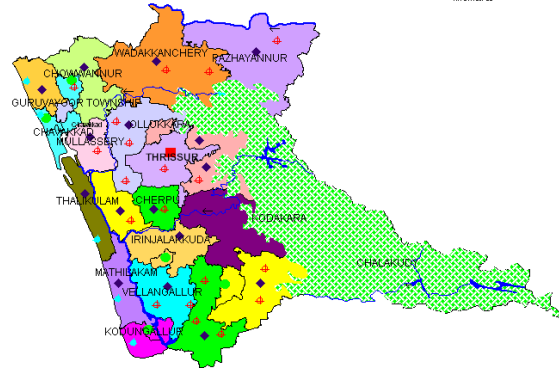


CONSERVE WATER – SAVE LIFE



भारत सरकार  
GOVERNMENT OF INDIA  
जल संसाधन मंत्रालय  
MINISTRY OF WATER RESOURCES  
केंद्रीय भूजल बोर्ड  
CENTRAL GROUND WATER BOARD  
केरल क्षेत्र  
KERALA REGION

भूजल सूचना पुस्तिका, त्रिचूर जिल्ला, केरल राज्य  
GROUND WATER INFORMATION BOOKLET OF THRISSUR  
DISTRICT, KERALA STATE



तिरुवनंतपुरम  
Thiruvananthapuram  
December 2013



**GOVERNMENT OF INDIA  
MINISTRY OF WATER RESOURCES  
CENTRAL GROUND WATER BOARD**

**GROUND WATER INFORMATION BOOKLET  
OF  
THRISSUR DISTRICT, KERALA**

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# GROUND WATER INFORMATION BOOKLET OF THRISSUR DISTRICT, KERALA STATE

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## DISTRICT AT A GLANCE

Sl No.	ITEMS	STATISTICS
1.	<b>GENERAL INFORMATION</b>	
	i) Geographical area (Sq km)	3032
	ii) Administrative Divisions (As on 31-03-2011) Number of Tehsils/Blocks Number of Panchayats	05 / 17 97
2.	<b>GEOMORPHOLOGY</b>	
	Major physiographic units	Low land , Mid land and High land
	Major Drainages	Parts of Ponnani basin, Keecheri & Karuvannur basins (Kole lands) and parts of Chalakudy basins.
3.	<b>LAND USE (Sq km), 2008</b>	
	a) Forest area :	1036.19
	b) Net area sown :	1537.41
	c) Cultivable area /Total cropped area	1931.87
4.	<b>MAJOR SOIL TYPES</b>	Laterite, Brown hydromorphic, River alluvium coastal soil and Forest Loam
5.	<b>AREA UNDER PRINCIPAL CROPS ( Sq Km ), 2008</b>	621.00 862.06 124.93 66.37
6.	<b>IRRIGATION BY DIFFERENT SOURCES (Area in sq.km), 2008</b>	
	Wells (Dug wells / Tube wells & Bore wells)	179.79
	Tanks / Ponds	135.19
	Canals	230.31
	Other Sources	185.57
	Net Irrigated area	783.50
	Gross Irrigated area	
7.	<b>NUMBER OF GROUNDWATER MONITORING WELLS OF CGWB (AS ON 31-3-2011)</b> No. of Dug wells No. of Piezometers	52 16

8	PREDOMINANT GEOLOGICAL FORMATIONS	Archaean Crystalline formation (Gneiss, Schist Charnockite), Tertiary formation, Sub-Recent laterite and Recent riverine Alluvium.
9.	HYDROGEOLOGY Major Water bearing formation  Depth to water level (Pre-monsoon April 2011), mbgl Depth to water level (Post-monsoon Nov. 2011), mbgl Long term water level trend in 10 years(2002-2011) in m/yr Premonsoon Rise Fall Postmonsoon Rise Fall	Weathered and fractured crystalline formations, semi consolidated Tertiary formations, laterites and Recent alluvium.  1.57 to14.42 0.53 to11.73 0.0057 to 0.3336 0.0011 to 0.6484 0.0079 to 0.2352 0.0084 to 0.6766
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-2011)	
	No. of wells drilled (EW, OW, PZ, SH, Total)	EW –26, PZ-16 SH – Nil. Total –42.
	Depth Range, m	35-301
	Discharge, litres per second	0.50 –24.50
	Storativity, S	1.18 X 10 <sup>-2</sup> - 8.90 X 10 <sup>-3</sup>
	Transmissivity, m <sup>2</sup> /day	20-288
11.	GROUND WATER QUALITY	
	Presence of chemical constituents more than permissible limits	Quality is good. Major chemical parameters are within the permissible limits.
12.	DYNAMIC GROUNDWATER RESOURCES (2009) – in MCM	
	Annual Replenishable Ground Water Resources	640.60
	Net Annual Groundwater Draft	356.73
	Projected demand for Domestic and Industrial Uses up to 2025	152.16
	Stage of Ground Water Development, %	55.69
13.	AWARENESS AND TRAINING ACTIVITY	

	<p>Mass Awareness Programmes organized</p> <p>Date Place No. of Participants</p> <p>Date Place No. of Participants</p> <p>Date Place No. of Participants</p>	<p>1) 09 February, 2001 Guruvayur 200</p> <p>2) February 2002 Kodungallur 300</p> <p>21 January 2011 Kodungallur 163</p>
	<p>Water Management Training Programmes organized</p> <p>Date Place No. of Participants</p>	<p>19 – 20 January 2011 Kodungallur 45</p>
14.	<p><b>EFFORTS OF ARTIFICIAL RECHARGE &amp; RAINWATER HARVESTING</b></p> <p>Projects completed by CGWB ( No &amp; Amount spent)</p> <p>Projects under technical guidance of CGWB (Numbers)</p>	<p>Nil</p> <p></p> <p>Nil</p>
15.	<p><b>GROUND WATER CONTROL AND REGULATION</b></p> <p>Number of Over Exploited blocks</p> <p>Number of Critical blocks</p> <p>Number of Semi-Critical blocks</p> <p>Number of Safe blocks</p> <p>Number of blocks notified</p>	<p></p> <p>Nil</p> <p>one</p> <p>one</p> <p>15</p> <p>Nil</p>
16.	<p><b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b></p>	<p>No severe problems noticed.</p>

**GROUND WATER INFORMATION BOOKLET OF THRISSUR DISTRICT,  
KERALA STATE**

## **1.0 INTRODUCTION**

Thrissur is one of the important historical cities of Kerala, which is known as the cultural capital of Kerala. The district has an area of 3032 sq.km and is located in the central part of the State.

### **1.1 Administration**

Thrissur district lies between North latitudes 10° 10' 22'' and 10° 46' 54''; and East longitudes 75° 57' 20'' and 76° 54' 23'', in the Survey of India Toposheet No. 58 B and 49 N. It is bounded on the north by Malappuram district, northeast by Palakkad district and south by Ernakulam and Idukki districts, touching western part of Tamil Nadu on the east and Lakshadweep Sea on the west. Thrissur district accounts for 7.8% of the area of the state.

The district has five taluks viz. Chavakkad, Talappilli, Thrissur, Kodungallur and Mukundapuram which comprises 17 blocks spread over a total of 97 panchayaths and 7 municipalities Fig. 1. The district Headquarters of the district is accessible from any part of the state by road and rail. The NH-47 connecting Kanyakumari-Salem passes through Thrissur. The coastal National Highway 17 passes through the western fringe of the area connecting Ernakulam to Mangalore. The major towns of the districts are connected by good network of roads. The Trivandrum-Mangalore broad gauge line passes through the district. In the western part of the district where lagoons and back water channels are prominent, country crafts and boats serve as useful means of communication cutting short the distance through roads.

