Dug Well	6.02	4.27	8.59	9.45
	Chittoor	Dug Well	3.82	3.38	2.07	3.91
	Chulliar Dam	Dug Well	2.9			
	Chullimada (R1)	Dug Well	3.1	0.6	0.6	2.3
	Chunnambuthara	Dug Well	4.65	1.85	1.55	2.95
	Dhoni	Dug Well	6.42	1.23	3.9	6.6
	Ellissery	Dug Well	6.46	4.2	4.8	5.65
	Erattakulam	Dug Well	2.79	1.15	0.9	0.83
	Eruthenpathi	Dug Well	4.95	3.28	3.6	4.5
	Gopalapuram	Dug Well	16.8	10.85	6.5	7.9
	Kadampazhipuram	Dug Well	3.81	3.6	3.35	4.35
	Kalladikode	Dug Well	9.93	6.42	4.5	8.63
	Kambilichungam	Dug Well	3.99	0.65	1.05	2.15
	Kanjikode	Dug Well	9.8	2	2.58	4.62
	Kanjirapuzha	Dug Well	4.5	1.4	0.97	2.7
	Kannadi	Dug Well	2	0.3	0.6	1.09
	Kannimari	Dug Well	6.5	2.33	2.3	3.4
	Karimpuzha	Dug Well			1.3	
	Kavassery	Dug Well	2.8	1.32	0.8	2.35
	Kodumbu	Dug Well	3.48	1.1	1.05	2.1
	Kodunthirapalli	Dug Well	4.5	0.75	0.9	4.38
	Koduvayur	Dug Well	7.72	3.62	2.26	4.53
	Kollengode -I	Dug Well	3.66	1.2		
	Kollengode- II	Dug Well	3.53	1.85	2.1	3.25
	Kongad1	Dug Well	6.66	3.2	2.3	5.3
	Koolimattom	Dug Well	3.52	0.2	0.1	2.62
	Koonathara	Dug Well	4.3	1.6	1.3	4.2

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Koottanad	Dug Well	9.18	6.72	8.1	9.3
	Koppam (R1)	Dug Well	6.08	3.35	2.92	5.9
	Koppanur	Dug Well	3.77	1.37	3.87	2.57
	Kottapuram	Dug Well	7.06	4.17	5.8	8.07
	Kottassery (Vattassery)	Dug Well	4.34	2.32	1.8	3.1
	Kottayi	Dug Well	9.43	7.42	5.84	7.38
	Kozhinjampara-R1	Dug Well	6.6	3.48	2.8	5
	Kozhipara	Dug Well	5.34	2.7	1.75	3.04
	Kudallur	Dug Well		4.88		5.9
	Kulakkad	Dug Well	8.1	6.1	4.65	6.32
	Kumaramputtur	Dug Well			0.59	1.64
	Kumaranallur	Dug Well	10.6	7.93	7.95	8.9
	Kunisseri	Dug Well	4	0.57	0.8	2.6
	Kuzhalmannam	Dug Well	2.65	1.7	1.6	2.15
	Lakkidi (Ramakrishnapadi)	Dug Well	9.6	6.3	4.22	7.5
	Malampuzha	Dug Well	2.85	1.3	1.37	1.6
	Mankara	Dug Well	5.3	3.05	3.1	3.47
	Mannarkkad (R1)	Dug Well	3.7	3.2	2.75	3.62
	Mathur	Dug Well	4.67	2.05	1.85	3.76
	Mattumanda	Dug Well	4.46	2.05	2.75	2.92
	Meenakshipuram	Dug Well	7.25	4.3	3.02	4.45
	Meenkara	Dug Well	6.6	3	1.05	2.9
	Melarkode	Dug Well	24.6	12.3	5.7	19.89
	Moochankundu	Dug Well		5.47	3.15	7.15
	Mulayankavu	Dug Well	7.7	4.9	3	6.1
	Mundur	Dug Well	3.82	0.87	0.85	2.8
	Muthalamada1	Dug Well		3.73	2.38	4.78
	Naikarapadi	Dug Well	5.09	6.1	3.5	2.95
	Nalliapalli	Dug Well	3.5	2.15	2.15	2
	Nanniyode	Dug Well	5.8	3.37	3.9	4.2
	Nedupuni	Dug Well	7.25	4.3	4.44	6.1
	Nellikatteri	Dug Well	10.9	5.35	5.42	11.8
	Nemmara	Dug Well	3.7	1.88	2.34	3.02
	Noorani (Palakkad West)	Dug Well	2.9	1.3	1.2	2.23
	Odannur	Dug Well	7.14	3.06	2.79	3.56
	Ongallur	Dug Well	9.3	5.89	6.26	7.64
	Oothara	Dug Well	3.4	0.75	0.75	1.5
	Ottapalam	Dug Well	8.05	6.72	6.4	7.8
	Padur DW	Dug Well	6.08	2.45	2.2	3.5
	Palamattom	Dug Well	8.12		2.15	2.7
	Palappuram-ii	Dug Well	8.35	5.15	5.35	7.72

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Palghat	Dug Well	5.98	3.1	3.1	4.77
	Pallavur	Dug Well	4.57	0.78	0.85	2.9
	Panayur (Athikode)	Dug Well	3.2	1.2	1.25	2.36
	Parali (Chakkanthara)	Dug Well	3.5	1.4	1.25	
	Pattambi	Dug Well	5.85	2.75	2.9	5.85
	Pattanchery	Dug Well	3.92	2.25	2.05	2.95
	Peringode	Dug Well	9.51	7.81	8.15	7.85
	Peringottukurissu DW	Dug Well	6.8	4.2	3.2	3.52
	Perumatty1	Dug Well	3.02	3.25	3	2.7
	Pudhunagaram	Dug Well	5.68	1.65	2.4	4.1
	Pudhupariyaram	Dug Well	5.5	2.02	2.15	4.7
	Pullundassery	Dug Well	5.05	3.25	2.1	4.14
	Punchapadam	Dug Well			6	6.8
	RVP Pudhur	Dug Well		3.67		
	Shoranur	Dug Well	6.05	5.4	5.05	5.85
	Sreekrishnapuram	Dug Well	7.51	7.38	7.12	8.42
	Tannirkod	Dug Well	11.39	4.92	6.15	7.7
	Tenkara	Dug Well	4.19	1.35	2.15	2.93
	Thachanattukara	Dug Well		7.47	7.42	3.74
	Thachanpara	Dug Well	2.59	0.92	0.86	1.66
	Thirumittamcode (Chathanur)	Dug Well		3.88	3.75	4.98
	Thiruvegapuram	Dug Well	9.84	7.39	7.34	7.91
	Tholanur	Dug Well	3.9	2.25	2.1	2.6
	Trittala	Dug Well	7.92	6.8	6.25	4.7
	Ummini	Dug Well				
	Vadakkancherry	Dug Well	4.7	2.45	2.22	5
	Vadanamkkurissi	Dug Well	6.32	2.85	3	5.01
	Vallapuzha	Dug Well	6.72	2.55	1.9	5.15
	Vaniyamkulam	Dug Well			4.1	
	Vannamada	Dug Well	6.85	4.85	4.1	4.8
	Velanthavalam	Dug Well	7.5	5	2.5	4.65
	Vilayur	Dug Well	8.22	3.92	3.5	5.98
	Viyyakurissi	Dug Well	4.96			5.08
	Walayar	Dug Well	4.5	3.82	1.05	2.45
PATHANAMTHITTA	Chetheckal	Bore Well		0.67	0.39	2.51
	Elanthoor	Bore Well	2.05	1.35	0.3	2.1
	Ezhamkulam	Bore Well	6.66	6.22	5.31	7
	Kadumeenchira Pz	Bore Well	15.86	14.9	14.87	
	Kalleli Pz	Bore Well				
	Koipuram Pz	Bore Well	11.31	9.32	8.4	11.35
	Kottangal Pz	Bore Well	2.19	2.1	1.21	2.62

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kunnamthanam	Bore Well	3.32	0.05	0	3.29
	Malayalapuzha Pz	Bore Well	14	9.05	5.28	14.8
	Pandalam	Bore Well	3.95	3.55	3.57	3.07
	Thayattumala	Bore Well	8.95	6.67	5.35	9
	Vallicode	Bore Well	2.8	2.67	2.41	0
	Adoor (R2)	Dug Well	9.75	7.4	5.86	8.42
	Adoor Bypass	Dug Well	2.8	3.12	2.8	3.9
	Anappara Kw	Dug Well				
	Angadikkal North	Dug Well	8.94	7.2	7.3	8.8
	Angamuzhi	Dug Well	5.46	5.02	5.1	5.82
	Aranmula	Dug Well	6.16	4.74	4.2	6.2
	Aruvapulam	Dug Well	2.8	2.67	1.56	3.3
	Athiringal (R1)	Dug Well	3.05	6.15	5.12	8.1
	Athumbukulam	Dug Well	3	3.05	2.2	3.85
	Chalappally	Dug Well	1.79	1.42	1.35	2.05
	Cherukolpuzha (Airoor)	Dug Well	6.16	3.04	2.85	5.95
	Chethekkal	Dug Well		1.14	0.92	3.16
	Chittar (R1)	Dug Well	10.17	7.24	6.24	8.94
	Churakkod	Dug Well	6.6	5.4	5.62	5.92
	Edakkulam	Dug Well	8.05	2.15	1.35	6.11
	Elanthur	Dug Well	1.98	0.5	0.35	3.46
	Elavumthitta	Dug Well	7.1	3.35	2.99	7.13
	Enathu	Dug Well	8.2	5.9	6.15	7.94
	Eraviperoor	Dug Well	2.85	1.35	0.97	2.86
	Ezhamkulam	Dug Well	6.66	6.22	5.31	7
	Ezhumattoor	Dug Well	3.5	3.64	3.54	4.55
	Kadambanad	Dug Well	3.67	4.5	5.34	6.43
	Kadammanitta	Dug Well	4.7			
	Kadumeenchira	Dug Well	7.66	4.87	3.55	6.57
	Kaipattoor	Dug Well	6.4	5.55	5.2	6.91
	Kalanjoor	Dug Well	4.55	4.42	2.97	8.26
	Karinkulam (R1)	Dug Well	2.23	2.7	1.4	4.66
	Kaviyur (R1)	Dug Well	9.2	6.4	6.34	8.67
	Kidanganoor	Dug Well	5.3	1.45	0.23	8.5
	Kodumon	Dug Well	6.1	5.83	5.74	7.02
	Koipuram (R1)	Dug Well	7.53	4.19	3.9	6.93
	Konni	Dug Well	4.62	4.79	2.78	5.43
	Koodal	Dug Well	5.22	6.37	5.82	7.03
	Kottanadu	Dug Well	4.02	1.39	1.13	1.94
	Kottangal	Dug Well	1.41	1.5	0.61	4.12
	Kozhenchery	Dug Well	0.7	1.28	0.7	2.19
	Kudutha	Dug Well	7.66		5.11	7.39

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Kulanada	Dug Well	9.15	4.21	3.52	7.48
	Kumbanad	Dug Well	6.44	3.41	3.16	7.14
	Kumplampoika	Dug Well	1.95	1.42	1.77	2.22
	Kunnamthanam1	Dug Well	12.56		6.71	12.94
	Kuttoor	Dug Well	3.3	0.85	0.64	3.67
	Laha balawadi	Dug Well	2.32	1.58	1.61	3.01
	Laha peruman	Dug Well	10.01	1.04	9.58	9.7
	Malayalapuzha	Dug Well	5.27	4.1	4.9	6.65
	Mallappally	Dug Well	5.14	2.9	2.9	4
	Maniyar	Dug Well	4.43	3.96	4.3	5.3
	Mannadi	Dug Well	2.96	0.93	1.12	2.25
	Murani	Dug Well	3.04	0.97	0.63	3.16
	Muthoor (R1)	Dug Well				
	Naduvathumuzhi	Dug Well	5.77	2.6	3.5	6.25
	Naranganam (R1)	Dug Well	2.78	2	0.93	2.87
	Nellimugal Kw	Dug Well				
	Nilakkal New	Dug Well	5.32	4.25	5.19	4.96
	Omallur(R1)	Dug Well	7.89	6.16	6.25	8.36
	Padiyinippara Kw	Dug Well				
	Pandalam Town	Dug Well	0.91	0.77	0.83	0.95
	Pandalam-1	Dug Well	4.45	4.19	1.68	3.86
	Paranthal	Dug Well	5.3	0	5.06	6.7
	Pathanamthitta (R1)	Dug Well	2.89	2.74	3.32	3.58
	Pazhakulam Kw	Dug Well				
	Peringara (R1)	Dug Well	1.88	0.64	0.38	1.82
	Plappally	Dug Well	3.01	0.96	1.09	2.44
	Podiyadi	Dug Well	1.9	0.92	0.5	1.78
	Poothangara	Dug Well	5.1	4.75	2.59	5.29
	Prakkanam	Dug Well	4.14	2.98	1.61	4.32
	Prakkanam (R1)	Dug Well				
	Pulikeezh	Dug Well	3.25	1.6	1.22	2.95
	Pullad	Dug Well	6.34	4.2	3.95	6.54
	Ranni i	Dug Well	3.11	1.42	1.2	3.93
	Ranni Perunad	Dug Well	6.81			6.4
	Thadiyur	Dug Well	7.71		2.3	7.85
	Thannithodu	Dug Well	4.45	6.02		7.2
	Thatta (R1)	Dug Well	1.25	0.4	0.7	1.4
	Thelliyur	Dug Well	7.17	5.18	5.1	8.5
	Thiruvalla	Dug Well	6.4		2.55	6.9
	Thumpaman	Dug Well	7.72	3.23	6.2	
	Ullannur	Dug Well	6.81	3.4	2.97	7.15
	V Kottayam	Dug Well				
	Vadasserikara	Dug Well	1.97	1.2	1.45	4.08

