

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, इडुक्की जिल्ला, केरल राज्य  
GROUND WATER INFORMATION BOOKLET OF IDUKKI DISTRICT, KERALA STATE



तिरुवनंतपुरम

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GOVERNMENT OF INDIA  
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OF  
IDUKKI DISTRICT, KERALA**

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

**TABLE OF CONTENTS**

**DISTRICT AT A GLANCE**

1.0 INTRODUCTION .....	1
2.0 RAINFALL & CLIMATE .....	3
3.0 GEOMORPHOLOGY AND SOIL TYPES .....	5
4.0 GROUND WATER SCENARIO .....	6
6.0 GROUND WATER RELATED ISSUES AND PROBLEMS .....	11
7.0 AWARENESS AND TRAINING ACTIVITY .....	12
8.0 AREA NOTIFIED BY CGWA/SGWA.....	12
9.0 RECOMMENDATIONS .....	12

**LIST OF TABLES**

Table: 1 Incidence of Annual Rainfall in Idukki district, Kerala (2006-2011) .....	3
Table. 2 Dynamic Ground Water Resources of Idukki District, Kerala (As in March 2009) .....	8

**LIST OF FIGURES**

Figure 1: Index map of Idukki District, Kerala.....	13
Figure 2: Depth to Decadal Average Water Level (Premonsoon April 2002-11) .....	14
Figure 3: Depth to Decadal Average Water Level (Postmonsoon (Nov-2002-2011).....	15
Figure 4 : Hydrogeology of Idukki District, Kerala State.....	16
Figure 5: Categorisation of Blocks in Idukki District.....	17
Figure 6: Artificial Recharge Structures proposed in Idukki District .....	18

**LIST OF ANNEXURES**

Annexure – I Salient Details of Exploratory Bore Wells Constructed by CGWB in Idukki District .....	19
Annexure – 2: Hydrochemical Data of Select Dug Wells in Idukki District, Kerala .....	20
Annexure – 3: Hydrochemical Data of Select Bore Wells in Idukki District, Kerala .....	21

## IDUKKI DISTRICT AT A GLANCE

Sl No.	ITEMS	STATISTICS
<b>1.</b>	<b>GENERAL INFORMATION</b>	
	i) Geographical area (Sq km)	4476
	ii) Administrative Divisions (As on 31-03-2010) Number of Tehsil / Block Number of Municipalities Number of Panchayats / Villages	4/8 1 51/64
	iii) Population (2011 Census)	1107453
	iv) Average annual rainfall (mm)	3677
<b>2.</b>	<b>GEOMORPHOLOGY</b>	
	Major physiographic units	Midland region, Plateau, High Ranges
	Major Drainages	Periyar river, Muvattupuzha river, Amaravathi river
<b>3.</b>	<b>LAND USE (Sq km) as in 2009</b>	
	a) Forest area	2609.07
	b) Net area sown	2330.91
<b>4.</b>	<b>MAJOR SOIL TYPES</b>	Forest loam Lateritic soil Brown hydromorphic soil Alluvial soil
<b>5.</b>	<b>AREA UNDER PRINCIPAL CROPS (Ha.) as in 2009</b>	Paddy – 3166 Sugarcane – 1790 Cardamom – 32856 Coconut – 24274 Arecanut – 4054 Tea – 23702 Coffee – 9389 Rubber – 38451 Tapioca – 5823 Pepper - 82316
<b>6.</b>	<b>AREA IRRIGATED BY DIFFERENT SOURCES (Ha.) as in 2009</b>	
	Wells (Dug wells / Bore wells)	2355
	Tanks / Ponds	5490
	Canals	3115
	Other Sources	5064
	Net Irrigated area	16059
<b>7.</b>	<b>NUMBER OF GROUNDWATER MONITORING WELLS OF CGWB (AS ON 31-3-2011)</b> No. of Dug wells No. of Piezometers	33 7
<b>8</b>	<b>PREDOMINANT GEOLOGICAL FORMATIONS</b>	Charnockite, Hornblende biotite gneiss, granite gneiss

9.	<b>HYDROGEOLOGY</b> Major Water bearing formations  Depth to water level (Average: 2002 – 11) Depth to water level (Pre-monsoon) (April 2011) Depth to water level (Post-monsoon, November 2011) Long term water level trend (2002-2011) ( m/yr) Declining trend Rising trend	Weathered and fractured gneisses, Charnockite and laterite 0.5 to 8.41 m bgl 1.20 to 9.08 mbgl 0.59 to 7.48 mbgl  0.005 to 1.06 0.0003 to 0.79
10.	<b>GROUND WATER EXPLORATION BY CGWB (As on 31-03-2011)</b>  No. of wells drilled (EW, OW, PZ, SH, Total) Depth Range (m) Discharge (litres per second) Storativity(S) Transmissivity (m <sup>2</sup> /day)	  EW -20, OW – 5, PZ - 9 34.50 to 232.20 Negligible to 14.0 - 1.0 to 503
11.	<b>GROUND WATER QUALITY</b>  Presence of chemical constituents more than permissible limits (e.g. EC, F, As, Fe,NO <sub>3</sub> )	Potable in general NO <sub>3</sub> more than 100 ppm at Kattappana.
12.	<b>DYNAMIC GROUNDWATER RESOURCES (as in March 2009)</b>  Annual Replenishable Ground Water Resources (MCM) Net Annual Groundwater Draft (MCM) Projected Demand for Domestic and Industrial Uses up to 2025 (MCM) Stage of Ground Water Development (%)	  196.55 82.98 59.85 42.22
13.	<b>AWARENESS AND TRAINING ACTIVITIES</b> <b>Mass Awareness Programme</b> Date Place No. of Participants	  25/02/2011 & 25.02.2011 Kattapana 150 each.
	<b>Water Management Training Programme</b> Date Place No. of Participants	  23.02.2004 Thodupuzha 32 people
14.	<b>EFFORTS OF ARTIFICIAL RECHARGE &amp; RAINWATER HARVESTING</b>  Projects completed by CGWB ( No & Amount spent) Projects under technical guidance of CGWB (Numbers)	  Nil Nil
15.	<b>GROUND WATER CONTROL AND REGULATION</b>  Number of Over Exploited blocks Number of Critical blocks Number of blocks notified	  Nil Nil Nil
16.	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>	Drying up of dug wells in summer in hilly areas