The population of the district is 3,110,327 as per 2011 census and the male population is 1,474,665 while female is contributing 1,635,662. There was change of 4.58 percent in the population compared to population as per 2001. In the previous census of India 2001, Thrissur District recorded increase of 8.66 percent to its population compared to 1991. The initial provisional data suggest a density of 1,026 in 2011 compared to 981 of 2001. Average literacy rate of Thrissur in 2011 was 95.32 compared to 92.27 of 2001.

### **1.2 Drainage and Irrigation practices**

Thrissur district comprises three river basins viz. parts of Ponnani, Keecheri & Karuvannur basins (Kole lands) and Chalakudy. The areal extensions of these basins are 510, 1691 and

830 sq.km respectively. The Kole lands are situated below mean sea level and are affected by tidal action. The overall drainage patterns of the rivers are controlled by the deformation structures in the basement rocks. The drainage pattern of the rivers are 'trellis' and 'sub trellis' types in the upper reaches and dendritic in coastal plain.

Two major irrigation projects in the district are Peechi and Vazhani. The Peechi project constructed across the Manali River where as the Vazhani dam across the Keecheri River at Vazhani. These projects operating and supplying water for irrigation from August to December. Another major irrigation project is Right Canal System of Chalakudy diversion constructed across the Chalakudy River, which is irrigating southern part of district.

The minor irrigation projects like gravity flow (diverting water from river through weirs) and lift irrigation (lifting water from rivers) also is being practiced in this district. The irrigation by using ground water is common in valleys and topographically low land. The bore wells constructed along the fracture and lineaments are yielding good amount of water for irrigation. In costal and rural areas the people still depend on ponds and tanks for irrigation purposes.

### **Works carried out by CGWB**

The number of scientific studies has been carried out by different organization during the past years. Systematic hydrogeological surveys have been carried out by the Scientists of Central Ground Water Board, Kerala Region. During the field season programme 1978-79, 79-80 and 80-81, Shri P. Lakshminarayanan carried out studies in the Peechi Canal Command area. During 1981-82 in Mukundapuram Taluk and Chalakudy Basin. Shri S.V.N.S. Rao carried out systematic surveys in 1978-79 in Thalappilli Taluk. Detailed work was done by the SIDA assisted coastal Kerala Ground Water Project (1983-88) of CGWB in Thrissur district along with special studies in the Kole land basins and exploration in the hard rock areas during the period. Reappraisal hydrogeological survey was carried out by Shri A. Subburaj during the period 1995-96 and by Shri K. Balakrishnan during the year 1999-2000. The ground water management studies were carried out by Dr S. Sakthi Murugan in AAP 2006-2007. Dr. V S Joji carried out a study of iron concentration in ground water in the coastal tract of Thrissur district in AAP 2010-11 of CGWB, KR, and Thiruvananthapuram.

### **2.0 RAINFALL AND CLIMATE**

The Thrissur district is characterized by wet type of climate and four types of seasons are identified. The hot summer season from March to May, the southwest monsoon season from June to September, the northeast monsoon season from October to December and a general cool and salubrious climate period during climate period during January and February.



## Ground Water Information Booklet of Thrissur District

The average annual rainfall ranges between 2310.1 and 3955.3 mm in the district with mean annual rainfall of 3198.133 mm. The maximum rainfall occurs during the period June to September (SW monsoon) and nearly 71.24% of the total rainfall is received during the season. 16.27% of the total rainfall is received during North East monsoon between October and December, 12.1% of the total rainfall is received during March to May and the balance 0.37% is accounted for during January and February months.

The month of July experiences abundant rainfall and is the wettest month. The months of June, August, September and October also receive heavy rainfall. The annual rainfall received in Thrissur district during the last 6 years is presented below in **Table 1**

**Table 1: Annual rainfall (mm) received in Thrissur district**

Year	2006	2007	2008	2009	2010	2011
Rainfall, mm	3576.7	3955.3	2310.1	3090.3	3114.4	3142

### **Variability of rainfall**

The year to year variability of annual rainfall is around 22%. In general it varies from 18.6 to 24.0%. The highest coefficient of variation is for Wadakanchery and the lowest for Trichur. In Thrissur district highest rainfall 4826.9 mm is recorded in 1961 at Irinjalakuda and the lowest rainfall 883.1 mm at Wadakancherry in the year 1924.

### **Meteorological Parameters**

#### **Temperature**

The maximum temperature ranges from 29.3 to 36.20C where as the minimum from 22.1 to 24.90C. The average annual maximum temperature is 32.300C and minimum temperature 23.30C. Generally March and April months are the hottest and November, December, January and February months are the coldest.

#### **Relative Humidity**

The humidity is higher during monsoon months from June to October and is around 93% during morning hours and 76% during evening hours.

#### **Wind Velocity**

The wind speed is more during December and January months and it is less during October.

### **Evaporation**

It is high during the months of December to April because of more bright sunshine hours and less number of rainy days. It is less during the monsoon months from June to October. The maximum rate of 7.4 mm/day is recorded in January and the minimum rate of 2.9 mm/day is recorded in July.

### **Potential evapo-transpiration**

The annual PET for Vellanikara is 1776.3 mm-based on Thornthwaite's method.

### **Aridity index**

The ratio of potential evapotranspiration to rainfall is known as aridity index and it is around 0.6 for Vellanikara.

## **3.0 GEOMORPHOLOGY AND SOIL TYPES**

The three geomorphologic units of the Thrissur district are coastal plain, mid lands and high lands.

### **The coastal plain**

The coastal plain with an average width of 7 km have elevation ranging from 1m below mean sea level to as much as 7.6 m.amsl. This coastal belts consists of number of beach ridges.

The Kole land, which has elevations in the range of 1-2 mamsl and water logged for 5-6 months in a year due to tidal effects.

### **The Midland**

Two geomorphic zones mark the midland region. These are the flat-topped landform covered by a thick blanket of laterite, which is immediately to the east of coastal plain and rises up to 20 mamsl. The laterite is quite thick and in some places attains thickness up to 25 m. The mounds occur all along the midland portion, occasionally rising to 70 m above mean sea level. The second geomorphic zone is represented by infilled valleys, which occur between lateritic mounts and varying in length from 100m to 3.5 km comprising alluvial sediments and are intensively cultivated and get flooded during the monsoon periods.

### **The High lands**

The hill ranges along the eastern part constitute the rugged terrains of Western Ghats. Pappattaparamudi (elevation 1160 m.amsl) and Mangattukumban are the high peaks in the area. The eastern high lands exhibit a typical topography with a steep hills dissected by deep 'V' shaped valleys drained by youthful rivers.

### **Soil Characteristics**

The soils in Thrissur district have been classified in the following types, based on the morphological features and physiochemical properties.

#### **The laterite Soil**

The predominant soil type observed is the lateritic soil, which covers almost the entire midland areas of the district. These soils are in general well drained, low in essential plant nutrients and organic matter. They exhibit very low cation exchange capacity and are generally acidic.

#### **Brown hydromorphic soils**

The second prominent soil type is the brown hydromorphic soil. These are confined to the valleys between undulating topography in the midlands and in the low lying areas of the coastal strip in the district. These have been formed as a result of transportation and sedimentations of materials from adjoining hill slopes and also by deposition from rivers. The soils are very deep and brownish in colour. The surface texture varies from sandy loam to clay.