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Vaipur	Dug Well	1.32	1.7	0.54	7.35
	Vakayar (Valiakavu)	Dug Well	2.4	1.4	2.2	2.4
	Valiyakkavu Kw	Dug Well				
	Vallamkulam	Dug Well	5.25	3.05	2.15	4.65
	Vallikod	Dug Well	3.54	3.3	3.26	8.92
	Vazhamuttom Kw	Dug Well				
	Vechoochira (R1)	Dug Well		2.55		4.71
	Vennikulam	Dug Well	3.21		3	3.28
THIRUVANAN-THAPURAM	Ariyanadu Pz	Bore Well	6.85			
	Attingal Pz	Bore Well				
	Chengal Pz	Bore Well		22.85	7.18	10.71
	Kariyavattom Pz	Bore Well	12.6		12.8	
	Kulathoor pz	Bore Well	12.7	10.05	6.98	8.16
	Manambur Pz	Bore Well		11.61	8.65	11.42
	Mangalapuram Pz	Bore Well		18.5	13.59	15.09
	Mannanthala Pz	Bore Well				
	Nemom Pz	Bore Well				
	Pattom Pz	Bore Well				
	Peringamala Pz	Bore Well	6.6		6.06	9.48
	Perumkadavila Pz	Bore Well		7.35	4.94	5.65
	Vazhakkad Pz	Bore Well	10.6	8.3	5.54	0
	Vengod Pz	Bore Well		6.5		5.09
	Amboori	Dug Well		8.1	6.1	7.98
	Anappara Valayanki	Dug Well	8.45	4.44	4.3	9.3
	Anjengo	Dug Well		1.05		1.47
	Aralumoodu	Dug Well	9.25	11.28	8.25	10.9
	Ariyanadu	Dug Well	4.3	2.71	3.83	4.45
	Arukannukuzhi	Dug Well		6.7		6.68
	Aruvikara	Dug Well		1.65		2.65
	Athazhamangalam	Dug Well	19.5	16.2	11.4	11.7
	Attingal	Dug Well	7.85		6.52	7.68
	Ayyankode	Dug Well	6.34	6.24	3.99	7.54
	Azhoor	Dug Well	12.5	10.3	6.87	10.75
	Balaramapuram(R1)	Dug Well	10.75	6.28	4.11	7.95
	Bharathanoor	Dug Well	5.8	5.4	4.67	6.92
	Changa	Dug Well	9.7	7.15	5.4	6.73
	Chaykottukonam	Dug Well				6.5
	Cheeranikara	Dug Well	8.8	6.12	2.25	6.6
	Chembur	Dug Well	11.25	7.5	5.75	9.1
	Chennampara	Dug Well	8.15	8.32	5.25	7.97
	Cherunniyur	Dug Well	15.5	14.22	12.51	14.13

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Chirayinkeezh	Dug Well	11.5		5.73	9.36
	Chittagode	Dug Well	7.38	5.88	4.75	5.03
	Chullimanoor	Dug Well		4.35		6.7
	Edavai	Dug Well	10	7.95	5.3	8.88
	Ithye	Dug Well		7.15	6.15	7.4
	Kadakkavur(R1)	Dug Well	4.2	2.76	2.05	3.46
	Kallar	Dug Well	3.56	2.86	3.03	4.09
	Kallikkad	Dug Well	1	2	0.57	1.65
	Kandala	Dug Well		7.15	4.62	8.37
	Kanjiramkulam	Dug Well		47.44	45.36	19.77
	Kanjiramkulam Church	Dug Well		21.55	16.84	46.75
	Kappil	Dug Well		9.96	8.82	10.38
	Karakulam	Dug Well	3.05	2.02	1.75	2.7
	Kariavattom	Dug Well		1.1		11.37
	Karinga	Dug Well	2.35	2.07	1.47	2.1
	Kattakkada	Dug Well	5.05	3.65	1.75	3.69
	Kazhakkuttom	Dug Well			2.02	
	Kilimannor	Dug Well		5.24	5.12	4.44
	Kochuveli(R1)	Dug Well	2.45	2.01	1.27	
	Korani	Dug Well		5.42	4.64	6.4
	Kulathur	Dug Well	11.51	8.56	5.61	7.04
	Madavur	Dug Well		12.2	6.71	9.82
	Malayadi	Dug Well	6.25	4.1	6.71	3.79
	Mangalapuram	Dug Well		17.92	12.99	14.9
	Mannanthala	Dug Well	7	5.9	4.44	6.62
	Maruthamala	Dug Well	9.26	5.86	4.52	6.74
	Meenangal	Dug Well	8.5	7.56	6.24	7.45
	Melvettoor	Dug Well	24.35	34.35	33.57	32.69
	Mulloor	Dug Well		18.09	15.56	16.77
	Murukumpuzha(R1)	Dug Well		2.45	2.05	2.48
	Nagapuram	Dug Well		15.66	7.86	11.64
	Nanniyode	Dug Well	5.8	3.37	3.9	4.2
	Navaikulam	Dug Well	13.1	9.27	7.66	10.55
	Nedumangad	Dug Well	8.35	5.85	3.97	7
	Neyyattinkara	Dug Well	11.2	10.6	8.15	10.87
	Ookod	Dug Well	9.3	9.7	7.57	9.41
	Ottashekharamangalam	Dug Well	5.55	2.7	3.02	4
	Palayamkunnu	Dug Well	12.6	10.24	8.24	11.28
	Palode	Dug Well	2.4	3	2.15	5.43
	Panavoor	Dug Well		3.08	2.52	3.35
	Pangode	Dug Well	6.7	4.61	3.9	5.96
	Parandakuzhi	Dug Well	11.45	13.33	8.35	12.87

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Parandod	Dug Well	4.2	3.8	2.66	4.7
	Parassala	Dug Well	0.9	0.45	0.01	5.25
	Peringamala	Dug Well				
	Perumathura	Dug Well	1.45		1.59	1.95
	Perumgulam	Dug Well	5.25	6.73	4.42	7.7
	Perumgur(R1)	Dug Well	5.04	1.74	1.43	3.69
	Perumkuzhi	Dug Well	4.03	2.53	1.76	2.91
	Perunkadavila	Dug Well	11.95	9.55	7.53	7.75
	Pirappankod	Dug Well	6.8	5.1	1.93	5.65
	Ponganadu	Dug Well		4.22	4.62	4.95
	Ponmudi(R1)	Dug Well		3.67	3.8	3.98
	Poonthura (R1)	Dug Well		3.2	2.61	3.95
	Poovachal	Dug Well	12.7	11.2	9.25	10.35
	Poovar	Dug Well		29.5	10.25	14.8
	Pothencod	Dug Well		7.87	5.66	8.55
	Pozhiyoor(R1)	Dug Well		3.2	2.4	4
	Pulluvila	Dug Well				55.5
	Sasthanthala	Dug Well		2.16	1.02	4.42
	Sasthavattom	Dug Well	9.85		1.57	
	Shankaramugham	Dug Well		5.5	4.84	5.7
	Tekkada	Dug Well	3.05	2.75	1.43	3.87
	Tholicode	Dug Well	10.6	6.26	4.56	7.03
	Thonakkal	Dug Well	12.35	7.8	3.57	8.37
	Thumba	Dug Well	3.6	3.45	2.57	3.41
	Tirupuram	Dug Well		26	24.9	15.57
	Trivandrum	Dug Well	15.37	12.33	7.9	9.17
	Uzhamalakkal	Dug Well		3.57	2.05	3.15
	Vakkom	Dug Well		3.25	2.05	3.51
	Valakkad	Dug Well			7.15	9.75
	Vamanapuram	Dug Well	3.6	1.85	1.46	3.4
	Varkala	Dug Well	16	13.98	11.93	12.51
	Vattapara	Dug Well		6.29	2.99	6.93
	Vattavila	Dug Well	10.5	9.35	3.92	9.3
	Vazhichal	Dug Well	2.3	1.7	1.28	8.3
	Veeranakavu	Dug Well	4.95	4.85	4.05	4.1
	Vellanad	Dug Well		5.27	3.86	4.8
	Vellarada(R1)	Dug Well	4.7	4.1	1.57	4.08
	Vellayani (Poonkulam)	Dug Well		16.1	14.5	17.7
	Venganoor	Dug Well		13.14	13.17	16.54
	Vengod	Dug Well		6.02	4.42	5.02
	Venjaramoodu	Dug Well	10.3	7.4	6.53	9.25
	Veyloor	Dug Well				22.92

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Vilapilshala	Dug Well	7	7.7	4.27	7.02
	Vithura	Dug Well	6.22	8.84	6.99	12.4
	Vizhinjam	Dug Well	3	0.8	0.87	0.9
	Edava	Tube Well	10	7.95	10.55	14.67
	Varkala Deep	Tube Well	19.85	19.05		
	Varkala(shallow)	Tube Well	10.6	18	15.52	17.04
THRISSUR	Arimpur	Bore Well	8.75	6.1	0.64	7.87
	Ayyanthole Pz	Bore Well	19	8.45	8.23	24.44
	Chazhur (Anthikad)	Bore Well	13.36	10.65	11.32	12.12
	Cheruthuruthi	Bore Well	19.5	17	18.47	24.53
	Chowannur	Bore Well	26.72	18.88	8.51	23.87
	Desamangalam	Bore Well	9.3			
	Kecheri Pz	Bore Well	9.14	6.6	7.32	8.05
	Kodakara Pz	Bore Well	12	10.17	11.14	12.68
	Madakkathara Pz	Bore Well	13.3	12.08	10.98	8.77
	Mapranam Pz	Bore Well	15.75	11.7	13.27	
	Palakal	Bore Well	13.39	7.51	10.91	11.92
	Poyya (poopathy)	Bore Well	10.8	8.69	8.54	9.55
	Ramavarmapuram	Bore Well	10.55	7.1	7.76	9.8
	Velur	Bore Well	7.87	6.63	6.61	20.42
	Adatt	Dug Well	12.48	11.62	11.72	12.3
	Akalad	Dug Well	4.08	2.7	2.95	3.63
	Amballur	Dug Well	6.03	4.5	6.29	8
	Annamanada	Dug Well	4.44	2.65	3.8	4.65
	Arimpur1	Dug Well	5.5	2.71	2.84	3.55
	Athani	Dug Well	8.17	2.95	6.95	7.8
	Attoor	Dug Well	7.65		7.85	
	Ayyanthole	Dug Well	8.4	7.45	8.52	8.3
	Azhikode (R2)	Dug Well	0.76	0.31	0.6	1.01
	Chalakudi	Dug Well	8.63	7.5	8.25	9.02
	Chammannur	Dug Well	4.07	2.1	2.12	3.6
	Chavakkad	Dug Well	4.07	1.17	1.45	2.47
	Chelakara	Dug Well	6.3	1.95	3.73	5.7
	Chelakod	Dug Well	4.88	1.65	2.4	3.22
	Chengallur (Rendamkallu)	Dug Well	7.78	6.55	7.5	7.5
	Cherenkonam	Dug Well	6.29			
	Cherpu	Dug Well	10	6.57	7.01	8.12
	Cherukunnu	Dug Well	5.72	2.8	3.18	4.85
	Cheruthuruthi (R1)	Dug Well	3.45	0.97	2.05	2.67
	Choondal	Dug Well	9.25	6.55	8.2	8.8
	Chowannur	Dug Well	26.72	18.88	8.51	23.87
	Deshamangalam	Dug Well	9.3	5.46	7.21	