## GROUND WATER INFORMATION BOOKLET OF IDUKKI DISTRICT, KERALA STATE

### 1.0 INTRODUCTION

Idukki district was formed on 26<sup>th</sup> January 1972 by carving out Devikulam, Peerumade and Udumbanchola taluks from Kottayam district and Thodupuzha taluk from Ernakulam district. The geographical area of the district is 4476 sq km. It lies between North latitudes 09<sup>o</sup> 16' 30" and 10<sup>o</sup> 21'00" and East longitudes 76<sup>o</sup> 38' 00" and 77<sup>o</sup> 24'30". Idukki district is located in the south central part of Kerala and forms part of the eastern border of the State with Tamil Nadu. It is bounded by Ernakulam district in the northwest and west, Kottayam district in the west and Pathanamthitta district in the south as. The northern and eastern parts of the district are bordered by the State of Tamil Nadu. The name 'Idukki' is derived from the Malayalam word "*Idukku*" indicating narrow gorge. The district famous for the largest hydro-electric project in the State, constructed across the river *Periyar*. Though Idukki is the major power source of the State, the district is industrially backward due to lack of transportation facilities. No railway line passes through the district. About 50% of the district is covered by the forests. *Anamudi*, the highest peak in India south of Himalayas, is in the Kuttampuzha Panchayat of Adimali Block, in the Kannan Devan Hills Village of Devikulam taluk. Thirteen other peaks in the district exceed a height of 2,000 m (6,600 ft). Agriculture is the main occupation of the people.

### 1.1 Administration

Idukki district has two revenue divisions with headquarters at Idukki and Devikulam. There are four taluks in the district, viz: Devikulam, Udumbanchola, Peerumade and Thodupuzha. These have further been subdivided into 8 Community Development Blocks, 51 Grama Panchayats and 64 revenue villages for administrative convenience. The community development blocks are Thodupuzha, Elamdesam, Adimali, Devikulam, Nedumkandam, Kattappana and Azhutha (**Figure.1**). The district Collectorate is at Painavu, located at 'Kuyilimala', a hill station surrounded by reserve forests. Thodupuzha is the only Municipal town in the district.

## 1.2 Drainage & Irrigation

Two west flowing and one east flowing rivers drain the district. Almost 80% of the district is drained by *Periyar* River, which is the largest river in Kerala which originates at the southeastern border of the district. The important tributaries of *Periyar* River in the district are *Mulla Ar*, *Panni Ar*, *Puyankutti Ar*, *Perinjankutti Ar* and *Muthirapuzha Ar*. The *Periyar* River and its tributaries exhibit good structural control and are aligned along major fracture zones. Two major tributaries of *Muvattupuzha* River viz. *Kaliyar Ar* and *Thodupuzha Ar* originate from the Thodupuzha and Nagarampara reserve forests in the district. The northeastern part of the district is drained by the tributaries of *Amaravathi* River namely *Pambar* River and *Ten Ar* which are east flowing. A small area in the southern part of the district is drained by *Azhutha* River which is the tributary of *Pamba* River.

More than 50% of the area is under forest cover. The net area sown constitutes about 45% of the total area. More than 80% of the cropped area is under perennial crops. Cardamom, Tea, Rubber and Coffee account for more than 50% of the total cropped area and pepper occupies about 25% area. Paddy cultivation is comparatively less, confined to around 3000 Hectares in the valley ar. There are no major irrigation projects in the district. Major crops are rain fed. About 16059 hectares of land is under irrigation by different sources.

An index map of the district is given in **Figure 1**.

## 1.3 Works carried out by CGWB

The Geological Survey of India carried out geological mapping of parts of the district from 1965 onwards. Detailed geological mapping was done by the Engineering Division of the Geological Survey of India in connection with the construction of Idukki arch dam. Systematic hydrogeological surveys covering the tribal hamlets of Devikulam Taluk was done during 1980-81. Reappraisal hydrogeological survey was done in Periyar basin of the district in the year 1987-88. Reappraisal survey was carried out in Thodupuzha taluk of the district in 1995-96 and in the rest of the district during 1997-98 and 2003-04.

9 purpose-built observation wells (Piezometers) were constructed in the district under Hydrology Project during the year 1998 for ground water regime monitoring. Ground water exploration was carried out in the district down to a depth of 100 m in the year 2003-04 and down to a depth of 200 m through outsourcing in 2004-05.