#### **Hydromorphic Saline Soils**

Very small patches of hydromorphic saline soils are found in the coastal tracts of the district. They are brownish, deep and imperfectly drained, showing wide variation in texture. In the estuarine areas of the district, these soils are found with wide fluctuations in the intensity of salinity.

#### **Coastal Alluvium**

These soils are seen on the coastal tracts stretching from Kodungallur to Chettuvai. These have been developed from recent marine deposits with a texture dominated by partially sorted sand fraction. They are excessively drained with very rapid permeability. Water holding capacity of these soils is low.

#### **Riverine Alluvium**

These soils consist of moderately well drained and distributed mainly on the banks of rivers and their tributaries. They are light to medium textured with good physical properties and contain organic matter, nitrogen and potash moderately. They show wide variations in their physico-chemical properties. They are very deep soils with surface texture ranging from sandy loam to clayey loam, predominated by the fine sand fractions.

### **Forest Loamy Soil**

These soils are found in the south-eastern hilly areas of the district, bordering Tamil Nadu. These are characterized by a surface layer very rich in organic matter. They are dark reddish brown to black with loam to silty loam texture. The soils are generally acidic.

### **4.0 GROUND WATER SCENARIO**

Groundwater occurs under water table conditions in alluvium, laterites and weathered mantle of the crystalline, where as in the deeper fractured crystalline the groundwater occurs under semi confined to confined conditions.

#### **4.1 Hydrogeology**

The aquifer system in the district can be broadly divided into hard rock aquifers, laterite aquifers and sedimentary aquifers. The hard rock and laterite aquifers constitute major aquifer system of the district while the sedimentary aquifers are seen along the coast and river courses. Groundwater occurs under phreatic, semi confined to confined conditions in the weathered and fractured portions of the crystalline formations and occurs semi-confined and confined condition in deep seated fractured and sedimentary formations. The hydrogeology map of Thrissur district presented in **Figure 4**

#### **Hard Rock Aquifers**

Along the weathered portion, the groundwater occurs under water table conditions and mainly controlled by geologic and geomorphic features. The weathered rocks form potential aquifers and the thickness of weathered portion ranges from 4.5 m to 21.0 meters. The depth to water level in the wells during pre monsoon period varies from 1.57 to 14.42 mbgl and during post monsoon period 0.53 to 11.73 mbgl. The shallow aquifer in these formations is developed by open dug wells and shallow bore wells. The design of dug wells in consolidated crystalline are 4m dia. and 12 m depth and shallow bore wells can be drilled up to a depth of 50 mbgl.

Groundwater occurs under semi confined to confined conditions in the fractured portions of the crystalline rocks. The studies carried out in the district indicate that the intersections of fractures are most potential followed by E-W and NW-SE fractures. The E-W and NW-SE fractures form potential zones for bore wells in the north-eastern part of the district.

The fractured deep aquifers were explored up to a depth of 300 mbgl by CGWB. The depth of casing ranges from 2.13 to 34.50 m and potential fractures encountered between 18 to 137 mbgl. The thickness of fracture varies from less than a meter to more than 10 metres. The

yield of bore wells ranges from 0.50 to 24.5 lps. The transmissivity ranges from 22-288 m<sup>2</sup>/day and storativity ranges from 1.18 X 10<sup>-2</sup>- 8.90 X 10<sup>-3</sup>.

### **Laterites**

This is the most commonly occurring aquifer system in the district. The laterites are highly porous and due to this the aquifer gets recharged fully by the initial few rains itself. Subsequent rains contribute little to the aquifer system and escapes as rejected recharge. Due to this high porosity the stored water escapes as sub surface run off from the elevated areas and slopes once the rain recedes. The laterite forms highly potential aquifers along topographic lows and valleys.

Depth of dug wells in these formations generally ranges from 5.00 to 25.62 metres. The depth to the water level generally ranges from 1.13 to 24.00 mbgl in pre-monsoon period and 0.98m to 20.10 meters in post-monsoon period. The yield of wells tapping laterite ranges from 20 to 40 m<sup>3</sup>/day. The specific capacity of the wells ranges from 5.04 X 10<sup>-3</sup> to 182.7 X 10<sup>-1</sup>.

The dug wells tapping the laterites are generally unlined up to lithomarge clay zone. The wells are lined to avoid caving along the lithomargic zone. Mostly cement rings are used for lining but the lining using the brick wall or laterite bricks are found quick recuperation and allow free flow of groundwater into the well. In the lateritic area the dimension of wells is 1.5mx6.0m to 3.0mx7.5m in the valley areas and in midlands 2 x 10.5 m to 4 x 12.0 metres.

### **Semi Consolidated (Vaikom Formation)**

The Vaikom formation contains coarse grained sands, gravel, clay, marl, carbonaceous clay and lignite intercalated with granular formations. In this formation the ground water occurs as semi confined to confined condition. The Vaikom formation is found lateritised on the top where ever it's exposed. At Kattur, the exploratory drilling data reveals that the Vaikom formation occurred at a depth of 17 mbgl which is covered by thick alluvium of coastal sediments and not exposed on the surface. The thickness of granular zone varies from 8 to 30 mbgl. The transmissivity and storativity of Vaikom formation ranges from 22 to 105 m<sup>2</sup>/day and 4.1 X 10<sup>-3</sup> to 4.8 X 10<sup>-4</sup>.

### **Alluvial Aquifer**

In general ground water occurs under water table condition along the river courses, intermontane valleys and along the coastal plain. The depth of dug wells located in these formations is ranging from 5.00 to 9.00 mbgl and depth of water level generally varies from 0.5 to 6.58 mbgl.

## Ground Water Information Booklet of Thrissur District

In the coastal alluvium the aquifer can be developed through construction of dug wells and filter point wells for both domestic and irrigation. The drilling data reveals that the alluvial thickness is around 15m. The depth of dug wells is ranging from 3.00 to 9.57 mbgl and depth to water level ranging from 1.87 to 6.10 mbgl in pre monsoon and 0.58 to 3.52 m in post monsoon. The specific capacity of the dug wells ranges from  $6.34 \times 10^{-3}$  to  $1.44 \times 10^{-1} \text{ m}^3/\text{min}/\text{m}.\text{dd}$ .

The depth ranges of filter points wells ranges from 6 to 10 mbgl with a slotted length of 1 to 3m at bottom. The yield of filter point wells ranges from 12 to 18 m<sup>3</sup>/day .Such potential areas are seen around Andathodu, Engandiyur, Nakitta, Perinjanam, Triprayar and Erriyad etc. All the dug wells tapping the alluvial formation are lined with concrete ring or bricks. Filter point wells are constructed along the coastal area wherever the saturated sand thickness exceeds five meters.

### Depth to Water level

The depth to water level in pre-monsoon period ranges from 1.57 to 14.42 m bgl and in post-monsoon period 0.53 to 11.73 mbgl. In general the water level is shallow during both monsoons particularly along valleys and topographically low areas. The data of ground water monitoring wells shows that around 13 % of the wells fall within 10.00 to 15.00 mbgl categories while 55% of the wells fall in the water level showing 5.00 to 10.0 mbgl category and 23% of the wells falls in the 2.00 to 5.00 mbgl category and 9 % of the wells falls in the 0.00 to 2.00 mbgl during the pre monsoon. The post monsoon data reveals that the 13 % of the wells falls under 10.00 to 15.00 mbgl category and 54 % wells falls than 5.00 to 10.00 mbgl category and 8 % of the wells fall in the 0.00 to 2.00 mbgl. The depth to water level ranges of pre & post monsoon data of April & November presented in **Table 2**.