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	East Fort (Thrissur)	Dug Well	8.36	6.67	8	8.3
	Echipara	Dug Well	3.63	1.68	1.98	3.01
	Edamuttom	Dug Well	2.15	0.27	0.95	1.75
	Edathrinji	Dug Well	0.73	0.48	0.95	1.7
	Engandiyur-R1	Dug Well	4.25	1.7	2.06	3.22
	Eriyad (R1)	Dug Well	1.33	0.8	0.9	1.4
	Erumapetty	Dug Well	7.93	5.44	6.57	8.33
	Eyyal Ambalam Jn	Dug Well	9.5	7.1	8.32	8.85
	Guruvayur (R1)	Dug Well	2	0.67	1.7	2.96
	Irinjalakuda -I	Dug Well	8.1	5.7	6.68	7.63
	Kallettumkara	Dug Well	5.3	3.9	4.72	4.87
	Kallumpuram	Dug Well	10.28	6.98	7.69	8.45
	Kallumpuram (R1)	Dug Well		6.98	7.69	8.45
	Kallur	Dug Well	8.95	6.05	7.85	8.25
	Kannara	Dug Well	5.77	3.81	5.51	5.8
	Karuppadanna	Dug Well	3.74	0.54	1.06	2.11
	Kattakampala (R1) (Pazhanji)	Dug Well	12.8	10.86	11	11.28
	Kattoor (R1)	Dug Well	1.6	0.63	1.55	1.25
	Kecheri (R1)	Dug Well	8.7	6.54	7.25	7.95
	Killimangalam	Dug Well	8.55	5.2	6.49	7.9
	Kizhakkumuri	Dug Well	8.2	6.15	7.8	7.85
	Kodakara	Dug Well	8.4	6.55	7.33	8.2
	Kodali	Dug Well	7	4.55	6.12	7.03
	Kodungallur (R1)	Dug Well	3.81	3.02	3.19	3.5
	Konnakuzhi-ii	Dug Well	3.74	4.64	5.96	3.37
	Koorkancheri (R1)	Dug Well	9.05	8.4	9.06	9.66
	Koratty	Dug Well	8.34	6.24	7.65	8.54
	Kottappadi	Dug Well	3.19	0.32	0.52	1.52
	Kundannur	Dug Well	6.1	0.87	1	2.37
	Kunnamkulam	Dug Well	7.26	6.82	6.89	7.06
	Kurunchikara	Dug Well	10.93	7.8	9.4	10.87
	Kuttanellur	Dug Well	9.02	7.4	8.57	8.8
	Logamalleswaram	Dug Well	3.35	1.9	2.15	2.58
	Madakkathara	Dug Well	9.2	6.88	9.95	8.67
	Mala	Dug Well	9.52	6.48	7.94	8.98
	Manalur	Dug Well	3.46	0.7	0.98	2.26
	Mannamangalam	Dug Well	5.25	4.85	5.2	5.69
	Mannuthy	Dug Well	4.45	1.55	4.33	4.4
	Mapranam	Dug Well	15.75	11.7	10.92	12.34
	Mattathur	Dug Well	8.55	6.25	8.05	7.4
	Mulankunnathukavu	Dug Well	7.78	4.75	6.1	7.12
	Mullassery	Dug Well	4.48	0.76	1.33	2.4

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Mullurkara(Vazhathodu Jn)	Dug Well	5.35	2.25	3.35	4
	Mundur	Dug Well	3.82	0.87	0.85	2.8
	Mupliyam	Dug Well	6.74	3.77	5.46	6.84
	Muringur	Dug Well	6.84	4.84	6.26	6.9
	Muriyad	Dug Well	8.46	6.8	8.05	8.15
	Nandipulam	Dug Well	6.95	4	6.84	6.8
	Nattika 1	Dug Well		1.82	2.42	
	Olarikara	Dug Well	8.45	7.26	8.01	9.1
	Ollur	Dug Well	8.5	6.35	7.65	8.45
	Orumanayur	Dug Well	2.99	0.87	1.56	2.24
	Palakkal	Dug Well	10.7	7	8.55	9.65
	Paliyamthuruthu	Dug Well	1	0.58	0.82	1.1
	Pallichira	Dug Well	4.83	2.75	3.85	4.44
	Pallikandam	Dug Well	3.06	2.15	2.6	3.2
	Pallikunnu	Dug Well	8.4	6.56	7.79	8.03
	Panamukku	Dug Well	9.4	6.8	7.9	8.63
	Parappukara (R1)	Dug Well	4.56	2.44	3.26	4.07
	Parappur	Dug Well	12.01	11.02	11.82	12.1
	Pariyaram	Dug Well	13.5	10.55	8.02	13
	Pattikad (R1)	Dug Well	1.83	3.55	4.39	2.17
	Pavaratty1	Dug Well	4.25	0.8	1.08	2.32
	Pazhayannur (R1)	Dug Well	5.78	3.05	4.45	5.88
	Pazhuvil	Dug Well	10.3	8.25	9.23	10.02
	Peechi (R1)	Dug Well	6.5	4.87	6.09	6.2
	Perambra	Dug Well	4.93	1.84	2.1	2.99
	Perinjanam (R2)	Dug Well	2.2	0.75	1.09	1.7
	Perumpilavu Junction	Dug Well	9.7	6.4	9.45	9.6
	Potta	Dug Well	1.92	2.15	3.6	2.03
	Poyya	Dug Well	12.73	8.6	10.83	14.77
	Pudukad1	Dug Well	1.73	1.85	2.03	2.45
	Pullikanni	Dug Well	3.07	0.85	1.24	1.95
	Punnayoor	Dug Well	5.83	2.36	3.3	4.55
	Puthenchira East	Dug Well	9	7.78	8.5	8.9
	Ramanchetty	Dug Well	4.92	2.6	3.21	4.15
	Tekkumkara (Konathukunnu)	Dug Well	8.75	4.7	6.49	7.45
	Trichur	Dug Well	7.97	4.98	6.3	6.83
	Triprayar	Dug Well	4.05	2.75	2.73	3.55
	Vadanapalli	Dug Well	2.36	0.67	1.07	1.81
	Vaniyampara	Dug Well	5.05	0.39	1.81	3.47
	Varavur	Dug Well	6.42	4.8	5.52	6.08
	Vellanikara	Dug Well	2.23	0.92	1.44	1.93

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Vellikulangara (Maramkad Jn)	Dug Well	6.9	3.7	7.15	5.7
	Velupadam	Dug Well	5.26	2.95	4.71	5.45
	Velur	Dug Well	7.87	6.63	6.61	20.42
	Viyyur	Dug Well	3.15	1.6	2.43	2.4
	Wadakkancherry	Dug Well	12.25	8.35	9	9.9
	Arattukadavu	Tube Well	0.88	0.83	0.64	0.78
	Engandiyur Pz	Tube Well	4.05	6.4	3.4	3.68
WAYANAD	Kottathara	Bore Well	1.87	1.55	1.6	1.77
	Pookode	Bore Well	2.48	1.6	1.65	2.25
	Pozhutana1	Bore Well	3.16	0	6.5	2.75
	Thavinjal Pz	Bore Well	2.64	1	2.25	2.45
	Valliyurkavu(e)	Bore Well	2.72	0.52	0.75	1.25
	Valliyurkavu(w)	Bore Well	2.94	0.8	0.78	1.1
	Ambalavayal	Dug Well	8.83	7.45	7.48	7.9
	Appapara	Dug Well		2.45	2.75	4.7
	Arimula	Dug Well	8.18	6.8	6.75	7.35
	Baveli	Dug Well	8.75	2.41	2.7	4.55
	Begur	Dug Well	10.63	8.48	8.52	9.55
	CC Junction	Dug Well	11.56	9.7	9.72	10.7
	Cheenkeri	Dug Well	7.85	5.47	6.15	6.65
	Chellakod	Dug Well	8.4	6.17	5.72	7.5
	Chenad	Dug Well	15.65	14.7		
	Cheyyambam	Dug Well	3.7	2.18	1.68	3.15
	Chulliyod	Dug Well	14.05	11.82	11.7	12.87
	Dasanakkara	Dug Well	4.77	2.65	3.45	4.6
	Kalpetta-R1	Dug Well	2.61	1.38	1.8	2.6
	Kamblakat	Dug Well	18.2	16.18	15.75	16.7
	Kanjirangad	Dug Well	2.83	0.5	1.35	2.65
	Kappiset	Dug Well	11.79	6.2	6.27	
	Karani	Dug Well	7.13	5.17		
	Kattikulam	Dug Well	4.85	1.21	2.77	6.35
	Kavumandam	Dug Well	5.7	5.22	5.3	5.65
	Kellur -5th Mile	Dug Well	12.57	2.82	3.76	8.15
	Koliyadi	Dug Well	2.12	1.07	1.12	1.97
	Koodal Kadavu	Dug Well	15.34	14.78	14.4	14.9
	Koroth	Dug Well	4.5	2	2.43	6.91
	Kottathara	Dug Well	4.31	2.7	3.65	4.62
	Kottavayal	Dug Well	4.02	3.5	3.6	4.3
	Krishnagiri	Dug Well	4.58	3.66	3.9	5.5
	Kuppadi	Dug Well	17.08	16.8	15.3	15.05
	Lakkidi	Dug Well	0.8	0.67	0.72	1

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Mampayil	Dug Well	3.01	2.39	2.8	3
	Manjapara	Dug Well	8.85	6.33	6.15	7.25
	Mannanthody	Dug Well	6.11	4.67	5.65	6.45
	Melaputhenkunnu	Dug Well	14.62	14.4	14.85	14.9
	Minangadi	Dug Well	4.97	4.3	4.9	4.85
	Moolankavu	Dug Well	7.23	5.5	5.45	6.2
	Mullankolly	Dug Well	4.67	3.56	3.82	4.5
	Muthunga (R1)	Dug Well	5.54	5.52	4.8	5
	Muttil	Dug Well	2.63	1.33	1.6	2.4
	Nadavayal	Dug Well	6.74	6.25	4.61	4.85
	Naykatti	Dug Well	4.73	3.88	4	4.45
	Nedugarana	Dug Well	8.76	6.65	6.63	7.75
	Neervaram	Dug Well	18.06	12.24	9.69	13.29
	Nenmeni Kunnu	Dug Well	2.12	1.65	1.88	2
	Noolpuzha (R1)	Dug Well	3.12	1.95	1.5	2.6
	Ondyangadi	Dug Well	10.86	7.68	8.9	9.8
	Pachilakkad	Dug Well	8.46	6.72	6.65	7.8
	Padinjarattara (R1)	Dug Well	8.85	5.75	6.5	7.45
	Pakkam	Dug Well	6.55	3	1.52	4.25
	Pallikunnu	Dug Well	8.4	6.56	7.79	8.03
	Panamaram	Dug Well	3.43	2.55	2.75	3.6
	Pattanikoopu	Dug Well	9.72	7.05	6.1	7.3
	Perikallur	Dug Well	12.1	7.78		9.6
	Perya	Dug Well	1.97	1.4	3.08	5.15
	Pookode1	Dug Well	3.32	2	6.85	2.3
	Pozhutana	Dug Well	6.95	5.82	1.2	6.4
	Pulpally	Dug Well	2.36	1.03	2.3	1.4
	Punchvayal	Dug Well	10.22	6.32	1.04	8
	Sulthan Battery	Dug Well	5	2.37	7.6	4.35
	Talapuzha	Dug Well	1.56	0.77	9.9	1.3
	Taruvana	Dug Well	10.86	6.58	2.85	8.9
	Thetrode	Dug Well	12.76	10.7	4.94	10.5
	Thirunelly (R1)	Dug Well	4.24	1.48	0.9	
	Tholpetty	Dug Well	8.04	5.68	5.65	3.8
	Thonichal	Dug Well	6.52	4.62	7.73	5.57
	Ullisseri	Dug Well	2.9	0.76	9.45	1.3
	Uppupara	Dug Well	9.27	5.32	2.65	6.92
	Vaduvanchal	Dug Well	9.03		7.72	8.2
	Valad (R1)	Dug Well	10.82	7.7	9.45	9.7
	Vallathur	Dug Well	1.24	0.79	2.65	2.95
	Vallithodu (Periye)	Dug Well	7.65	7.66	7.72	7.65
	Valliyur kavu	Dug Well	2.81	0.8		
	Varayal	Dug Well	4.68	3.59	3.85	4