As part of the Awareness and Training activities of CGWB, Water Management Training programmes were conducted at Thodupuzha during 2004 and 2011. A Mass Awareness Programme on Water Conservation and Protection was organized at Kattappana during 2011.

## 2.0 RAINFALL & CLIMATE

The district receives an average annual rainfall of about 3677mm, ranging from less than 1000 (Marayoor, Kanthloor, Chinnar areas and the areas north east of Anamudi) to around 5000 mm (Peerumedu, Neriyanangalam etc). The rainfall increases from east to west. Eastern part of the district lies in the rain shadow region of the Western Ghats. The major rainfall contribution is from South West monsoon from June to September which contributes about 60% of the total annual rainfall. The North East monsoon from October to December contributes 24% of the annual rainfall and the balance during the period January to May. The incidence of monthly and annual rainfall in the district during 2006-2011 is shown in **Table 1**.

**Table: 1 Incidence of Annual Rainfall in Idukki district, Kerala (2006-2011)**

Month	Rainfall (mm) during					
	2006	2007	2008	2009	2010	2011
January	10.30	01.00	05.00	10.10	12.50	44.00
February	00.00	08.30	44.90	00.30	00.00	41.00
March	138.3	09.60	166.50	102.70	41.30	17.00
April	135.2	207.60	120.20	42.90	160.40	289.0
May	651.1	179.80	65.20	226.70	182.90	65.00
June	585.9	896.60	494.30	443.20	786.50	869.0
July	856.5	1234.1	718.90	983.40	777.30	681.0
August	467.2	616.60	638.40	335.80	543.60	705.0
September	504.8	696.00	426.80	533.00	306.10	383.0
October	435.0	465.70	283.50	296.10	427.90	358.0
November	230.5	92.10	62.40	236.10	305.60	178.0
December	00.00	45.80	05.10	107.20	24.50	46.00
<b>Total</b>	<b>4014.8</b>	<b>4453.2</b>	<b>3031.20</b>	<b>3317.50</b>	<b>3568.60</b>	<b>3676.0</b>



Though the district have not experienced severe or most severe droughts in the last decade, the deficient summer showers and the northeast monsoon rainfall during 2006 to 2010 had affected the crops and drinking water availability, in the rain shadow region of the eastern part.

### **Meteorological Parameters**

The climatic conditions in the mid lands, plateau regions and hill ranges of the district have wide variations. Since all these regions do not have full-fledged climatic stations, the details at Pampadumpara station (Plateau region) maintained by Kerala Agricultural University are furnished below.

#### **i) Temperature**

The temperature is more during the months of March to May and is less during January and February. The average monthly maximum temperature ranges from 25.1 to 31.5<sup>0</sup> C and minimum temperature from 18.6 to 14.0<sup>0</sup> C.

#### **ii) Relative Humidity**

The relative humidity is more during the morning hours and is less during evening hours. During morning hours it ranges from 85.0 to 98.45% and during evening hours it ranges from 40.8 to 87.3%.

#### **iii) Evaporation**

Evaporation is more during summer months of March to May. In general it ranges from 1.11 to 5.0 mm/day. During the south west monsoon it ranges from 1.11 to 2.13 mm/day.

#### **iv) Sunshine Hours**

Sunshine ranges from 1.8 to 9.5 hrs/day. Maximum sunshine is during the month of February. The months of June to August record the minimum sunshine due to cloudy sky. Generally good sunshine hours are recorded in the months of December to May.

#### **v) Wind**

The wind speed ranges from 3.90 to 7.95 km/hour. The wind speed is high during the months of March to July and November to January.

### **3.0 GEOMORPHOLOGY AND SOIL TYPES**

A major part of the district falls in the hill ranges of Western Ghats except for Thodupuzha block and western part of Elamdesam block which fall in the mid land region of the State. The average elevation of the mid land region ranges from 40 – 60 m amsl. The mid land area is characterized by rugged topography formed by small hillocks separated by deep valleys. The general slope of the area is towards west. The hill ranges can be subdivided into foot hills, plateau region and high ranges. The foot hill region is a narrow strip of land where midland region grades into the plateau regions. The elevation of this region ranges from 80 to 500 m amsl and slope is very steep, ranging from 30 to 50% and occasionally up to 80%. The width of the foot hill ranges from 2 to 8 km. Plateau region is the most important physiographic unit of the district and is characterized by moderately sloping large land mass with a slope of less than 30 % and an elevation of less than 1500 m amsl. Major part of the district fall in this region. The region is incised by a number of deep cut streams. The area in the north eastern part of the district is characterized by high mountains with elevation more than 1500 m amsl. The highest peak in South India, Anamudi (2693 m amsl) is in the north central part of the district. There are several steep falls within the region.

There are four major soil types encountered in the district. They are forest loams, lateritic soils, brown hydromorphic soils and alluvial soils. About 60 % of the district is covered under forest loams which are the product of weathering of the rock under forest cover. They are characterized by a surface layer very rich in organic matter. They are generally acidic, high in nitrogen and poor in bases, due to heavy leaching. They are dark reddish brown to black with loamy to silty loam texture. In denuded areas leaching and deposition of humus in the lower layer is common. The lateritic soils are derived from laterites and are encountered mainly in Elamdesam and Thodupuzha blocks of the district. They are well-drained and are low in plant nutrients and organic matter. The fertility of the soil is generally poor with low available nitrogen and phosphorous. Brown hydromorphic soils are confined to valley portions in undulating terrain. These soils are formed as a result of transportation and sedimentation of materials from adjoining hill slopes and are brownish black in colour. The surface texture varies from sandy loam to clay. Alluvial soils are seen as narrow strips along the banks of rivers in the district. They are more common along the banks of Thodupuzha River. The surface texture of these soils range from sandy loam to clay and they are fertile.