**Table 2: Depth to water level range- Pre and Post monsoon (April & November 2011)**

Formations	DTW ranges in GWMW, mbgl							
	0.0-2.0m		2.0-5.0m		5.0-10.0m		10.0-20.0m	
Pre monsoon April 2011	No.	4 (9.0 %)	No.	11 (23%)	No.	26 (55%)	No.	6 (13%)
Post monsoon November 2011	of wells & %	4 (8%)	of wells & %	12 (25%)	of wells & %	26 (54%)	of wells & %	6 (13%)

The analysis of the long-term water level does not pose any severe problems in the district. The long-term trend of pre monsoon water level during 2002 to 2011 indicates a fall of

## Ground Water Information Booklet of Thrissur District

0.0011 to 0.6484 m/y. The rising trend are also seen which ranges from 0.0057 to 0.3336 m/y. The post monsoon period falling trend ranges 0.0084 to 0.6766 m/y and rising trend ranges from 0.0079 to 0.2352 m/y. The decadal (2002-2011) pre and post monsoon water level maps have been prepared (**Figures 2 & 3**).

In general this falling trend is not at all alarming and most of the areas indicate a rising trend. This may be due to the canal command irrigation in the district.

### 4.2 Ground Water Resources

The ground water assessment was done block wise as per GEC-1997 methodology as in 2008-09. The net annual groundwater availability is 640.60 MCM where as the draft for all uses is 356.73 MCM. The Kodungallur block falls under critical and Ollukkara semi critical category and all other blocks are under safe category (**Figure 5**). The block wise ground water resource of Thrissur district is given in **Table 3**

**Table 3: Block Wise Ground Water Resources of Thrissur district**

S.No	Blocks	Total Annual Ground Water Recharge	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for All uses	Provision for domestic, and industrial requirement supply in 2025	Net Ground Water Availability for future irrigation development	Stage of Ground Water Development	Category
1	Anthikkad	34.01	32.3095	14.6102	5.7819	5.7819	45.22	Safe
2	Chalakkudy	66.4116	59.7704	30.6156	10.3279	10.3279	51.22	Safe
3	Chavakkad	38.4965	36.5717	24.2565	9.1533	9.1533	66.33	Safe
4	Cherpu	38.6308	36.6993	17.4093	5.0967	5.0967	47.44	Safe
5	Chowannur	35.5922	32.033	19.0539	8.9624	8.9624	59.48	Safe
6	Irinjalakkuda	34.992	31.4928	17.3731	8.1333	8.1333	55.17	Safe
7	Kodakara	63.8302	57.4472	33.15	9.8169	9.8169	57.71	Safe
8	Kodungallur	13.278	11.9502	11.1852	7.0454	7.0454	93.60	Critical
9	Mala	47.5781	42.8203	25.7539	8.1302	8.1302	60.14	Safe
10	Mathilakom	22.7265	21.5902	13.7441	7.7279	7.7279	63.66	Safe
11	Mullassery	30.8878	27.799	11.7874	4.8607	4.8607	42.40	Safe
12	Ollukkara	58.7159	52.8443	38.6274	25.7117	25.7117	73.10	Semi-Critical
13	Pazhayannur	45.5817	41.0235	21.1601	9.0874	9.0874	51.58	Safe
14	Puzhakkal	63.8169	60.6261	21.0449	7.3085	7.3085	34.71	Safe
15	Thalikkulam	23.7113	22.5257	15.0318	6.9562	6.9562	66.73	Safe
16	Vellangallur	25.2822	22.754	14.4371	6.0438	6.0438	63.45	Safe
17	Wadakkancherry	55.9323	50.3391	27.4922	12.02	12.02	54.61	Safe
<b>Total</b>		<b>170.9693</b>	<b>699.4741</b>	<b>135.0579</b>	<b>356.7329</b>	<b>152.164</b>	<b>55.69</b>	

### **4.3 Ground Water Quality**

The chemical quality of groundwater is generally good in both phreatic as well as deeper fractured rock aquifers. In the deeper sedimentary area the formation water is slightly brackish. Around 38 Nos of Ground Water samples are showing EC less than the 300  $\mu\text{s/cm}$  at 250C while the 15 Nos of samples with less than 100  $\mu\text{s/cm}$ . The EC ranges from 37 to 635  $\mu\text{s/cm}$  at 250C and the total hardness ranges from 6 to 240 mg /litre. The chloride ranges from 4.30 to 121 mg/litre and the chemical data presented in **Annexure I**.

### **4.4 Status of Ground Water Development**

The stage of development in this district is 55.69 % as per 2009 estimation. The maximum stage of development is seen in Kodungallur block (93.60%) while minimum is in Puzhakkal block (34.71%). The lifting devices of water are through centrifugal pumps, jet pumps for dug wells and submersible pumps and compressor for bore wells. Water is also being lifted by bucket and rope from dug wells for domestic purposes. The stage of groundwater development reveals that large quantity of water is available for future development. Future developments can be possible for the blocks falling under safe category. The springs seen in hilly areas of the district can be developed. Most of the rural water supply schemes in the district depend on ground water by means of dug wells, tube wells and bore wells. Based on drilling data the potential fracture zones are within 100 mbgl. For example the high yield bore wells drilled by Central Ground Water Board near Pazhayannur has been providing water supply to the nearby villages for the last 15 years. The details of wells drilled by CGWB in Thrissur District are compiled (**Annexure II**)

## **5.0 GROUND WATER MANAGEMENT STRATEGY**

Groundwater in the district is mostly developed through dug wells, dug-cum-bore wells, and bore wells for domestic and irrigation needs. In the valley fill and lateritic areas, groundwater is developed mostly through dug wells. The groundwater is developed through bore wells for irrigations and domestic purposes particularly in midlands and eastern uplands.

### **5.1 Ground Water Development**

Out of seventeen blocks, one critical block (Kodungallur) is as per recent Ground Water Estimation Committee calculations. The stage of ground water development in Thrissur district is 55.69 % and hence enough water is available for further development. Groundwater can be developed through the construction of dug wells, bore wells and dug-cum-bore wells. In alluvium, dug wells with depth of 2 to 5 mbgl and diameter of 1.5 to 2.50 metres are feasible. In laterite terrain, dug wells are feasible in the valley and gentle slopes



with a depth range of 4 to 10 mbgl and diameter of 2.0 to 3.5. In the valley fill areas the dug wells are feasible with depth range of 4 to 8 metres with a diameter of 2 to 3.0 metres. In the crystalline formations dug wells feasible with a depth range of 5.0 to 15.0 metres with a diameter of 2.0 to 3.00 metres. The bore wells are feasible in crystalline and Laterite areas, which can be drilled at a depth range of 50 metres to 150 metres bgl. The favourable bore wells sites are along the lineaments, fractures, shear zones etc which can be located by using remote sensing and geophysical investigation. For proper site selection and other ground water related issues farmers may make use of the technical expertise of the Central Ground Water Board and State ground water agencies. There should be a norm for disseminating the scientific and technical knowledge through village and block panchayats.

### **5.2 Water Conservation and Artificial Recharge**

The critical and semi critical blocks should be given immediate attention to stop the over exploitation of the ground water. In those areas more mass awareness and training programme should be conducted to educate the importance of the conservation recharge of ground water for future use of ground water. The artificial recharge projects like construction of ponds and tanks, check dam, gully plugs, subsurface dyke and rooftop rain water harvesting to be implemented in both Urban and rural areas ( **Figure 6**).