DISTRICT	LOCATION	WELL TYPE	WL-April 21	Aug-21	Nov-21	Jan-22
	Vellamunda	Dug Well	6.65	4.2	4.72	5.45
	Vengapalli	Dug Well	14.41	9.85	11.4	13.05
	Vyittiri	Dug Well	7.83	6.08	6.25	7.3

Annexure II

The chemical analysis data of water samples collected form National Hydrograph Wells April 2021															
Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
1	Alappuza	Kommadi	7.0	47.0	0.0	16.2	3.8	4.4	1.2	0.3	26.5	4.2	3.9	6.5	1.2
2	Alappuza	Pattanakkad	8.4	390.0	31.9	176.0	3.0	20.5	5.7	0.3	165.5	49.2	10.4	22.8	5.8
3	Alappuza	Purakkad	8.6	440.0	31.9	213.9	3.6	22.0	7.5	0.5	144.3	30.0	16.9	48.6	10.2
4	Alappuza	Pazhaveedu	8.5	220.0	10.6	73.1	4.9	22.0	4.7	0.1	65.7	12.8	8.2	31.5	4.4
5	Alappuza	Komalapuram-1	8.3	2600.0	53.2	203.1	2.6	772.2	22.4	1.4	213.7	68.5	10.4	393.5	20.5
6	Alappuza	Komalapuram-2	8.4	2500.0	53.2	203.1	2.8	732.6	14.8	1.4	251.2	77.1	14.3	375.3	19.8
7	Alappuza	Chandanakkavu	8.6	1540.0	79.9	311.4	0.9	298.4	9.3	2.0	224.5	85.7	2.6	266.6	13.9
8	Allapuzha	Alleppey	7.2	250.0	0.0	154.1	4.3	5.4	2.1	0.0	160.0	60.0	2.0	5.4	1.8
9	Allapuzha	Aranootimangalam	6.4	85.0	0.0	18.0	0.4	12.0	14.4	0.0	29.0	8.2	2.1	8.1	2.4
10	Allapuzha	Arukutti	7.0	96.0	0.0	96.3	8.7	3.7	14.1	0.0	117.0	44.3	1.7	4.3	1.5
11	Allapuzha	Chandirur	7.4	175.0	0.0	97.5	3.3	4.2	1.7	0.0	89.0	30.0	3.4	4.0	4.8
12	Allapuzha	Chettikulangara	7.5	132.0	0.0	46.2	12.3	6.3	1.0	0.0	48.0	15.0	2.6	6.4	2.9
13	Allapuzha	Edathua1	7.7	590.0	0.0	231.1	34.9	53.9	11.6	0.2	164.0	44.1	13.3	44.8	6.7
14	Allapuzha	Haripad	8.1	410.0	0.0	134.8	16.0	45.7	15.4	0.1	149.0	49.9	6.1	27.5	6.0
15	Allapuzha	Kallissery	8.1	104.0	0.0	10.3	7.5	6.3	21.6	0.0	26.4	5.9	2.9	7.7	1.7
16	Allapuzha	Kattanam	8.1	41.0	0.0	12.8	2.3	1.8	4.9	0.0	8.6	1.8	1.0	5.1	1.0
17	Allapuzha	Kattoor1	8.0	260.0	0.0	147.7	1.6	8.4	0.9	0.0	124.0	46.2	2.2	6.5	0.0
18	Allapuzha	Kayamkulam	7.9	350.0	0.0	38.5	31.2	32.5	7.9	0.0	61.8	17.2	4.6	26.2	4.8
19	Allapuzha	Kudasanad	8.0	260.0	0.0	57.8	19.0	31.6	14.9	0.0	59.0	10.4	8.0	26.1	5.4
20	Allapuzha	Nedumudi(pupalli)	7.6	800.0	0.0	321.0	9.9	113.3	7.1	0.3	292.0	79.6	22.9	63.7	6.4
21	Allapuzha	Nirkunnam(R2)	7.7	260.0	0.0	109.1	4.2	13.8	19.3	0.1	94.0	29.7	4.9	18.9	3.7
22	Allapuzha	Oachira1	7.7	200.0	0.0	25.7	34.2	16.0	8.0	0.0	60.4	18.6	3.4	16.5	5.0
23	Allapuzha	Pallarimangalam	7.7	370.0	0.0	77.0	15.8	57.5	22.7	0.0	86.3	31.0	2.2	40.5	2.3
24	Allapuzha	Parumala-R1	8.0	52.0	0.0	5.1	1.6	6.7	10.2	0.0	8.9	1.4	1.3	6.0	0.5
25	Allapuzha	Pathiyur-R1	8.1	840.0	0.0	202.8	91.2	107.9	6.7	0.1	218.0	57.3	15.4	87.1	22.3

The chemical analysis data of water samples collected form National Hydrograph Wells April 2021															
Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
26	Allapuzha	Pattanakad	8.3	460.0	0.0	256.8	5.9	19.9	16.3	0.1	219.0	79.5	5.0	16.1	12.8
27	Allapuzha	Purakkad1	8.2	460.0	0.0	211.8	10.0	35.6	4.6	0.1	168.0	58.8	5.4	27.8	11.4
28	Allapuzha	Ramankari-R1	8.1	330.0	0.0	141.2	13.6	26.4	0.1	0.1	133.0	40.9	7.7	20.7	3.8
29	Allapuzha	Sherthalai	8.0	28.0	0.0	128.4	4.5	22.1	0.3	0.1	112.0	35.7	5.6	15.2	2.3
30	Allapuzha	Thaikattusseri-R1	7.8	650.0	0.0	218.3	12.6	81.7	21.4	0.1	188.0	58.3	10.4	44.8	32.2
31	Allapuzha	Thakazhi	8.1	500.0	0.0	173.3	28.4	59.0	2.5	0.2	147.0	36.7	13.6	46.3	7.3
32	Allapuzha	Thevery	7.9	240.0	0.0	64.2	25.3	21.0	4.6	0.1	57.8	5.6	10.7	18.0	3.9
33	Allapuzha	Valavanad	7.8	193.0	0.0	53.9	12.0	17.5	6.1	0.0	29.1	4.6	4.3	15.1	5.7
34	Allapuzha	Venmani(thazhagam)	7.9	158.0	0.0	15.4	11.8	18.3	11.6	0.0	32.8	4.6	5.2	16.0	3.6
35	Allapuzha	Thannirmukkom	7.7	330.0	0.0	128.4	12.9	19.7	7.3	0.1	110.0	35.7	5.2	25.5	5.4
36	Ernakkulam	Aikranad	6.1	38.0	0.0	2.5	1.9	5.0	2.3	0.0	2.1	1.0	2.0	5.8	1.5
37	Ernakkulam	Alwaye	6.3	164.0	0.0	7.6	16.0	17.0	13.1	0.1	21.4	6.8	1.1	15.0	15.0
38	Ernakkulam	Anchalpetty	6.6	112.0	0.0	12.7	6.5	12.2	8.6	0.0	25.7	9.4	0.6	9.7	3.2
39	Ernakkulam	Angamali	7.0	240.0	0.0	44.0	14.0	23.5	11.1	0.3	37.5	6.4	5.3	21.6	9.7
40	Ernakkulam	Chellanum	8.2	1240.0	0.0	394.0	4.8	137.0	59.0	0.1	342.4	132.0	3.7	99.4	34.2
41	Ernakkulam	Chengamanad	8.1	98.0	0.0	5.1	3.9	19.1	15.6	0.8	12.8	5.1	0.0	18.4	6.3
42	Ernakkulam	Chulli R1	7.9	51.0	0.0	15.2	1.8	8.7	2.9	0.9	15.0	3.4	1.6	10.2	3.1
43	Ernakkulam	Edapally	8.2	1120.0	0.0	241.0	21.6	212.0	1.9	0.6	278.0	107.2	2.9	123.0	9.7
44	Ernakkulam	Edavanakkad	8.3	340.0	0.0	171.0	3.0	16.1	2.0	0.8	113.0	45.0	0.3	14.6	7.4
45	Ernakkulam	Fort Cochin	8.5	740.0	6.0	200.0	12.5	26.4	2.1	0.2	118.0	40.0	4.6	22.8	5.5
46	Ernakkulam	Karukutty	8.2	147.0	0.0	22.9	2.8	18.0	15.0	0.6	21.4	5.0	2.2	19.0	6.2
47	Ernakkulam	Koothattukulam	7.9	420.0	0.0	44.5	8.8	32.0	87.7	0.0	75.0	30.0	0.1	29.0	33.2
48	Ernakkulam	Kothamangalam	7.9	184.0	0.0	38.1	17.2	11.3	14.3	0.1	94.0	13.6	14.7	15.3	6.2
49	Ernakkulam	Kottapadi	7.9	96.0	0.0	28.0	4.5	8.8	5.4	0.0	6.4	2.3	0.1	10.7	2.7
50	Ernakkulam	Kottapuram 2	7.9	78.0	0.0	5.1	1.3	10.4	11.4	0.0	19.3	6.8	0.6	12.3	3.4
51	Ernakkulam	Kumbalangi	8.3	690.0	0.0	279.4	11.6	52.1	9.6	0.1	273.0	77.0	19.9	46.8	25.7
52	Ernakkulam	Malayatoor	8.2	120.0	0.0	28.0	8.5	10.7	7.0	0.0	42.8	8.5	5.3	11.8	6.0

The chemical analysis data of water samples collected form National Hydrograph Wells April 2021															
Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
53	Ernakkulam	Malipuram	8.2	380.0	0.0	152.0	4.8	25.4	12.0	0.0	161.0	55.7	5.6	23.0	5.2
54	Ernakkulam	Mulanthuruthi	7.9	166.0	0.0	7.6	5.0	24.0	19.3	0.1	34.2	7.7	3.7	22.3	4.3
55	Ernakkulam	Munambam R1	8.2	330.0	0.0	152.0	11.4	14.0	0.5	0.1	177.0	53.5	10.7	12.6	6.6
56	Ernakkulam	Muvattupuzha	8.0	200.0	0.0	38.0	30.7	7.5	8.6	0.0	59.0	21.4	1.4	8.3	8.8
57	Ernakkulam	Neriyamangalam	7.9	91.0	0.0	10.2	5.7	14.0	5.6	0.0	25.6	6.8	2.1	11.6	3.3
58	Ernakkulam	North Paravoor	8.1	480.0	0.0	184.0	5.4	48.7	1.2	0.1	139.0	47.2	5.3	36.1	5.9
59	Ernakkulam	Perumbadavam	8.1	60.0	0.0	15.2	0.7	7.0	2.2	0.0	23.5	3.4	3.7	6.2	2.1
60	Ernakkulam	Pothanicad	7.9	200.0	0.0	44.5	10.8	13.7	20.4	0.0	70.0	19.2	5.4	15.7	13.1
61	Ernakkulam	Tripunithura	8.3	630.0	6.0	203.0	36.5	47.4	24.6	0.1	155.0	40.7	13.1	46.8	19.2
62	Ernakkulam	Varapuzha	8.2	430.0	0.0	89.0	32.4	30.1	34.1	0.1	128.0	42.0	5.8	33.0	9.4
63	Ernakkulam	Vazhakulam North	8.2	230.0	0.0	64.0	5.5	19.2	14.0	0.0	91.0	19.0	10.6	20.1	4.6
64	Idukki	Adimali	6.9	135.0	0.0	19.1	10.8	20.5	4.4	0.0	15.0	4.0	1.2	16.1	2.6
65	Idukki	Chinikuzhi	7.0	113.0	0.0	44.5	4.4	5.9	3.1	0.0	10.0	4.0	0.1	10.2	4.0
66	Idukki	Chittur	7.0	45.0	0.0	10.2	2.1	5.5	2.3	0.0	20.0	4.0	2.4	8.7	1.8
67	Idukki	Elapara	6.9	230.0	0.0	31.8	8.0	24.4	24.3	0.0	55.0	20.0	1.2	18.1	6.8
68	Idukki	Erattayar	6.8	360.0	0.0	24.4	15.2	35.9	64.0	0.1	25.0	8.0	1.2	62.3	4.7
69	Idukki	Idukki	6.5	92.0	0.0	25.4	4.1	8.4	5.6	0.0	25.0	8.0	1.2	10.8	2.7
70	Idukki	Kaliyar	6.9	230.0	0.0	25.4	7.1	26.3	31.3	0.0	45.0	16.0	1.2	21.0	7.0
71	Idukki	Karimkunnam1	7.1	300.0	0.0	57.2	15.3	25.9	29.4	0.1	75.0	24.0	3.7	22.7	7.6
72	Idukki	Kattapana	3.1	790.0	0.0	0.0	27.8	87.1	134.0	0.3	105.0	26.1	9.7	67.2	24.5
73	Idukki	Koilkadavu	7.2	450.0	0.0	90.0	19.8	64.2	17.4	0.2	120.0	38.0	6.1	38.0	8.7
74	Idukki	Kulamavu	7.3	170.0	0.0	19.1	4.1	17.2	30.9	0.0	45.0	12.0	37.0	16.2	4.1
75	Idukki	Kumaramangalam	7.3	96.0	0.0	20.3	15.0	10.8	12.0	0.1	20.0	8.0	0.1	12.6	3.3
76	Idukki	Kumili	7.8	340.0	0.0	127.1	8.1	28.5	2.4	0.3	105.0	36.0	3.5	26.5	4.6
77	Idukki	kuttikanam1	7.8	220.0	0.0	25.4	4.4	39.0	15.7	0.1	45.0	14.0	2.4	28.0	6.1
78	Idukki	Moolamattam	7.7	105.0	0.0	27.9	5.2	6.4	8.2	0.3	25.0	8.0	12.0	8.5	1.5
79	Idukki	Munnar	7.7	90.0	0.0	25.7	3.1	14.7	7.2	0.0	30.0	8.0	24.0	13.4	3.8