## **4.0 GROUND WATER SCENARIO**

Idukki district is underlain entirely by rocks of Archaean age. The main rock types encountered are charnockite, hornblende biotite gneiss and granite gneiss. Ground water occurs under water table condition in laterites and weathered mantle of crystalline rocks and under semi confined to confined conditions in the deeper fractured crystallines. Weathered and fractured crystallines form aquifers in the entire district. Laterites occur in the gentle slopes and valleys in Thodupuzha and western parts of Elamdesam blocks and as patches in Adimali, Nedumkandam and Kattapana blocks. They also form aquifers of low to moderate potentials in parts of the district. Alluvium, found in isolated discontinuous patches in the valleys and river banks do not constitute important aquifers in the district.

### **4.1 Hydrogeology**

The important hydrogeological units encountered in the district are laterites, weathered crystallines and fractured crystallines.

Laterites constitute aquifers in the mid land regions of the district, mostly in Panchayats of Kumaramangalam, Muttom, Edavetty, Mannarkkad, Kodikulam, Karimannoor etc. In the plateau region, laterites are seen in the Panchayats of Adimali, Rajakkad, Nedumkandam, Kattappana, Chakkupallam, Vandanmedu etc. Laterites are generally underlain by lithomargic clay, the thickness of which varies from about 0.5 to 4.0 meters. The depth to water level in the pre monsoon period is in the range of 1.4 to 9.5 m bgl. The depth to water level is shallower in valley portions and gentle slopes and deeper along the ridges. The water table fluctuation ranges from 0.5 to 4 m.

The weathered crystalline rock forms important aquifers throughout the district. The thickness of weathering ranges from less than 2.0 to around 20 meters. In the steep slopes and high ranges, where the weathered mantle is very thin or absent perennial phreatic aquifers are virtually non-existent. The thickness of weathered zone is more in weathered granitic terrains especially in parts of Devikulam, Adimali and Nedumkandam blocks. The depth to water level in the weathered crystalline rocks ranges from 1.4 to 9.5 m bgl in pre-monsoon period and 0.6 to 7.4 m bgl in post monsoon period. The water level is shallow in the valley areas. The fluctuation in water table ranges from 0.5 to 3.8 m.

The deeper fractured crystalline aquifers are under semi confined to confined conditions. They are tapped through bore wells for domestic, agriculture as well as for water supply. Exploratory bore wells have been constructed by CGWB at 20 locations in the district. The salient details of the bore wells are shown in **Annexure – 1**. Potential fractures are encountered to depth varying from 10 to 120 m bgl, but generally they are encountered within 75 m depth. The depth to water level ranges from 4 to 40 m bgl in pre monsoon period and from 2 to 33 m bgl in post monsoon period. The depth to water level in the Ground Water Monitoring Wells of CGWB during pre and post monsoon periods are shown in **Figure 2 & Figure 3** respectively and a generalized hydrogeological map of Idukki district is shown in **Figure 4**.

Long term trend of pre and post monsoon water level of ground water monitoring wells between 2002 and 2011 have been analyzed. In the pre monsoon period, about 50% of the well shows rising trend in water level in the range of 0.004 to 0.61 m/year. In the eastern part of the district especially in the blocks of Kattapana and Nedumkandam there is a falling trend in water level in the range of 0.0047 to 0.03 m/year. Many of the piezometers in the high range area also show falling trend in water level. In the post monsoon period, about 70 % of the wells show falling trend in water level in the range of 0.01 to 0.12 m/year. Maximum falling trend was observed in the eastern part of the district. Majority of wells in the western part of the district show rising trends in the range of 0.004 to 0.20m/year.

#### **4.2 Ground water Resources**

The assessment of dynamic ground water resources of the district was done block wise as per GEC 1997 methodology based on the data as in March 2009. Block wise ground water resources and categorization of ground water development of the blocks as on 31<sup>st</sup> March 2009 is furnished below in **Table 2** respectively and a map showing categorization of blocks is shown in **Figure 5**.

**Table. 2: Dynamic Ground Water Resources of Idukki District, Kerala (As in March 2009)**

Block	Net annual GW Availability	Existing Gross GW Draft for irrigation	Existing Gross GW Draft for domestic and industrial supply	Existing Gross GW Draft for all uses	Allocation for domestic and industrial requirement supply up to 2025	Net GW availability for future irrigation development	Stage of GW development %	Categorization
Adimali	4247.19	566.38	583.29	1149.68	643.89	3036.92	27.07	Safe
Devikulam	2463.18	160.02	625.43	785.46	691.61	1611.55	31.89	Safe
Thodupuzha	1817.53	422.90	568.22	991.12	626.81	767.82	54.53	Safe
Elamdesam	1713.02	371.50	626.37	997.88	691.61	649.90	58.25	Safe
Idukki	2293.11	242.75	650.73	893.48	719.35	1331.01	38.96	Safe
Nedumkandam	1502.51	357.49	695.79	1053.28	768.28	376.75	70.10	Semi critical
Kattappana	1878.21	584.08	908.29	1492.37	1003.17	290.97	79.46	Semi critical
Azutha	3739.87	168.60	766.09	934.68	840.61	2730.66	24.99	Safe
<b>Total (ha m)</b>	<b>19654.62</b>	<b>2873.72</b>	<b>5424.21</b>	<b>8297.93</b>	<b>5985.33</b>	<b>10795.57</b>	<b>42.22</b>	
<b>Total(MCM)</b>	<b>196.55</b>	<b>28.74</b>	<b>54.24</b>	<b>82.98</b>	<b>59.85</b>	<b>107.96</b>	<b>42.22</b>	