### **6.0 GROUND WATER RELATED ISSUES AND PROBLEMS**

Acute water scarcity being faced in the hilly areas in summer period due to drying up of dug wells and hand pumps. Dug wells in midland region get dried up if monsoon is delayed or if there are no summer showers. The increased dependence on bore wells in midland areas leads to drying up of dug wells in lateritic mounds and slopes, which affects the drinking water needs of those areas. The coastal areas stretching from Engandiyoor to Chettuva and the villages of Eriyad, Nattika and Chamakala experiences severe coastal erosion frequently which leads degrading ground water quality nearby coastal aquifer. In Kole land and adjoining areas are water logged about six months in year in those areas the conjunctive use of both ground and surface water to be adopted for irrigation and industrial uses. In Kole land the salinity has been observed more during high tides and less during low tides and increasing from February to May. This salinity problem has been partly solved by the construction of bunds/regulators across the rivers draining into sea. In general the quality problems are seen highly localised which is found along the coastal area where the streams are confluence with sea particularly during summer months.

## **7.0 AWARENESS AND TRAINING ACTIVITY**

Mass Awareness Programme was organised at Kodungallur and Guruvayoor to give awareness to the local people pertaining to rain water harvesting and optimum utilisation of ground water particularly along the coastal areas.

## **8.0 AREAS NOTIFIED BY CGWA/SGWA**

Most of the blocks are falling under safe category, however the Kodungallur block falls under critical category and Ollukkara under semi-critical category. None of the blocks is notified by Central Ground water Authority the State Ground water Authority.

## **9.0 RECOMMEDATIONS**

It is recommended that all the critical I and semi critical blocks may be given immediate attention for implementing artificial recharge schemes through State and Central sector schemes with stake holder participation.

The deeper potential aquifers in the safe blocks may be developed for drinking and agricultural purpose with sustainable pumping rate.

Pangarapally, which falls under Pazhayannur blocks of Thallapally taluks having the very good potential aquifer along the valley of Pulakaod to Pangarapally village. The ground water can be developed through both dug wells and deep bore wells. The indication of the potential zone in this area are a) three successful deep bore wells supplying water for near panchayat more than 20 years with high discharge b) a auto flow dug wells seen in middle of the valley near Pulakod Village. In general in and around Wadakacherry and Pazhayanoor areas are having high ground water potential zones with varying depths which can be developed for agricultural as wells as rural water supply schemes by the grama panchayats.

In the district there are numerous springs seen along the slope of the eastern hill ranges, which are the perennial sources for drinking water. These have not been developed so far effectively. Attention may be given for the proper development of springs as the spring water can be supplied to the down streams just by gravity flow.

There should be a proper water budgeting in the district. There are number of minor irrigation and water supply schemes in the district, which require periodic maintenance and attention. Priority should be given to micro level water supply projects.

Mass awareness programmes may be organised in Panchayath level to make awareness among people about the importance of conservation of water resources. Stress should be given for integrated water shed management and conjunctive use of water resources in the district.

Most of the blocks are falls under safe category and the groundwater can be developed for irrigation and other purposes. In some part of the area, the scarcity of water is observed during summer period. In these areas artificial rainwater harvesting structure may be recommended for augmenting the groundwater.

The urban areas are suitable for roof top rainwater harvesting. It can be practiced by all government buildings and individuals with small land holding. The same can also be adopted along high land and rural areas where water scarcity is reported during peak summer.

Gully plugs in areas with local break in slope and plateau terrain, which is suitable for midland region of Vellangallur, Mala, Puzhakkal, Kodakara and Chowannur blocks.

Percolation Tanks can be constructed in areas with thick alluvial patches along eastern parts of district and also along laterite hilltops.

Check dams can be constructed across the streams with gentle slope with permeable beds and the suitable areas are Wadakkancherry, Ollukara and Pazhayannur blocks.

Sub-surface dyke along gently sloping wide valleys with narrow out let. However, necessary suitable studies are to be carried out before construction since each one is site specific.

Figure 1: Index Map of Thrissur District

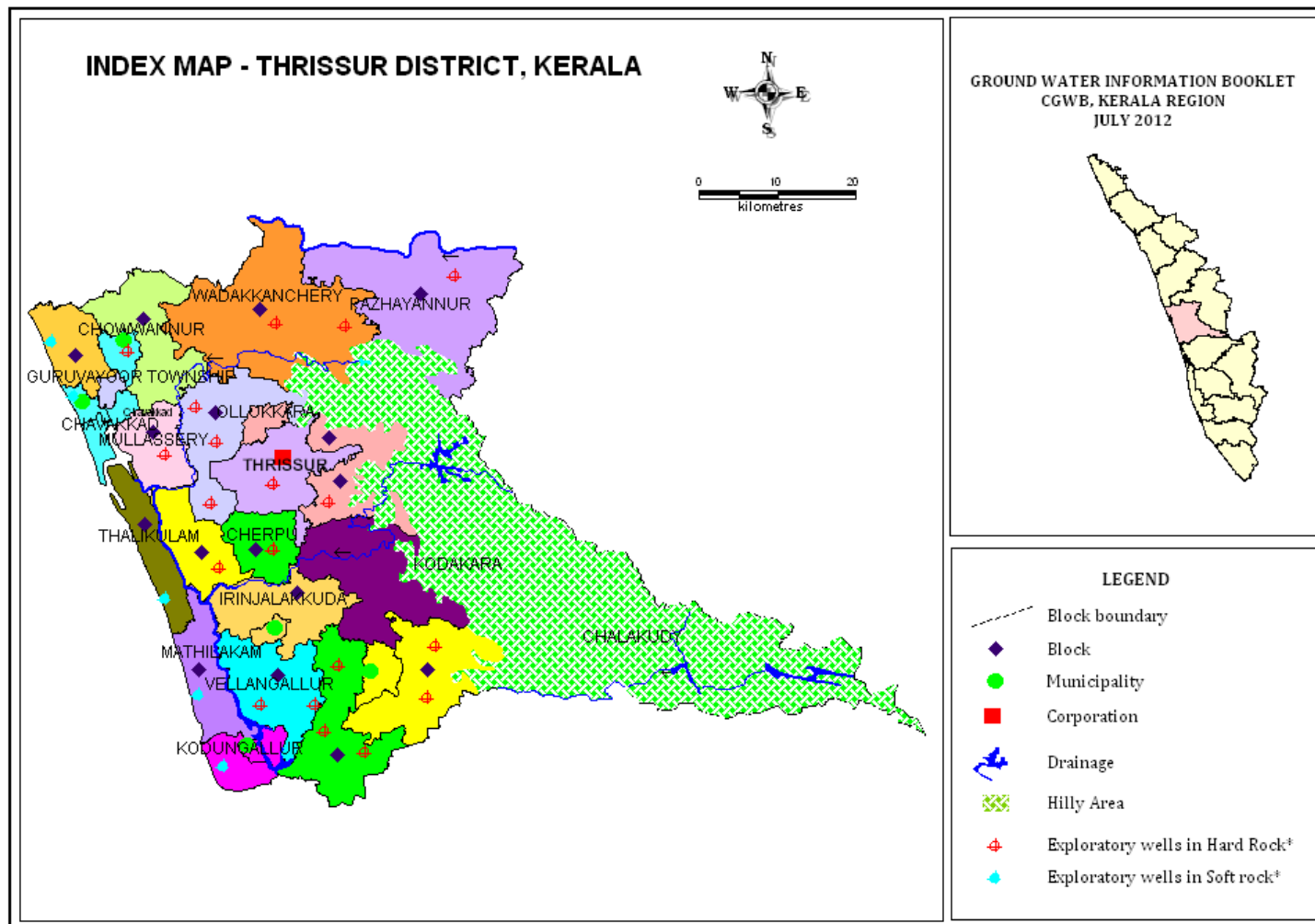


Figure 2: Pre-monsoon Depth to Water Level, Thrissur District (April 2002-11)