The chemical analysis data of water samples collected form National Hydrograph Wells April 2021															
Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
80	Idukki	Nedumkandam	7.7	470.0	0.0	133.4	14.7	50.2	13.1	0.1	145.0	46.1	7.2	37.8	8.7
81	Idukki	Poopara	7.8	450.0	0.0	79.0	17.3	45.5	42.5	0.1	95.0	28.1	6.1	43.4	13.9
82	Idukki	Vandanmedu	7.8	187.0	0.0	82.6	6.4	24.1	18.7	0.0	45.0	16.0	13.0	18.5	5.8
83	Idukki	Vandiperiyar	7.7	490.0	0.0	50.8	27.4	57.1	52.6	0.1	75.0	20.0	6.1	47.4	35.6
84	Idukki	Vellilamkandam	7.8	63.0	0.0	12.7	1.9	10.4	5.4	0.0	20.0	4.0	2.4	11.9	4.6
85	Idukki	NirmalaCity	7.6	54.0	0.0	20.3	3.6	3.2	3.7	0.1	25.0	6.0	2.4	5.7	2.0
86	Kannur	Alacode	5.9	31.0	0.0	16.2	3.7	5.2	5.9	0.0	15.9	2.1	2.6	6.2	1.1
87	Kannur	Chakkarakkal	5.8	165.0	0.0	16.2	6.1	28.8	15.3	0.0	48.0	6.4	7.8	24.3	6.9
88	Kannur	Chelery	6.1	31.0	0.0	21.6	0.8	5.7	2.7	0.0	15.9	2.1	2.6	4.2	1.1
89	Kannur	Chapparapadavu	6.4	58.0	0.0	21.6	1.9	5.0	11.4	0.0	32.0	6.4	3.9	5.8	0.9
90	Kannur	Dharmadom	7.2	103.0	0.0	48.7	2.9	13.7	2.1	0.0	43.0	8.5	5.2	13.9	1.6
91	Kannur	Kannapuram	8.6	260.0	26.6	40.6	11.2	18.4	23.9	0.1	75.0	21.4	5.2	18.4	4.8
92	Kannur	Kannavam	3.3	230.0	0.0	0.0	1.1	6.8	40.6	0.0	26.5	4.2	3.9	7.0	1.6
93	Kannur	Koothuparamba	6.7	360.0	0.0	48.7	21.0	35.5	60.6	0.0	128.0	30.0	13.0	23.6	12.2
94	Kannur	Kottiyur Phc	7.0	70.0	0.0	48.7	2.6	5.8	2.9	0.0	32.0	6.4	3.9	8.1	2.5
95	Kannur	kozhichal	7.0	57.0	0.0	16.2	1.1	3.3	13.3	0.0	26.2	6.4	2.6	4.3	0.9
96	Kannur	Mahe	8.3	390.0	13.3	101.5	19.0	35.6	24.9	0.1	106.0	19.2	14.3	36.8	9.3
97	Kannur	Mattannur	3.9	174.0	0.0	16.2	0.9	21.0	34.4	0.0	42.5	8.5	5.2	16.1	7.4
98	Kannur	Mokeri	4.4	240.0	0.0	16.2	2.7	43.2	33.7	0.1	48.0	8.5	6.5	40.4	4.4
99	Kannur	Muzhakkunnu Dw	6.6	73.0	0.0	32.4	1.9	8.4	9.3	0.0	26.5	4.2	3.9	8.7	1.7
100	Kannur	Payyanur	4.0	145.0	0.0	16.2	14.5	11.1	20.5	0.0	37.2	12.8	1.3	10.7	4.7
101	Kannur	Peringome	4.7	124.0	0.0	21.6	4.2	11.4	31.0	0.0	42.5	8.5	5.2	10.9	5.1
102	Kannur	Ramanthali	3.8	82.0	0.0	0.0	0.6	6.5	13.1	0.0	21.3	2.1	3.9	5.7	1.2
103	Kannur	Sreekandapuram	4.3	310.0	0.0	21.6	12.9	44.1	52.7	0.0	96.2	30.0	5.2	28.0	6.6
104	Kannur	Thalasserry	7.5	380.0	0.0	200.3	18.9	24.4	11.3	0.0	117.0	34.2	7.8	26.6	12.8
105	Kannur	Taliparamba	7.5	220.0	0.0	54.1	9.1	18.9	41.0	0.0	74.6	23.5	3.9	16.8	10.4
106	Kannur	Ullikkal	7.6	68.0	0.0	27.0	5.0	6.9	14.8	0.0	26.5	4.2	3.9	7.1	1.4

The chemical analysis data of water samples collected form National Hydrograph Wells April 2021															
Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
107	Kannur	Valapattanam	4.0	320.0	0.0	16.2	18.4	57.4	25.4	0.1	48.0	12.8	3.9	49.3	5.2
108	Kasargod	Angadimogar	8.0	98.0	75.0	37.9	4.4	14.4	0.8	0.1	37.4	6.4	5.2	16.7	3.0
109	Kasargod	Bandadka	8.4	210.0	26.6	92.0	9.6	6.2	0.2	0.2	101.0	19.3	13.0	9.0	3.2
110	Kasargod	Bekal	4.4	260.0	0.0	38.1	3.0	31.3	34.9	0.0	53.4	10.7	6.5	23.9	4.9
111	Kasargod	Choyankode	7.8	75.0	0.0	16.2	3.2	23.1	6.6	0.4	16.0	4.3	1.3	21.8	3.2
112	Kasargod	Chittarikkal	7.9	129.0	0.0	78.5	2.8	4.2	2.9	0.0	58.8	8.6	9.1	7.0	1.9
113	Kasargod	Kanhangad TOWN	7.5	176.0	0.0	5.4	2.2	19.0	24.1	0.1	37.4	8.6	3.9	16.2	3.5
114	Kasargod	Kasaragod-DW	7.4	185.0	0.0	45.2	3.6	19.7	8.6	0.0	53.5	17.1	2.6	17.8	4.2
115	Kasargod	Kumbala-dw	7.7	192.0	0.0	75.8	5.2	13.4	7.5	0.1	69.7	17.1	6.5	14.0	2.9
116	Kasargod	Manjeswaram-DW	7.7	148.0	0.0	29.7	3.0	17.5	4.0	0.0	32.1	6.4	3.9	15.6	3.4
117	Kasargod	Mulleria	7.6	88.0	0.0	18.9	4.0	10.5	8.1	0.0	21.4	6.4	1.3	10.2	4.8
118	Kasargod	Neeleswaram	7.4	185.0	0.0	43.3	3.1	17.5	20.6	0.0	70.0	19.3	5.2	6.7	9.1
119	Kasargod	Odayanchal	7.6	52.0	0.0	27.0	1.8	6.5	2.6	0.0	21.4	4.3	2.6	8.0	2.6
120	Kasargod	Paivalige	7.6	148.0	0.0	48.7	4.8	19.3	0.7	0.1	32.1	6.4	3.9	20.4	4.7
121	Kasargod	Panathur-Panathady	7.6	95.0	0.0	32.4	1.8	9.4	8.6	0.0	32.1	6.4	3.9	10.8	1.8
122	Kasargod	Parappa N	6.5	69.0	0.0	8.1	2.1	7.0	16.1	0.0	26.7	4.3	3.9	8.3	2.5
123	Kasargod	Perla	7.3	159.0	0.0	43.3	4.3	16.9	13.3	0.0	48.1	6.4	7.8	16.1	6.0
124	Kasargod	Poinachi	7.4	68.0	0.0	13.5	1.7	10.8	6.7	0.0	16.0	4.3	1.3	11.9	2.7
125	Kasargod	Povval	7.5	150.0	0.0	37.9	2.4	11.0	20.3	0.0	43.0	8.6	5.2	13.9	2.4
126	Kasargod	Pullur	7.5	59.0	0.0	21.6	2.2	9.9	5.0	0.1	26.7	8.6	1.3	10.6	4.4
127	Kasargod	Thrikkarippur	7.5	42.0	0.0	13.5	3.7	5.8	2.6	0.0	16.0	6.4	0.7	6.2	1.8
128	Kasargod	Uppala	7.4	178.0	0.0	64.9	1.8	15.2	9.9	0.1	64.1	15.0	6.5	13.8	5.0
129	Kollam	Achenkovil	6.8	310.0	0.0	70.4	21.0	21.9	12.2	0.2	78.1	17.9	8.2	24.6	21.0
130	Kollam	Akkal	6.1	250.0	0.0	2.5	5.6	35.2	57.5	0.1	56.0	9.4	7.9	23.0	5.6
131	Kollam	Anchalummoodu	3.8	290.0	0.0	0.0	7.5	49.1	58.2	0.1	50.0	15.2	2.9	31.8	7.5
132	Kollam	Ariyankavu	6.6	121.0	0.0	46.1	2.8	14.6	6.7	0.1	49.0	10.4	5.7	15.2	2.8
133	Kollam	Avaneeswaram	6.8	100.0	0.0	28.1	3.5	15.9	1.6	0.1	31.0	9.0	2.1	11.3	3.5

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Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
134	Kollam	Ayur	7.1	62.0	0.0	28.1	3.1	3.3	3.1	0.0	11.5	2.7	1.2	7.1	3.1
135	Kollam	Chenkulam	6.9	105.0	0.0	20.4	2.6	16.0	6.1	0.0	22.0	6.9	1.2	17.5	2.6
136	Kollam	Iravipuram	7.4	460.0	0.0	108.8	12.6	44.3	42.0	0.1	129.0	43.1	5.4	36.7	12.6
137	Kollam	Kottarakkara	7.1	210.0	0.0	23.0	7.0	42.9	16.6	0.0	43.8	10.2	4.5	30.4	7.0
138	Kollam	Kulathupuzha	7.0	240.0	0.0	20.4	9.9	42.7	23.9	0.0	43.0	10.8	3.9	32.1	9.9
139	Kollam	Kunnada	7.0	81.0	0.0	7.6	4.0	12.9	6.4	0.0	15.4	4.2	1.2	10.6	4.0
140	Kollam	Kudavettur	6.6	290.0	0.0	35.8	3.5	52.9	34.0	0.0	68.4	17.2	6.2	35.0	3.5
141	Kollam	Madathara	6.9	154.0	0.0	12.8	5.1	24.5	15.7	0.0	36.8	10.2	2.8	19.9	5.1
142	Kollam	Needakara	7.6	450.0	0.0	210.2	2.8	29.0	1.3	0.1	200.0	69.2	6.5	20.7	2.8
143	Kollam	Paripalli	4.6	146.0	0.0	5.1	4.3	20.7	28.0	0.2	45.0	13.0	3.1	16.2	4.3
144	Kollam	Perinad	5.3	138.0	0.0	5.1	2.2	30.6	9.1	0.0	23.1	6.7	1.6	22.8	2.2
145	Kollam	Pozhikkara	6.7	340.0	0.0	76.8	2.8	57.6	2.7	0.1	86.8	17.5	10.5	37.5	2.8
146	Kollam	Punalur	6.9	102.0	0.0	10.2	6.3	13.7	9.4	0.0	29.0	7.8	2.5	9.5	6.3
147	Kollam	Quilon	6.9	106.0	0.0	20.4	1.7	14.8	1.8	0.0	38.0	11.9	2.1	11.3	1.7
148	Kollam	Sasthamkotta	6.8	104.0	0.0	5.1	2.1	20.4	6.3	0.0	24.0	7.1	1.6	14.6	2.1
149	Kollam	Sooranadu	4.9	127.0	0.0	1.2	3.6	21.1	21.3	0.0	22.0	4.8	2.6	16.0	3.6
150	Kollam	Thenmala	6.2	50.0	0.0	11.5	2.0	7.8	4.1	0.1	18.2	5.3	1.2	6.6	2.0
151	Kollam	Vallikavu	7.1	195.0	0.0	58.9	1.3	17.3	9.9	0.0	86.0	30.1	2.5	10.5	1.3
152	Kollam	Yeroor	7.6	390.0	0.0	128.1	6.7	41.1	3.7	0.1	93.2	24.5	7.8	45.2	6.7
153	Kottayam	Aranootimangalam	5.9	70.0	0.0	6.4	1.0	6.6	7.4	0.1	22.1	4.2	2.8	5.6	1.8
154	Kottayam	Changanacherry	6.7	430.0	0.0	30.7	33.4	65.6	32.2	0.2	72.0	17.8	6.7	42.5	15.2
155	Kottayam	Chempu	7.2	148.0	0.0	55.1	10.4	4.9	2.2	0.0	56.7	18.6	2.5	4.9	2.5
156	Kottayam	Cheruthikara	7.3	102.0	0.0	33.3	3.9	7.7	3.7	0.0	41.0	10.0	3.8	7.6	3.8
157	Kottayam	Erumelly	7.1	120.0	0.0	12.8	2.4	11.9	22.6	0.1	39.0	8.6	4.3	10.4	2.6
158	Kottayam	Ettumanur	7.2	73.0	0.0	7.7	0.8	10.3	9.4	0.1	21.2	5.0	2.2	8.6	2.1
159	Kottayam	Kaduthuruthi	7.0	140.0	0.0	12.8	6.5	12.9	22.3	0.0	34.4	9.6	2.6	12.4	3.6
160	Kottayam	Kanjirapally	7.0	79.0	0.0	20.5	6.7	5.0	4.7	0.0	35.0	9.4	2.8	5.0	1.6