As per the categorization of blocks based on 2004 computations, Kattappana block was 'Critical', Devikulam and Nedumkandam blocks were 'Semi Critical' and the remaining five blocks were 'Safe' category, whereas as per the 2009 computations Nedumkandam and Kattappana blocks have been categorized as 'Semi Critical' and the remaining six blocks as 'Safe'.

### 4.3 Ground Water Quality

The chemical quality of ground water is generally good in both phreatic as well as deeper fractured aquifers. Majority of dug well samples from ground water observation wells have EC less than 400 $\mu$ s/cm at 25<sup>0</sup>C. Fluoride concentration is within the permissible limit in all the water samples, the highest value being 0.65 ppm. Nitrate is within permissible limits in all samples except on from Kattappana (> 100 ppm).

The water samples collected from the bore wells are potable in general. All the water samples have EC less than 750 $\mu$ s/cm at 25<sup>0</sup>C. Fluoride is also within the permissible limit in all the wells, in the range of 0.1 to 0.98 ppm.

Hydrochemical data pertaining samples from 28 dug wells and 20 bore wells in the district are presented in **Annexures 2 & 3** respectively.

#### **4.4 Status of Ground water development**

The shallow phreatic aquifers in the laterites are developed through dug wells. The depth of dug wells ranges from 2.3 to 10.0 m bgl. And their diameter ranges from 1.75 to 3.50 m. The yield of dug wells ranges from 3 to 25 m<sup>3</sup>/day in winter, which reduces to 1 to 10 m<sup>3</sup>/day in summer. Most of the dug wells located in the topographic highs and ridges dry up in summer.

In the weathered crystallines, the yields of dug wells range from 2 to 30 m<sup>3</sup>/ day in winter period and from 1 to 10 m<sup>3</sup>/ day in summer period. Many of the wells on slopes and topographic highs dry up in summer. The depths of dug wells range from 2.0 to 20.7 m bgl with diameters of 1.5 to 4.5 m. In the valleys and gentle slopes generally large diameter dug wells are constructed for storage of water.

In the fractured crystallines, bore wells constructed to the depths ranging from 24 to more than 200 m bgl. CGWB has drilled bore wells down to 200 m under its ground water exploration programme. The bore wells are comparatively shallower in the mid land areas (Thodupuzha and Elamdesam blocks), with nearly 60 % of the bore wells within the depth of 70 m or less. The bore wells are comparatively deeper in other blocks in the plateau and high range areas. In the blocks of Nedumkandam and Kattappana, more than 70% of the bore wells are more than 70 m deep. The thickness of overburden varies from less than a meter to more than 20m. In Thodupuzha, Elamdesam and Azhutha blocks, the thickness of overburden is generally less with more than 60% of the bore wells having overburden thickness less than 10 m. Thickness of overburden is more than 10 m in 74% of the bore wells in the blocks of Adimali and Nedumkandam and more than 60% of bore wells of Kattappana and Devikulam.

The yield of bore wells drilled by CGWB in the district ranges from less than 1 to about 13 lps. About 50% of the bore wells have yields in the range of 0.3 to 1.5 lps. Only 10% bore wells in the district have yields in excess of 3 lps.

In the recent years, due to fall in water level, the dug wells have been deepened in many parts of the district and bore wells drilled in dug wells to increase the yield of the wells.

The most common devices for lifting water are centrifugal pumps and jet pumps for dug wells and submersible pumps and compressors for bore wells. Water is also being lifted by bucket and rope from dug wells for domestic purposes. Water is also collected from the shallow wells located on slopes and ridges through hose pipes by gravity.

The drinking water needs of the populace in the district are being catered to by Kerala Water Authority and Grama Panchayats through supply of protected water. The major source of water supply in the district is surface water followed by dug wells, springs and bore wells. Water supply scheme with bore wells is less than 10% of the rural water supply schemes.

## **5.0 GROUND WATER MANAGEMENT STRATEGY**

Ground water in the district is mostly developed through dug wells and bore wells for domestic and irrigation purposes. Most of the households have their own wells to meet the domestic requirements and population in the hill ranges depends mainly on springs. Recently in most of the areas ground water is developed through bore wells for domestic and irrigation purposes.

In view of the characteristic geomorphic and geological settings of the area and the limited availability of ground water resource, ground water development in the district needs to be coupled with suitable interventions to ensure its sustainability. This will mainly involve integrated use of surface and ground water resources and rainwater harvesting wherever feasible. The existing water sources such as dug wells, ponds and tanks should be cleaned and protected. Artificial recharge schemes should be implemented in feasible areas. The springs seen in many parts of the district can be developed to cater to the needs of the local populace.