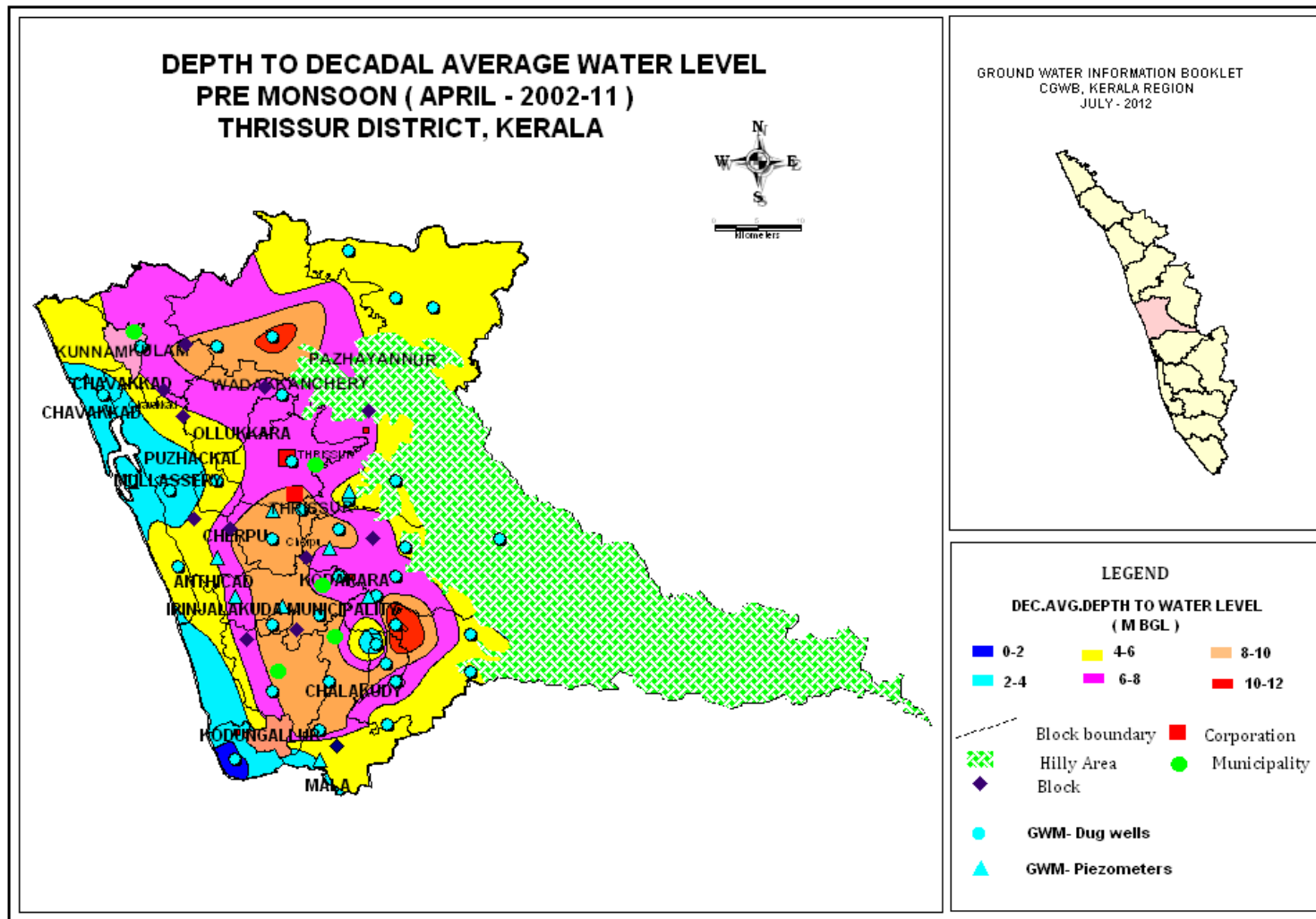




Figure 4: Hydrogeology of Thrissur District, Kerala State

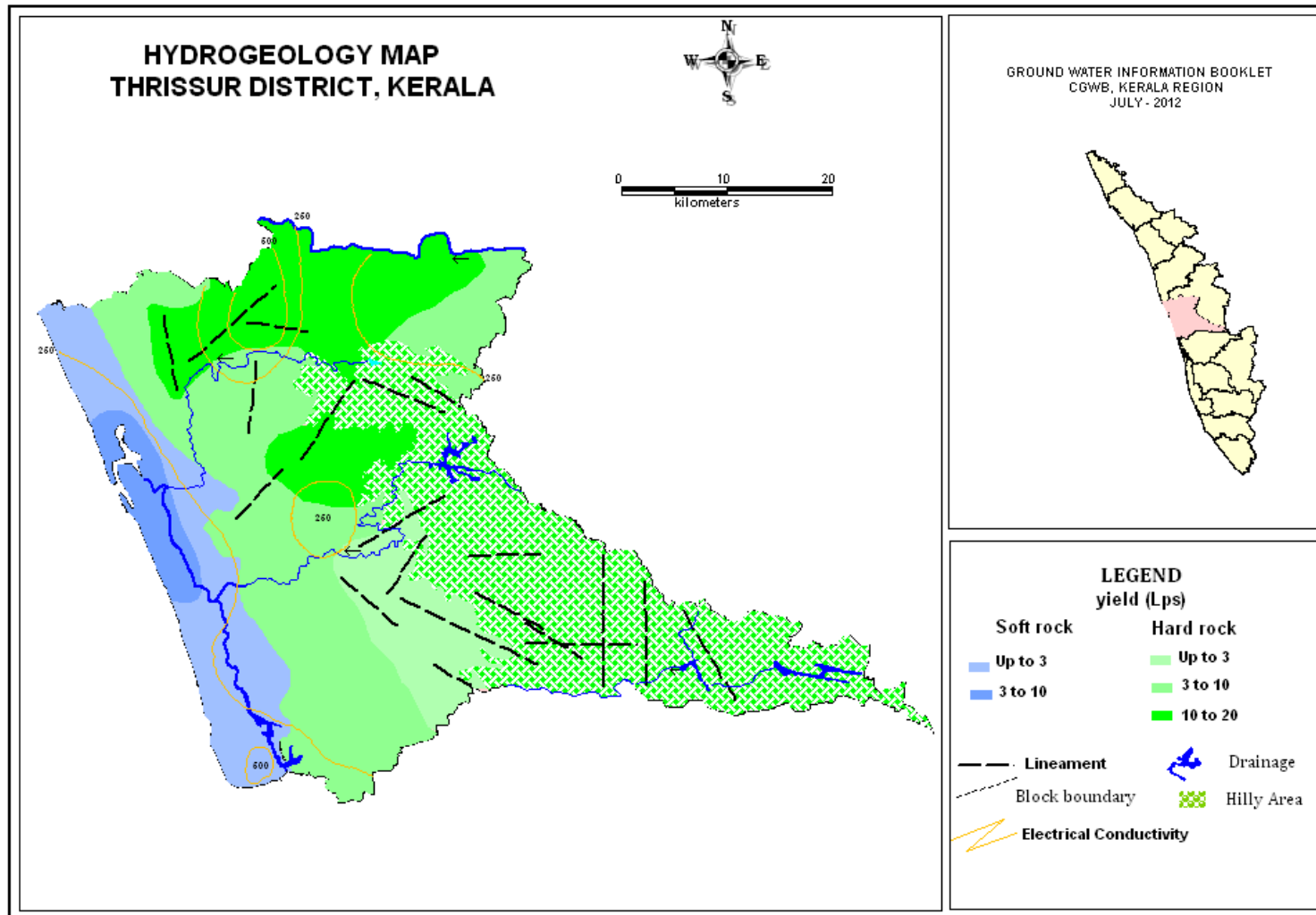