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Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
161	Kottayam	Kottayam	7.0	50.0	0.0	5.1	2.5	6.1	6.5	0.0	17.0	5.1	1.1	5.2	1.1
162	Kottayam	Kozha	6.7	86.0	0.0	7.7	3.8	7.6	14.4	0.0	32.0	7.3	3.3	7.0	3.0
163	Kottayam	Kumarakom	8.3	390.0	15.0	181.9	4.3	26.3	2.9	0.1	130.0	44.3	4.8	19.1	4.2
164	Kottayam	Kuttikal	7.9	151.0	0.0	20.5	9.5	13.6	13.4	0.0	45.0	11.8	4.0	11.8	6.1
165	Kottayam	Naranganam	7.6	32.0	0.0	10.2	1.1	2.3	3.6	0.0	22.0	5.7	1.8	2.8	1.1
166	Kottayam	Neendur	7.2	145.0	0.0	7.7	3.3	24.2	17.8	0.0	29.0	7.4	2.5	15.9	6.7
167	Kottayam	Paipad	6.8	210.0	0.0	5.1	12.0	26.6	35.3	0.0	37.0	10.7	2.5	19.3	8.8
168	Kottayam	Pala	7.1	187.0	0.0	53.8	10.3	14.4	16.2	0.1	70.0	15.6	7.7	11.8	4.5
169	Kottayam	Palamkadavu	7.4	200.0	0.0	58.9	9.4	24.9	2.7	0.2	78.0	15.4	9.7	16.5	2.1
170	Kottayam	Pallikathodu	7.3	87.0	0.0	10.2	1.0	8.7	16.4	0.0	37.6	7.0	4.9	6.0	2.2
171	Kottayam	Pallom(Nattagam)	7.1	94.0	0.0	10.2	11.6	8.6	8.5	0.0	32.0	9.6	1.9	7.8	3.2
172	Kottayam	Pambadi	7.1	56.0	0.0	20.5	2.7	4.5	2.9	0.0	31.0	8.5	2.4	4.2	1.1
173	Kottayam	Paruthumpara	7.0	194.0	0.0	6.4	3.5	31.1	29.8	0.0	32.0	8.7	2.5	21.9	8.1
174	Kottayam	Plakkalpadi	7.1	103.0	0.0	11.5	1.4	15.3	13.6	0.1	28.5	6.1	3.3	12.8	3.8
175	Kottayam	Pulikuttisseri	7.9	440.0	0.0	151.2	9.9	55.8	1.7	0.1	132.0	41.4	7.2	30.7	1.8
176	Kottayam	Talayolaparambu	7.9	167.0	0.0	29.5	18.7	14.5	3.0	0.0	60.0	14.4	5.9	10.5	2.4
177	Kottayam	Tottakkad	7.6	63.0	0.0	11.5	2.2	6.6	7.4	0.0	30.5	8.6	2.2	5.7	1.6
178	Kottayam	Vaikom	8.1	390.0	0.0	166.5	20.3	27.6	6.0	0.2	135.0	41.3	7.9	25.6	6.8
179	Kottayam	Vazhur	7.7	72.0	0.0	20.5	1.1	4.3	3.9	0.0	36.4	8.5	3.7	4.2	1.2
180	Kottayam	Velloor II	7.6	200.0	0.0	61.5	13.8	11.6	13.2	0.1	76.0	14.3	9.8	15.8	3.8
181	Kottayam	Kuruvilangad	7.6	72.0	0.0	17.9	1.5	7.1	6.2	0.0	37.0	7.0	4.9	6.5	1.3
182	Kottayam	Edinjillam	7.8	220.0	0.0	87.1	28.3	6.9	4.9	0.0	84.7	27.1	4.2	11.4	2.8
183	Kozhikode	Badagara	7.2	370.0	0.0	45.0	22.8	50.0	53.6	0.0	134.0	44.7	5.7	23.0	9.0
184	Kozhikode	Balusseri	7.4	200.0	0.0	6.4	2.0	33.9	35.6	0.0	56.0	16.6	3.7	22.9	5.8
185	Kozhikode	Beypore	7.4	530.0	0.0	96.3	46.6	74.6	32.4	0.0	185.0	59.4	9.1	50.7	14.0
186	Kozhikode	Chelavur	4.0	310.0	0.0	0.0	3.5	55.2	62.4	0.0	47.1	13.5	3.2	54.7	4.7
187	Kozhikode	Chemencheri	6.3	250.0	0.0	32.1	26.7	24.1	24.4	0.0	107.9	39.2	2.5	19.6	4.9

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188	Kozhikode	Devarkoil	6.4	280.0	0.0	25.7	18.3	31.5	55.1	0.0	97.0	31.3	4.6	22.9	5.3
189	Kozhikode	Elattur	6.7	270.0	0.0	63.5	32.1	21.1	16.9	0.0	136.0	48.7	3.6	17.6	2.3
190	Kozhikode	Kakkayam	7.0	53.0	0.0	19.3	2.9	2.8	2.9	0.0	45.0	14.4	2.3	4.7	1.4
191	Kozhikode	Kayapanachi	6.7	370.0	0.0	12.8	19.9	92.3	17.9	0.0	98.6	17.7	13.3	43.4	2.2
192	Kozhikode	Koduvalli	6.9	107.0	0.0	40.0	1.8	8.1	6.9	0.0	73.3	19.4	6.1	9.4	1.5
193	Kozhikode	Koothali	6.9	61.0	0.0	9.8	1.7	5.6	12.2	0.0	39.1	11.8	2.3	4.7	2.6
194	Kozhikode	Kozhikode	9.7	280.0	12.0	74.9	17.0	29.8	15.4	0.0	150.6	54.8	3.4	17.4	1.8
195	Kozhikode	Mavoor II	7.1	142.0	0.0	37.4	3.1	9.7	6.1	0.0	39.6	11.4	2.7	13.6	8.3
196	Kozhikode	Mukkali	7.0	115.0	0.0	20.0	9.7	9.6	6.5	0.0	42.3	14.7	1.4	10.2	1.9
197	Kozhikode	Nadapuram	6.8	200.0	0.0	24.9	8.7	20.3	9.1	0.0	85.0	27.2	4.2	16.5	3.3
198	Kozhikode	Perambra	6.9	130.0	0.0	17.5	3.2	15.0	18.5	0.0	59.6	19.4	2.7	12.3	2.6
199	Kozhikode	Pudukayam	7.0	61.0	0.0	15.0	0.5	6.4	12.3	0.0	42.3	12.8	2.5	6.8	0.9
200	Kozhikode	Pudupadi	6.9	122.0	0.0	19.9	5.3	15.5	10.0	0.0	45.7	13.8	2.8	11.4	3.5
201	Kozhikode	Quilandy	7.1	480.0	0.0	174.7	18.4	42.0	29.2	0.0	357.8	70.9	44.0	45.2	17.0
202	Kozhikode	Ramanattukara	7.7	870.0	0.0	268.3	58.5	116.8	23.1	0.0	330.7	80.0	31.9	149.8	14.9
203	Kozhikode	Thamarasseri	7.8	133.0	0.0	32.4	4.2	19.1	2.1	0.0	77.1	25.7	3.2	11.1	2.2
204	Kozhikode	Thiruvallur	7.6	114.0	0.0	7.5	3.4	10.6	31.1	0.0	55.0	17.2	3.0	9.5	2.2
205	Kozhikode	Tikkodi	7.6	95.0	0.0	7.5	5.0	13.0	12.1	0.0	41.6	13.5	1.9	7.6	6.2
206	Malappuram	Amminikad	7.1	240.0	0.0	76.8	29.7	28.2	15.3	0.2	74.8	15.0	9.1	21.5	2.4
207	Malappuram	Arikode	7.2	210.0	0.0	44.3	7.1	25.9	19.7	0.0	64.0	17.1	5.2	16.8	2.5
208	Malappuram	Chokkad	7.5	360.0	0.0	121.6	7.7	45.5	14.7	0.2	107.0	25.7	10.4	33.5	3.1
209	Malappuram	Chungathara1	8.3	810.0	25.0	211.3	42.6	102.0	51.1	0.5	261.0	47.1	35.1	73.3	12.9
210	Malappuram	Edappal	7.9	340.0	0.0	38.4	3.4	27.7	69.5	0.1	80.0	23.5	5.2	32.5	4.5
211	Malappuram	Edavanna1	7.8	151.0	0.0	38.4	1.9	18.5	18.4	0.1	42.6	12.8	2.6	13.3	1.1
212	Malappuram	Iswaramangalam	8.0	280.0	0.0	96.0	12.1	37.8	2.7	0.3	91.0	19.2	10.4	26.9	1.9
213	Malappuram	Kadalundi	7.8	470.0	0.0	102.4	58.9	62.6	10.1	0.1	149.0	42.8	10.4	39.1	2.3
214	Malappuram	Kalikavu	7.8	113.0	0.0	38.4	3.7	17.7	4.3	0.0	32.0	4.2	5.2	11.2	4.5