### **5.1 Ground Water Development**

Since six out of eight blocks in the district is under safe category and the stage of ground water development of the district is 48.16% there is a fair scope for further ground water development. Ground water development is feasible by digging dug wells, dug-cum bore wells and drilling deep bore wells. In the lateritic terrain dug wells are feasible in the valleys and gentle slopes with the depth range of 3 to 9 m bgl with diameter of 2.0 to 3.5 m. In the weathered crystalline formations dug wells are feasible with the depth range of 3.0 to 20.0 m bgl and diameter of 2.0 to 4.0 meters. Bore wells are feasible in the crystalline formations in favorable locations with depth range of 50 to 100 m bgl. Generally the potential fractures are encountered within 100 m depth. For proper site selection farmers may make use of the technical know-how of the CGWB, GWD

etc. There should be a mode for disseminating the technical knowledge through Panchayats. Farmers may also take support of State Ground Water Department and reliable NGOs for geophysical surveys for locating sites for bore wells.

## **5.2 Water conservation and Artificial recharge**

In view of the low stage of ground water development in the district, CGWB has not implemented any artificial recharge schemes in the district. However, it has provided technical guidance to Panchayat authorities and NGOs for implementing artificial recharge schemes and rain water harvesting in the district. Due to the peculiar geographic and hydrogeologic settings of the district, the scope for artificial recharge in the district is rather limited. Further, artificial recharge in highly weathered sloping areas may, in rare occasions, increase chances of landslides, especially in the granitic terrains of Devikulam, Adimali and Nedumkandam blocks. Artificial recharge schemes can be implemented along with the rain water harvesting in the plain areas of the plateau regions of the district especially in the areas Valara to Kallarkutty, Pooppara to Rajakkad, Nedunkandam to Ramakkalmedu, Vanadanmedu, Puttadi Anakkara, Chakkupallam, Kumily etc. Subsurface dyke, gully plugging and bore well recharge with recharge pits are feasible in the mid land areas (Thodupuzha and Elamdesam blocks). Contour bunding is feasible in the Panchayats of Kanthalloor and Vatavada. Percolation tanks and desiltation of ponds are feasible in the weathered plain areas of Kumily, Chakkapallam, Vandanmedu and Karunapuram Panchayats and in the mid land areas. Rain water collection in Ferro cement tanks, storage tanks and in polythene sheets are already being practiced in the eastern part of the district. Considerable quantity of rain water can be collected in the numerous abandoned rock quarries in the district. The artificial recharge schemes recommended in different blocks of the district are presented in **Figure 6**.

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

Scarcity of water is quite frequent in the hilly areas of the district during summers due to the drying up of dug wells and springs. The northeastern part of the district is a rain shadow area, where water scarcity conditions occur frequently. There is a long-term decline in water level in the eastern part of the district especially in the blocks of Kattappana and Nedumkandam.



## **7.0 AWARENESS AND TRAINING ACTIVITY**

Two Water Management Training Programmes (at Thodupuzha) and one Mass Awareness programme (Kattapana) have been conducted in the district by CGWB. About 200 participants attended the Mass awareness programme. Various aspects related to ground water management were dealt with in the training programmes.