Figure 5: Categorisation of Blocks in Thrissur District

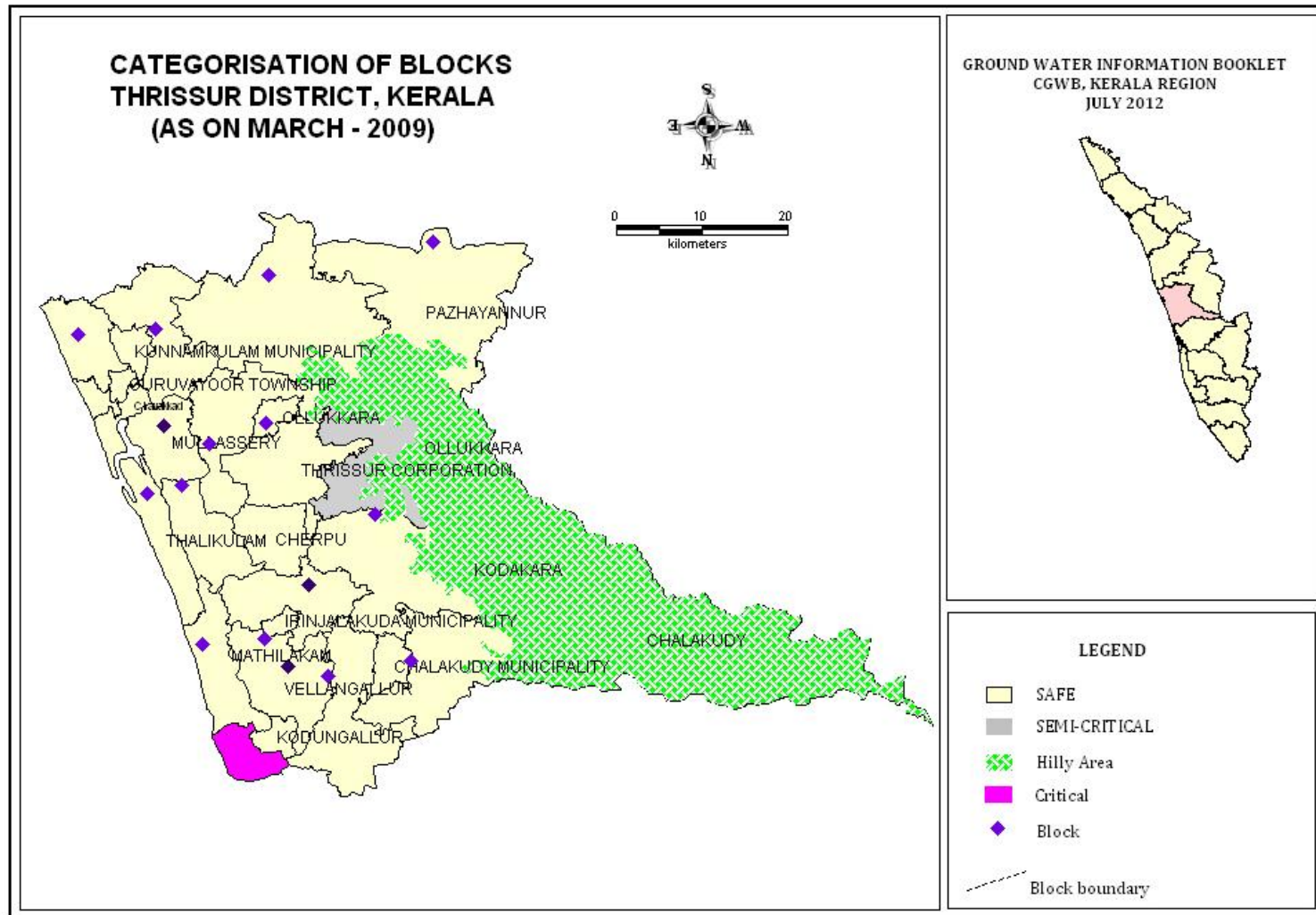
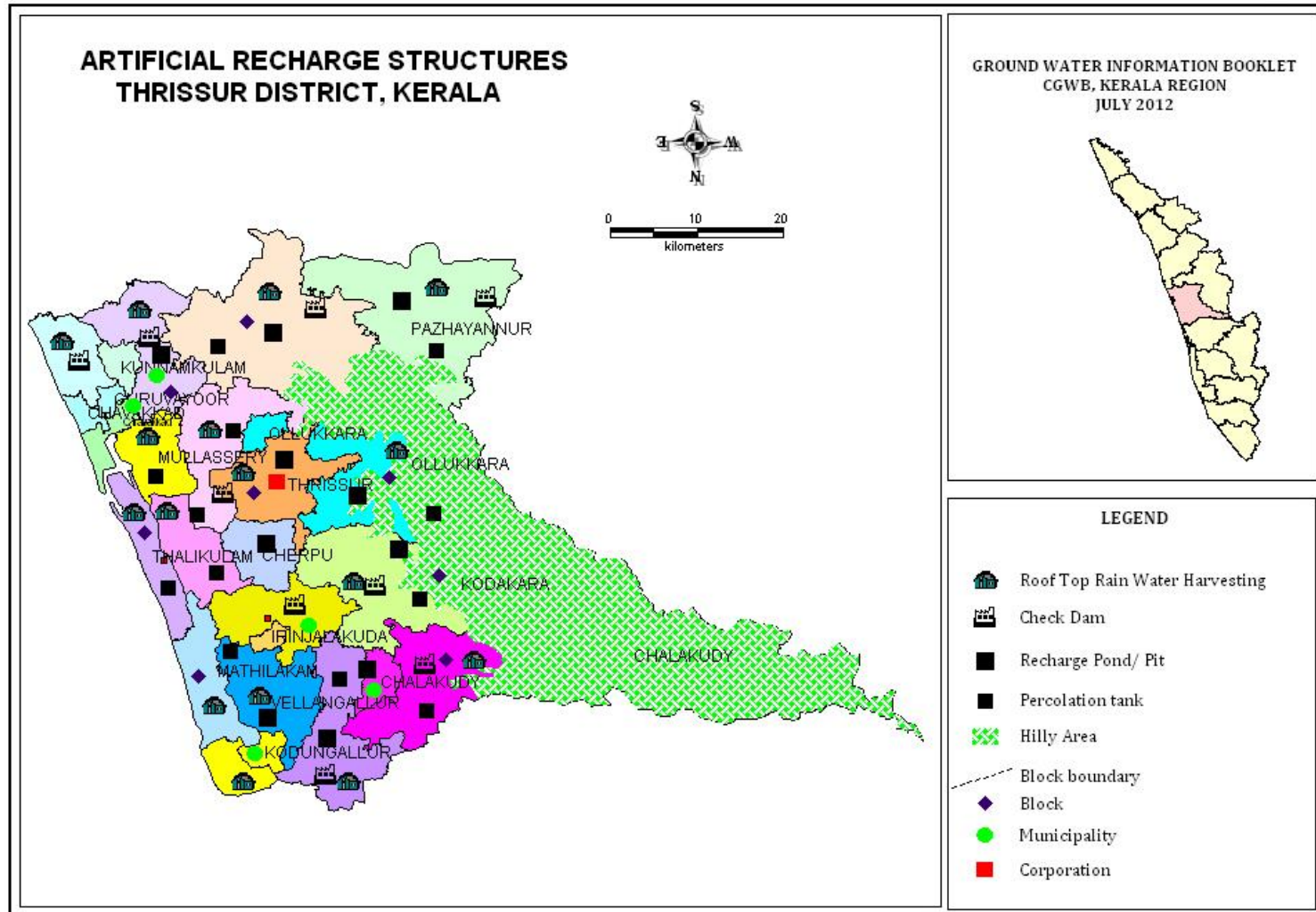