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Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
215	Malappuram	Kanjiramukku	7.5	240.0	0.0	76.8	4.7	44.3	3.1	0.1	53.0	17.1	2.6	29.6	3.8
216	Malappuram	Kariavattam	6.4	144.0	0.0	25.6	23.6	24.9	16.0	0.1	26.5	8.5	1.3	18.7	2.4
217	Malappuram	Karulai	7.5	380.0	0.0	147.3	22.7	82.3	25.7	0.4	133.0	25.7	16.9	60.1	1.9
218	Malappuram	Kondotty	7.4	191.0	0.0	32.0	3.1	35.1	17.0	0.0	48.0	8.5	6.5	21.6	1.0
219	Malappuram	Kottakkal	7.2	500.0	0.0	25.6	2.5	113.1	79.6	0.3	90.0	27.8	5.2	55.5	12.6
220	Malappuram	Kuruva	7.4	132.0	0.0	64.0	1.1	11.9	10.1	0.0	32.0	12.8	0.0	13.8	3.5
221	Malappuram	Kuttipuram	7.7	400.0	0.0	108.8	20.7	44.2	28.6	0.3	122.0	23.5	15.6	36.9	10.4
222	Malappuram	Malappuram	7.4	154.0	0.0	44.8	4.8	17.1	17.2	0.0	48.0	12.8	3.9	13.7	3.8
223	Malappuram	Mangalam	3.3	610.0	0.0	0.0	84.3	44.7	100.8	0.2	154.0	42.8	11.7	38.8	13.3
224	Malappuram	Manjeri	6.7	380.0	0.0	57.6	13.5	55.6	47.3	0.2	90.0	25.7	6.5	35.7	12.6
225	Malappuram	Maruda	7.4	260.0	0.0	25.6	30.0	29.7	27.2	0.1	122.0	23.5	15.6	18.1	2.0
226	Malappuram	Melattur	7.4	200.0	0.0	92.0	3.5	27.0	16.0	0.1	53.3	12.8	5.2	23.9	1.0
227	Malappuram	Nilambur	7.4	187.0	0.0	25.6	0.3	30.8	37.4	0.0	31.8	8.5	2.6	23.2	3.1
228	Malappuram	Parappanangadi	7.4	550.0	0.0	160.1	55.4	57.7	33.7	0.0	144.0	49.2	5.2	35.5	12.7
229	Malappuram	Perumpadappu	7.4	290.0	0.0	19.2	33.4	37.9	33.0	0.1	58.7	21.4	1.3	35.3	5.6
230	Malappuram	Ponnani1	7.7	440.0	0.0	187.7	4.5	52.3	4.7	0.1	122.0	38.5	6.5	20.3	9.3
231	Malappuram	Pulamantol	7.6	400.0	0.0	44.8	8.0	73.3	41.1	0.1	74.0	17.1	7.8	41.0	15.6
232	Malappuram	Tanur	7.7	193.0	0.0	44.8	8.2	31.7	17.8	0.0	37.0	12.8	1.3	22.9	6.5
233	Malappuram	Thirunavaya	7.9	380.0	0.0	172.9	23.0	29.5	9.0	0.2	107.0	15.0	16.9	29.6	1.8
234	Malappuram	Thuvur	7.7	139.0	0.0	44.8	2.1	15.2	20.7	0.0	42.7	12.8	2.6	12.0	3.7
235	Malappuram	Tirur	7.6	230.0	0.0	32.0	20.4	43.6	10.2	0.0	64.0	19.2	3.9	19.5	2.0
236	Malappuram	Valancheri	7.9	380.0	0.0	38.4	2.1	101.2	26.5	0.1	69.4	15.0	7.8	38.8	7.6
237	Malappuram	Vazhikadavu	7.9	410.0	0.0	147.3	14.4	48.8	15.9	0.2	91.0	19.2	10.4	31.2	3.8
238	Malappuram	Vylattur	7.8	240.0	0.0	25.6	1.7	42.0	49.5	0.1	42.7	10.7	3.9	29.0	4.6
239	Palakkad	Agali	7.2	970.0	0.0	402.6	33.6	63.3	39.8	0.5	192.4	49.3	16.9	81.0	3.0
240	Palakkad	Alathur	7.8	640.0	0.0	133.4	50.9	99.8	1.8	0.0	284.4	52.6	37.4	52.5	6.5
241	Palakkad	Athipeta	7.9	640.0	0.0	158.9	22.5	68.5	2.8	0.0	200.5	38.2	25.6	40.5	40.3

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242	Palakkad	Chalissery	8.0	170.0	0.0	15.2	9.4	24.3	16.8	0.2	43.7	9.5	4.9	19.7	4.5
243	Palakkad	Chavadiyar	7.6	910.0	0.0	561.2	22.1	20.1	22.4	0.6	335.0	34.6	60.4	46.7	3.1
244	Palakkad	Cherupulassery	7.7	330.0	0.0	50.8	20.4	34.9	38.7	0.5	97.4	22.8	9.9	28.5	16.9
245	Palakkad	Chittor	7.0	320.0	0.0	152.5	8.2	17.7	2.9	0.2	135.0	45.7	5.2	32.1	2.1
246	Palakkad	Chullimada	8.3	290.0	0.0	152.5	8.5	13.5	0.9	0.2	128.0	22.0	17.8	24.0	3.9
247	Palakkad	Gopalapuram	7.8	660.0	0.0	273.2	13.7	48.1	30.9	1.4	208.0	41.0	25.6	72.4	3.9
248	Palakkad	Kalladikkode	3.4	320.0	0.0	0.0	39.7	27.7	0.5	0.0	21.6	5.2	2.1	32.0	3.2
249	Palakkad	Kanjikkode	8.1	1400.0	0.0	482.9	45.2	158.7	50.3	0.2	249.0	42.2	35.1	140.2	74.1
250	Palakkad	Karimpuzha	7.6	103.0	0.0	147.4	8.5	11.5	4.0	0.0	65.8	18.2	5.0	12.8	4.3
251	Palakkad	Koduvayur	7.9	300.0	0.0	88.4	18.6	27.4	3.2	0.9	101.0	9.3	19.0	35.6	2.2
252	Palakkad	Kollengode	7.9	510.0	0.0	203.0	28.5	30.8	2.5	1.1	150.0	26.1	20.7	58.1	5.8
253	Palakkad	Koppam	7.8	260.0	0.0	44.2	3.2	43.4	18.6	0.1	73.6	11.0	11.0	35.9	3.5
254	Palakkad	Kozhinjampara	8.1	670.0	0.0	215.7	43.7	64.5	16.7	0.0	264.0	62.3	26.6	61.6	3.7
255	Palakkad	Kozhippara	7.9	1260.0	0.0	469.5	48.0	158.8	5.4	1.2	385.0	32.5	74.1	159.8	3.8
256	Palakkad	Kuzhalmannom	8.2	630.0	0.0	228.7	35.2	64.2	3.0	0.9	251.0	48.6	31.7	56.3	9.3
257	Palakkad	Mankara	8.1	290.0	0.0	82.6	14.6	28.5	6.6	0.1	101.0	12.0	17.4	33.1	5.4
258	Palakkad	Mannarkkad	8.4	420.0	12.0	104.4	14.3	38.3	24.0	0.1	100.0	24.2	9.8	30.4	12.8
259	Palakkad	Meenakshipuram	8.4	980.0	12.0	355.6	28.8	65.0	86.7	0.4	248.0	41.1	35.4	57.9	9.0
260	Palakkad	Meenkara	8.3	880.0	24.0	381.2	55.1	70.4	4.1	1.2	317.0	69.1	35.4	75.8	11.5
261	Palakkad	Mundur	8.3	400.0	0.0	139.8	9.0	42.1	2.6	0.3	151.0	21.0	24.0	34.8	3.9
262	Palakkad	Nadupuni	8.3	1740.0	0.0	571.8	236.4	193.1	4.2	1.8	494.0	86.6	67.7	222.0	24.5
263	Palakkad	Nenmara	8.6	500.0	0.0	44.5	33.3	34.1	9.0	0.3	143.0	41.0	10.0	20.0	7.9
264	Palakkad	Ottapalam	6.3	370.0	0.0	19.0	2.6	80.3	11.5	0.1	91.0	18.0	11.2	58.6	1.5
265	Palakkad	Palakkad	8.1	710.0	0.0	279.6	26.7	70.3	11.5	0.5	315.0	40.6	52.0	64.8	3.5
266	Palakkad	Pattambi	8.1	320.0	0.0	69.9	19.7	41.0	14.1	0.1	109.0	20.3	14.4	32.0	6.2
267	Palakkad	Pudunagaram	8.0	960.0	0.0	300.0	30.7	75.0	0.2	0.2	248.0	59.0	24.7	82.5	31.7
268	Palakkad	Thavalam	8.0	300.0	0.0	101.7	22.4	13.6	0.3	0.0	151.0	28.9	19.4	26.3	0.0

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269	Palakkad	Thirthala	8.1	590.0	0.0	279.6	63.7	0.8	0.3	0.0	238.0	54.7	24.8	43.0	3.2
270	Palakkad	Vadakkanchery	8.4	640.0	6.0	177.9	34.8	73.1	36.9	0.3	268.0	59.6	29.1	54.8	5.8
271	palakkad	Kollangode-i	7.9	510.0	0.0	203.0	28.5	30.8	2.5	1.1	150.0	26.1	20.7	58.1	5.8
272	palakkad	Kollangode-ii	8.8	850.0	0.6	330.0	41.4	62.9	1.8	0.6	235.0	25.7	41.7	59.3	3.4
273	palakkad	Koppanur	9.2	2300.0	0.1	762.0	61.0	265.0	29.7	0.1	235.0	25.7	41.6	350.0	25.0
274	palakkad	Erattukulam	8.9	380.0	0.6	146.0	12.7	24.6	1.5	0.5	177.0	42.8	17.1	18.6	3.7
275	palakkad	Koduvayur	7.9	300.0	0.0	88.4	18.6	27.4	3.2	0.9	102.0	9.3	19.0	35.6	2.2
276	palakkad	Eruthenpathy	8.6	1690.0	0.6	405.0	155.0	107.0	26.6	0.9	133.0	12.8	24.6	275.0	3.7
277	palakkad	Nadupuni	8.3	1740.0	0.0	571.8	236.4	193.1	4.2	1.8	494.0	86.6	67.7	222.0	24.5
278	palakkad	Vannamada	8.9	1140.0	0.6	381.0	60.2	71.4	64.2	0.6	214.0	34.2	31.3	102.0	4.4
279	palakkad	Kozhipara	7.9	1260.0	0.0	469.5	48.0	158.8	5.4	1.2	385.0	32.5	74.1	159.8	3.8
280	palakkad	Vattaluki	8.7	1140.0	0.1	507.0	47.5	76.3	19.7	1.7	256.0	25.7	46.7	115.0	10.5
281	palakkad	Kottathara	8.3	220.0	0.0	102.0	4.6	10.1	1.6	0.2	91.0	21.4	9.1	11.3	5.1
282	palakkad	Naikarapady	8.5	800.0	0.0	419.0	6.6	17.0	13.6	1.3	289.0	25.7	54.7	41.1	8.3
283	palakkad	Athikode	9.1	1420.0	0.1	495.0	73.3	152.0	6.2	0.6	225.0	30.0	36.5	200.0	3.4
284	palakkad	Koduthirapally	9.0	840.0	0.6	216.0	47.4	95.9	2.9	0.7	225.0	42.8	28.7	55.0	3.8
285	palakkad	Velenthavalam	8.6	1060.0	0.6	228.0	83.8	89.0	40.0	0.6	203.0	25.7	33.8	101.0	6.7
286	Pathanamthitta	Angadikkal	7.2	36.0	0.0	21.6	0.7	3.5	1.8	0.0	21.3	2.1	3.9	0.2	1.9
287	Pathanamthitta	Aranmula	8.1	200.0	0.0	77.8	13.5	12.6	15.7	0.1	96.0	27.9	6.5	0.4	2.4
288	Pathanamthitta	Enathu	8.4	810.0	21.3	140.8	60.7	76.2	82.4	0.2	208.0	21.4	37.7	57.0	74.7
289	Pathanamthitta	Kaviyur	8.0	51.0	0.0	5.5	3.0	11.2	8.2	0.0	16.0	4.3	1.3	11.2	5.0
290	Pathanamthitta	Konni	7.4	410.0	0.0	22.2	30.2	67.2	55.4	0.1	107.0	19.3	14.3	24.7	32.7
291	Pathanamthitta	Kottanadu	7.5	95.0	0.0	13.9	2.5	15.6	10.6	0.0	32.1	6.4	3.9	12.6	5.5
292	Pathanamthitta	Mullapally	7.4	82.0	0.0	8.3	1.2	10.2	11.8	0.0	26.7	4.3	3.9	8.8	2.4
293	Pathanamthitta	Muthoor	7.3	165.0	0.0	22.2	12.9	17.7	15.2	0.0	42.7	12.9	2.6	8.2	5.6
294	Pathanamthitta	Naduvathumuzhi	7.4	55.0	0.0	25.0	2.4	6.4	6.5	0.0	26.7	4.3	3.9	8.6	2.9
295	Pathanamthitta	Nilakkkal	4.0	176.0	0.0	0.0	1.2	26.9	19.9	0.0	37.4	8.6	3.9	0.9	4.0