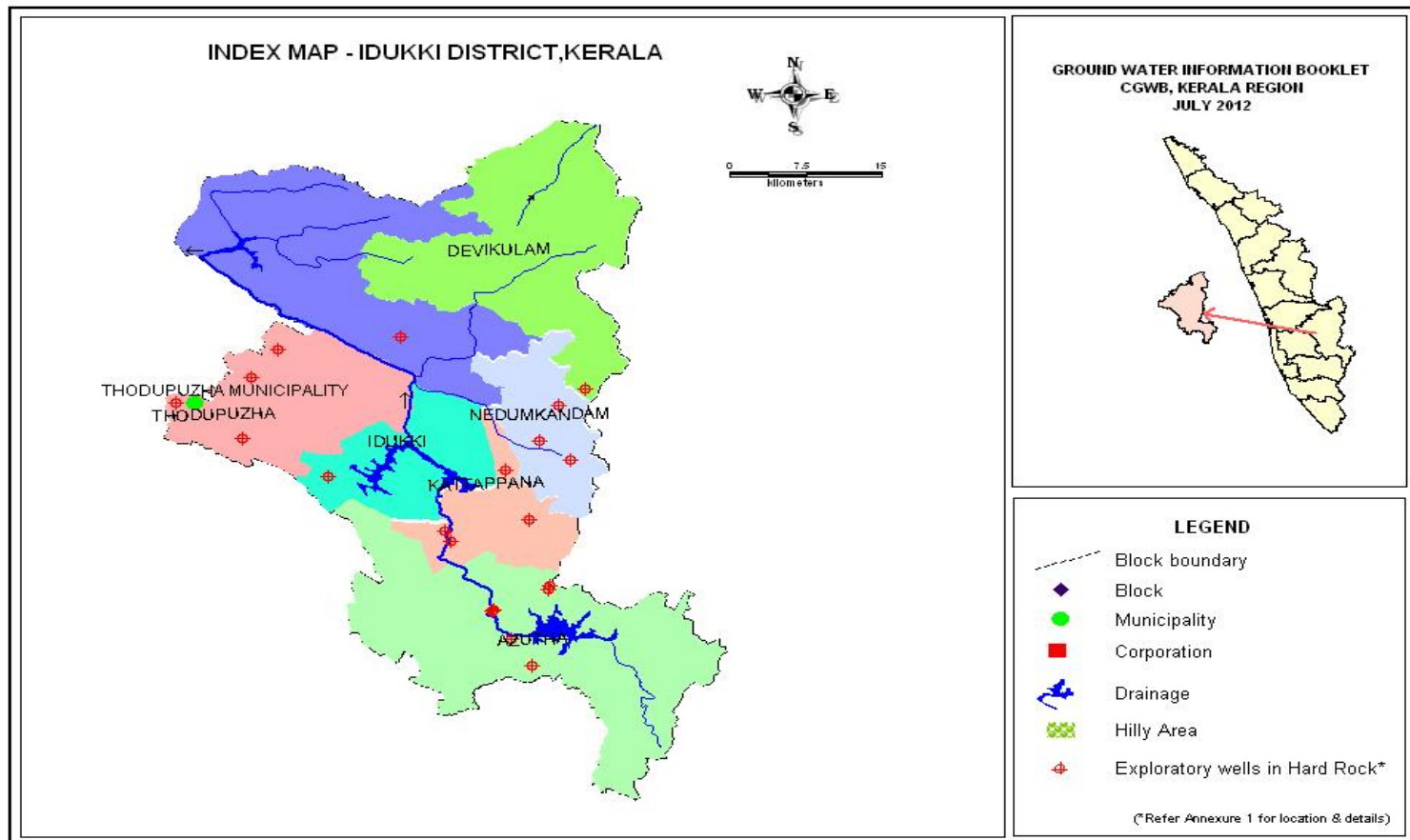
## **8.0 AREA NOTIFIED BY CGWA/SGWA**

No area/block is notified in the district by the State Ground Water Authority.

## **9.0 RECOMMENDATIONS**

- The stage of ground water development in the district as in 2009 was 48.16%, leaving scope for future development of ground water. Of the eight blocks, six blocks have been categorized as 'Safe' and two blocks as "Semi-Critical".
- Ground water development is comparatively high in the eastern part of the district, viz. Kattappana and Nedumkandam blocks as well as in the rain shadow region of Marayoor and Kanthloor Panchayats. In view of the limited resources available, ground water development from these areas should be coupled with measures for conserving and augmenting the resource.
- The data collected during the exploratory drilling program has indicated the presence of productive fractures mostly within 100 m. depth. Drilling of bore wells beyond this depth may not be economical.
- In view of the long-term sustainability of ground water, integrated use of surface and ground water resources should be practiced wherever feasible. Government should encourage comprehensive development of watersheds to augment & protect water and other natural resources.
- There is considerable scope for development of springs in the hilly areas of the district, which can cater to the requirements of isolated habitations including tribal habitations in such areas.
- Artificial recharge/ rainwater harvesting needs to be implemented wherever feasible to augment ground water resources in the district.