Figure 6: Artificial Recharge Structures proposed in Thrissur District



**Ground Water Information Booklet of Thrissur District**

**Annexure I: Ground water quality of ground water monitoring wells**

S.No	Location	pH	EC in µs/cm at 25 o C	Total Hardness as Ca CO3	Ca	Mg	Cl	F	NO3
					Concentration, mg/l				
1	Kodungallur	8.1	478	110	28	9.7	47	0.22	39
2	Azhikode	8.45	181	70	25	1.9	14	0.33	1.4
3	Eriyad	8.38	309	48	18	1	48	0.03	1.4
4	Padakulam	-	616	70	26	1.2	121	0.15	44
5	Logamalleswaram	8.25	319	98	37	1.5	34	0.25	0.44
6	Perinjanam	8.61	110	34	14	0	8.5	0.19	0
7	Manalur	7.63	52	12	3.2	1	7.1	0.07	0
8	Engandiyur	8.73	244	84	34	0	17	0.2	2
9	Chavakkad	8.63	263	64	22	2.4	27	0.41	4
10	Guruvayur	8.19	227	58	20	1.9	26	0.14	0.5
11	Punnayur	7.81	120	42	17	0	5.7	0.14	0.7
12	Kallumpuram	8.5	326	90	24	7.3	40	0.24	13
13	Kunnamkulam	7.65	101	16	6.4	0	11	0.31	8.7
14	Erumapetty	7.53	121	22	8	0.5	16	0.2	8
15	Kundannur	8.24	635	240	24	44	92	0.23	0.88
16	Wadakkancherry	8.1	126	30	9.6	1.5	14	0.42	2.1
17	Cheruthuruthy	8.26	376	132	8.8	27	26	0.34	0.27
18	Chelakara	8.44	403	120	25	14	52	0.35	0.33
19	Chelakode	8.85	420	80	12	12	50	0.7	3.1
20	Pulakod	-	252	70	13	9.2	9.9	0.62	1
21	Keecheri	8.02	391	66	16	6.3	61	0.24	63
22	Athani	7.84	112	18	4.8	1.5	18	0.25	11
23	Mulankunnathukavu	7.77	352	60	17	4.4	36	0.08	31
24	Vellannikkara	8.6	110	26	6.4	2.4	14	0.16	0.86
25	Pattikad	7.88	114	28	6.4	2.9	8.5	0.34	0.26
26	Kombazha	8.61	145	30	8.8	1.9	14	0.18	0.44
27	Trichur	7.56	67	14	4	0.97	8.5	0	2.5
28	Adatt	7.32	173	26	7.2	1.9	30	0.08	16
29	Parappur	7.22	175	20	6.4	0.97	28	0.2	25
30	Ollur	8.35	462	66	19	4.4	75	0.38	49
31	Cherukunnu	7.6	73	10	1.6	1.5	9.9	0.06	1.9
32	Manamangalam	7.61	44	6	1.6	0.49	5.7	0.6	0.3
33	Kallur	7.67	160	28	8	1.9	24	0.28	6.7
34	Echipara	7.97	54	12	3.2	0.97	5.7	0.01	0.7
35	Velupadam	7.34	124	16	4	1.5	18	0.15	13
36	Mattathur	7.45	44	6	2.4	0	4.3	0.08	1.4
37	Vellikulangara	7.16	90	16	4.8	0.97	11	0	9.6
38	Konnakuzhi I	7.59	49	12	4	0.49	5.7	0.24	1.4
39	Konnakuzhi II	6.84	46	8	2.4	0.49	5.7	0.38	2.9
40	Konnakuzhi III	7.24	37	6	2.4	0	5.7	0.55	0.83
41	Potta	-	124	18	4.8	1.5	18	0.2	1.1
42	Parapukara	7.44	191	34	9.6	2.4	28	0.25	14
43	Cherpu	7.7	104	14	4.8	0.49	14	0.35	1.2
44	Chalakydy	7.38	70	14	4.8	0.49	9.9	0.22	0.58

## Ground Water Information Booklet of Thrissur District

45	Puthenchira	8.44	122	34	10	1.9	13	0.24	1.7
46	Tekkumkara	7.46	57	12	4	0.49	9.9	0.41	0.54
47	Mala	7.93	197	60	20	2.4	18	0.64	5.7
48	Annamanada	7.42	163	22	16	1.5	28	0.14	15
49	Triprayar	7.96	417	114	39	3.9	41	0.37	45
50	Muriyad	7.8	142	28	7.2	2.4	24	0.3	5.2
51	Irinjalakuda	7.64	167	40	14	1.5	17	0.07	4.4

### Annexure II: Salient features of wells drilled by CGWB in Thrissur District are compiled

S. No	Location	lineament Direction	Depth drilled/ SWL mbgl	Depth of casing, mbgl	Fracture zones with yield, lpm	Discharge lpm during drilling / recommended	T, m <sup>2</sup> /day	EC, $\mu$ /cm at 250C	Cl, ppm
1	Pudukad	Nil	200.53, 2.95	21.02	50.13/30, 80.61/90, 137.5/120	180 NA	37.97	7900	2684
2	Mannutti	E-W	195.0, 0.90	8.20	8-10, 15-16, 22-23, 26-27, 45-46, 49-50/750	750 550	22-100.9	240	13
3	Agr.Unv Main Gate	Nil	301.00, 4.28	8.24	Nil	30 NA	22	1430	6
4	KAU	E-W	114.00, 3.78	12.27	27-114/1800	1800 3360	288 8.90*10 <sup>-3</sup>	260	10
5	KAU Pepper Research Station	E-W	137.5, 2.34	13.45	13.3, 32-42, 83.5, 114-129, 130-137.57/1440	1140 1130	50.44	470	11
6	Kadavallur	NNW-SSE	200.53, 3.81	3.36	Nil	dry	—	—	—
7	Alur	N-S	300.81	5.25	184, 221.4-300.8	dry	—	—	—
8	Chiranellur	NE-SW	151.2, 3.03	11.59	15.7-19.2, 30.9, 50-76, 111-122.0/1200	1218 2280	192	320	16
9	Chelakkara	NW-SE	172.05, 5.605	11.68	23-81/1080	1080 2870	103 7.14*10 <sup>-3</sup>	220	13
10	Pazhayannur	NNW-SSE	69.49	NA	56.4/260, 57.9/500, 60.9/900	12.50 720	39.6 1.18*10 <sup>-2</sup>	520	30