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296	Pathanamthitta	Pandalam	6.6	70.0	0.0	30.5	0.8	8.1	4.2	0.0	32.1	2.1	6.5	8.4	0.4
297	Pathanamthitta	Pathanamthitta	7.3	179.0	0.0	72.2	14.5	15.0	13.7	0.1	64.2	21.4	2.6	2.1	8.3
298	Pathanamthitta	Peringara	7.6	151.0	0.0	41.7	5.0	12.8	0.8	0.2	64.2	10.7	9.1	12.8	0.9
299	Pathanamthitta	Pulikeezh	7.8	168.0	0.0	47.2	15.1	11.7	4.3	0.1	58.8	12.9	6.5	13.5	3.0
300	Pathanamthitta	Ranni Peruned	7.8	93.0	0.0	36.1	4.3	5.2	5.5	0.0	42.7	10.7	3.9	0.2	2.5
301	Pathanamthitta	Thelliyur	7.9	75.0	0.0	36.1	2.2	5.5	2.7	0.1	32.7	6.4	3.9	0.2	3.0
302	Pathanamthitta	Ullannur	7.7	50.0	0.0	11.1	0.9	4.3	4.7	0.0	10.7	4.3	0.7	5.0	3.1
303	Pathanamthitta	Vadaserikara	7.3	79.0	0.0	16.6	5.1	3.1	15.2	0.0	37.4	10.7	2.6	0.4	1.8
304	Trissur	Adatt	6.8	198.0	0.0	12.7	3.2	29.8	24.8	0.0	45.4	7.8	6.3	20.0	4.0
305	Trissur	Annamanada	6.9	200.0	0.0	10.2	3.3	29.8	24.2	0.2	39.0	5.4	6.1	20.0	8.2
306	Trissur	Chalakudi	6.9	98.0	0.0	7.6	1.6	13.2	14.1	0.4	42.5	5.0	4.2	12.3	3.0
307	Trissur	Chavakkad	7.4	240.0	0.0	76.2	16.0	19.5	1.3	0.0	65.0	13.0	7.9	19.6	6.3
308	Trissur	Chelakkara	8.0	460.0	0.0	165.2	14.1	36.9	3.7	0.5	190.7	14.3	3.7	34.7	3.1
309	Trissur	Cherpu	7.7	145.0	0.0	38.1	2.8	16.1	2.6	0.1	62.0	8.0	10.2	20.1	4.7
310	Trissur	Cheruthuruthy	8.3	310.0	0.0	133.4	11.3	19.5	1.5	0.4	144.6	12.6	2.7	21.5	3.8
311	Trissur	Echipara	8.0	90.0	0.0	20.3	5.4	6.0	8.1	0.0	60.0	7.4	10.1	8.6	2.0
312	Trissur	Engadiyur	8.1	300.0	0.0	120.7	13.8	14.0	6.5	0.1	49.5	1.7	11.0	17.4	4.4
313	Trissur	Eriyad	8.3	350.0	0.0	108.0	7.9	28.9	1.5	0.0	40.1	9.5	8.5	17.0	5.9
314	Trissur	Guruvayur	8.3	300.0	0.0	82.6	7.0	35.6	2.4	0.1	86.3	13.6	12.7	29.7	4.7
315	Trissur	Irinjalakkuda	8.0	220.0	0.0	52.2	23.1	16.4	5.5	0.0	66.5	14.0	7.7	13.6	7.2
316	Trissur	Kallumpuram	8.0	190.0	0.0	30.5	12.3	16.5	10.5	0.1	69.0	10.0	10.0	15.7	5.5
317	Trissur	Kallur	8.0	128.0	0.0	30.5	1.9	15.0	8.8	0.1	57.9	7.6	9.4	12.4	7.4
318	Trissur	Kecheri	7.8	340.0	0.0	25.4	2.4	47.6	52.8	0.1	67.7	7.5	11.9	39.3	9.5
319	Trissur	Kodungalloor	8.6	780.0	4.0	222.0	46.6	53.9	23.7	0.1	122.6	30.3	11.4	58.9	24.6
320	Trissur	Kundannur	8.7	740.0	6.0	222.0	35.0	77.7	2.5	0.4	237.3	24.1	4.3	52.5	11.2
321	Trissur	Mala	8.4	141.0	6.0	15.2	16.0	11.8	7.4	0.1	100.0	22.0	11.0	10.3	9.3
322	Trissur	Manalur	8.1	46.0	0.0	12.7	2.9	6.4	1.3	0.0	37.0	5.7	5.5	8.3	1.6

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323	Trissur	Mannamangalam	7.8	53.0	0.0	17.8	15.8	5.2	0.0	0.1	47.1	8.0	7.0	8.5	1.5
324	Trissur	Mulangunnathukavu	7.6	250.0	0.0	38.1	15.2	21.2	0.0	0.1	76.5	10.4	11.2	21.6	13.4
325	Trissur	Mupliam	7.6	170.0	0.0	7.6	1.8	20.1	0.0	0.1	55.6	10.0	9.3	18.3	6.2
326	Trissur	Muriyad	7.7	178.0	0.0	15.2	5.5	30.2	0.0	0.0	54.7	6.1	9.6	23.8	9.1
327	Trissur	Pattikkad	7.9	150.0	0.0	61.0	5.6	5.2	3.8	0.2	91.6	11.1	1.5	9.7	2.6
328	Trissur	Perinjanam	8.3	1100.0	6.0	165.0	46.8	111.0	143.9	0.1	126.8	30.1	12.5	103.0	22.6
329	Trissur	Punnayur	8.4	122.0	6.0	50.0	4.1	7.7	5.9	0.0	51.9	15.2	3.3	10.0	4.4
330	Trissur	Thekkumkara(Konathukunnu)	8.3	65.0	0.0	30.5	2.5	7.6	3.8	0.0	39.0	8.2	4.5	8.9	2.8
331	Trissur	Thrissur	7.9	131.0	0.0	38.1	3.7	11.6	6.7	0.1	63.2	10.1	9.2	10.3	5.8
332	Trissur	Triprayar	8.3	410.0	0.0	127.0	24.5	28.3	2.7	0.0	86.0	22.0	7.4	25.2	12.8
333	Trissur	Wadakkancherry	8.3	143.0	6.0	43.2	3.1	14.1	3.2	0.1	30.0	12.0	2.0	14.1	5.0
334	Trivandrum	Perumkuzhi	6.9	410.0	0.0	43.3	64.5	46.8	38.9	0.6	106.7	23.5	11.7	45.3	21.0
335	Trivandrum	Chirayinkil	6.8	360.0	0.0	10.8	4.1	78.4	39.6	0.2	42.7	6.4	6.5	67.6	3.2
336	Trivandrum	Kadakkavur1	7.1	370.0	0.0	54.1	36.2	35.2	32.2	0.1	122.0	32.1	10.4	28.3	4.7
337	Trivandrum	Varkala	3.8	200.0	0.0	0.0	6.1	26.7	23.8	0.3	37.3	10.7	2.6	19.6	3.9
338	Trivandrum	Edavai	3.7	580.0	0.0	0.0	5.7	71.3	94.9	0.1	64.0	15.0	6.5	68.3	8.1
339	Trivandrum	Palode	6.5	530.0	0.0	43.3	7.6	24.4	27.0	0.1	53.0	17.0	2.6	24.0	8.8
340	Trivandrum	Mannanthala	4.0	220.0	0.0	0.0	4.1	33.2	27.8	0.1	26.8	4.3	3.9	30.1	10.9
341	Trivandrum	Nedumangad	6.9	220.0	0.0	43.3	3.0	32.4	6.2	0.1	26.7	4.3	3.9	28.4	7.0
342	Trivandrum	Attingal	6.8	179.0	0.0	59.5	1.8	20.7	11.9	0.1	42.7	15.0	1.3	23.9	2.5
343	Trivandrum	Pangode	4.1	176.0	0.0	5.4	1.1	28.5	53.5	0.1	37.4	6.4	5.2	29.9	10.1
344	Trivandrum	Vamanapuram	7.2	260.0	0.0	124.5	5.8	34.3	28.0	0.1	106.0	36.4	3.9	26.6	9.6
345	Trivandrum	Chempoor	7.3	210.0	0.0	54.1	4.5	24.3	20.6	0.1	48.0	17.1	1.3	22.3	6.5
346	Trivandrum	Kazhakuttom	7.6	410.0	0.0	113.7	38.4	30.9	20.4	0.0	138.0	38.5	10.4	31.4	9.7
347	Trivandrum	Trivandrum	4.1	410.0	0.0	5.4	29.7	59.2	35.8	0.3	53.4	15.0	3.9	44.8	7.4
348	Trivandrum	Vithura	3.6	230.0	0.0	0.0	9.1	17.8	44.7	0.0	54.0	15.0	3.9	17.7	5.9
349	Trivandrum	Kallar	6.0	50.0	0.0	34.4	2.2	5.2	5.5	0.0	16.0	6.4	0.0	6.4	1.9

The chemical analysis data of water samples collected form National Hydrograph Wells April 2021															
Sl.	**District**	**Location**	**pH**	**EC**	**CO3**	**HCO3**	**SO4**	**Cl**	**NO3**	**F**	**TH**	**Ca**	**Mg**	**Na**	**K**
350	Trivandrum	Kattakkada	6.3	350.0	0.0	37.9	3.5	50.4	49.2	0.2	48.0	19.3	0.0	34.8	13.3
351	Trivandrum	Kallikkad	6.7	149.0	0.0	27.0	9.7	19.2	10.6	0.0	53.4	10.7	6.5	18.3	9.0
352	Trivandrum	Vellarada1	7.4	400.0	0.0	81.2	24.5	50.5	23.6	0.0	85.5	25.7	5.2	43.9	20.2
353	Trivandrum	Kulathur	7.3	112.0	0.0	32.4	2.3	16.7	8.6	0.1	21.4	8.6	0.0	17.5	4.7
354	Trivandrum	Chittagode	7.0	290.0	0.0	32.4	7.8	44.5	36.7	0.1	53.3	12.8	5.2	37.3	10.1
355	Trivandrum	Neyyattinkara	7.0	190.0	0.0	16.2	0.6	28.9	32.8	0.1	32.0	6.4	3.9	28.7	4.3
356	Trivandrum	Balaramapuram	6.6	790.0	0.0	16.2	2.8	162.1	106.7	0.1	139.0	45.0	6.5	87.8	34.5
357	Wayanad	Ambalavayal	7.5	130.0	0.0	23.0	7.5	10.7	14.9	0.1	38.7	12.2	2.0	13.4	4.1
358	Wayanad	Chenad	7.5	110.0	0.0	33.3	3.0	7.2	10.9	0.2	46.4	15.7	1.8	8.0	2.2
359	Wayanad	Kalpetta (R1)	7.6	390.0	0.0	112.7	13.1	40.4	20.4	0.1	112.0	35.2	5.9	25.7	17.2
360	Wayanad	Kamblakat	7.3	170.0	0.0	10.2	1.5	10.8	54.0	0.1	56.0	14.2	5.0	16.2	1.8
361	Wayanad	Koroth	7.3	72.0	0.0	12.1	2.3	6.3	11.3	0.0	36.1	11.0	2.2	6.0	1.3
362	Wayanad	Mannanthody	7.7	350.0	0.0	89.6	22.6	29.9	21.2	0.0	105.0	32.2	6.0	21.7	14.7
363	Wayanad	Minangadi	7.5	139.0	0.0	43.5	5.7	12.1	5.2	0.1	58.5	18.5	3.0	9.7	5.6
364	Wayanad	Muthanga (R1)	8.4	580.0	37.8	172.9	5.6	73.2	26.7	0.1	204.0	44.0	22.9	37.5	2.8
365	Wayanad	Nool Puzha	7.9	154.0	0.0	71.7	2.3	6.7	8.9	0.1	75.1	18.1	7.3	9.6	2.0
366	Wayanad	Padinjarattara(R1)	7.6	220.0	0.0	40.9	11.8	13.4	37.1	0.1	84.4	21.5	7.5	13.0	1.9
367	Wayanad	Perikallur	7.7	500.0	0.0	147.3	14.1	66.5	26.6	0.2	150.0	35.4	15.0	47.0	3.1
368	Wayanad	Pulpally	7.9	260.0	0.0	117.8	3.4	19.5	5.4	0.2	94.4	19.2	11.3	23.4	1.6
369	Wayanad	Sulthans' Bathery	8.1	370.0	0.0	115.2	18.7	20.8	17.6	0.2	128.0	41.2	6.3	16.5	18.2
370	Wayanad	Thirunelly (R1)	7.7	111.0	0.0	35.8	4.5	8.7	3.5	0.0	54.0	14.7	4.2	8.1	3.8
371	Wayanad	Vaduvanchal	7.3	156.0	0.0	10.2	0.6	14.7	33.7	0.1	47.6	13.0	3.7	9.4	6.5
372	Wayanad	Valad (R1)	7.4	62.0	0.0	12.6	2.1	3.9	9.2	0.0	30.0	8.4	2.2	4.6	1.1
373	Wayanad	Vythiri	7.1	210.0	0.0	35.8	22.8	18.1	20.7	0.0	64.0	18.5	4.3	14.3	7.9

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