Figure 1: Index map of Idukki District, Kerala



**Figure 2: Depth to Decadal Average Water Level (Pre-monsoon April 2002-11)**

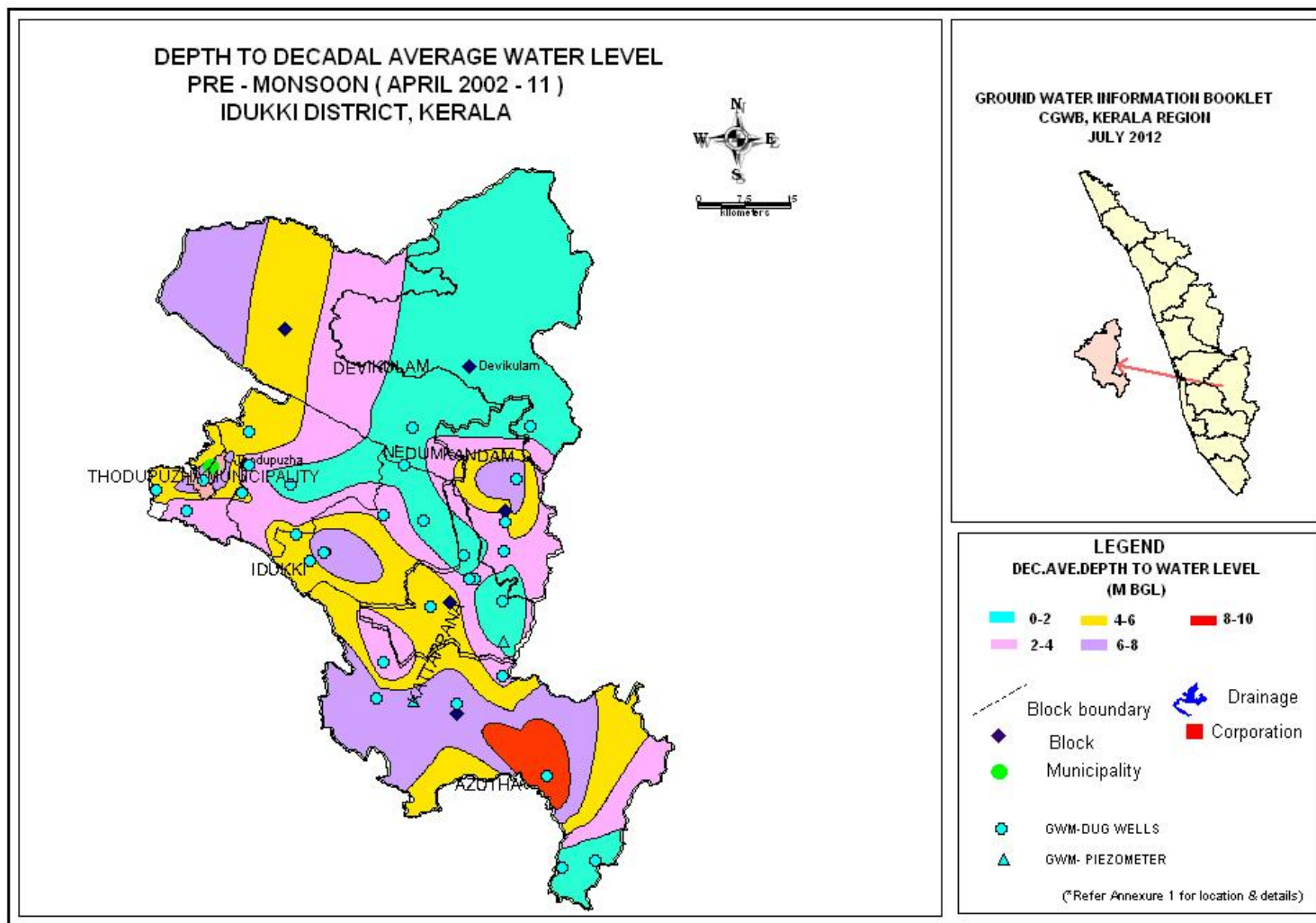


Figure 3: Depth to Decadal Average Water Level (Post-monsoon (Nov-2002-2011))

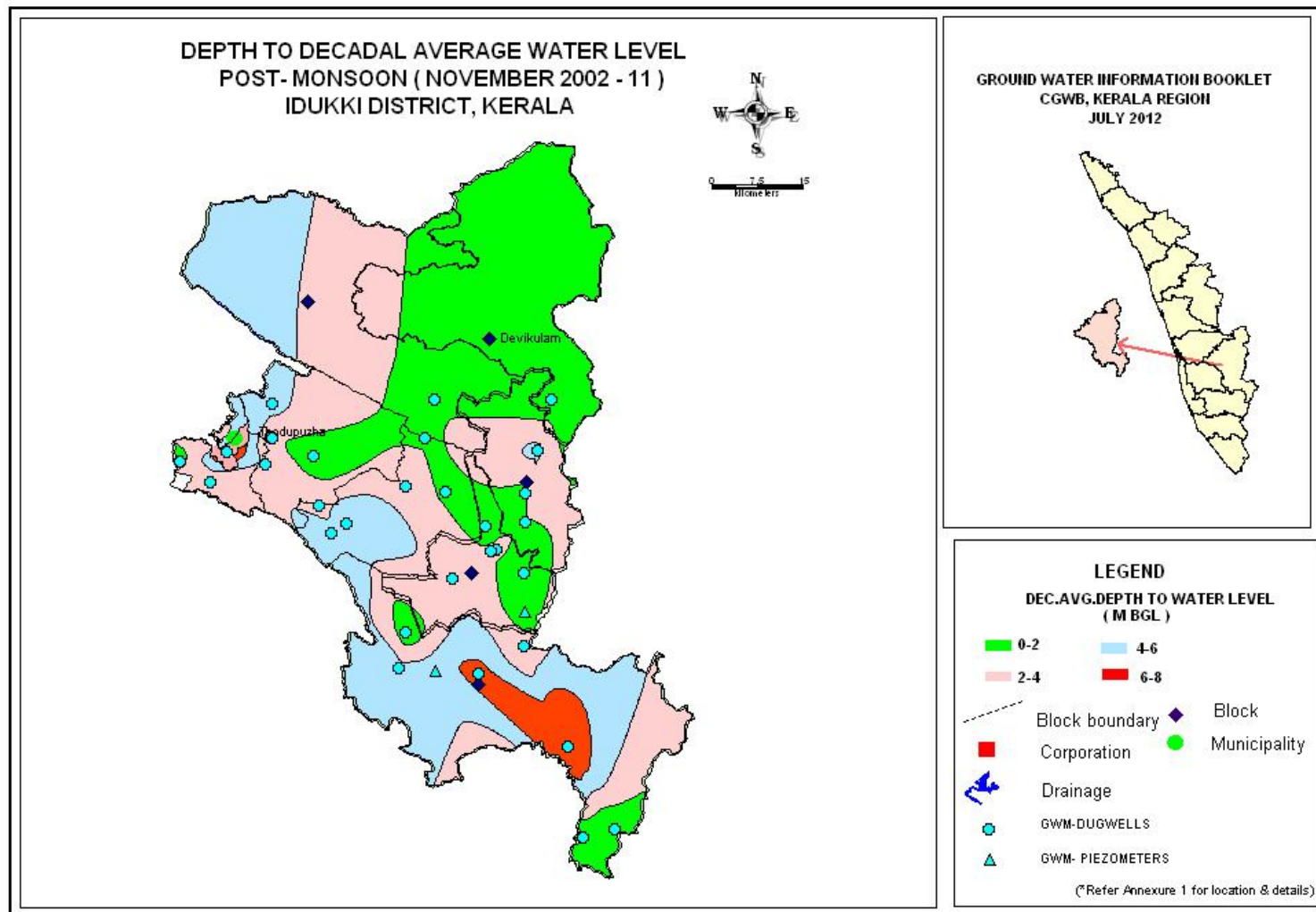


Figure 4 : Hydrogeology of Idukki District, Kerala State

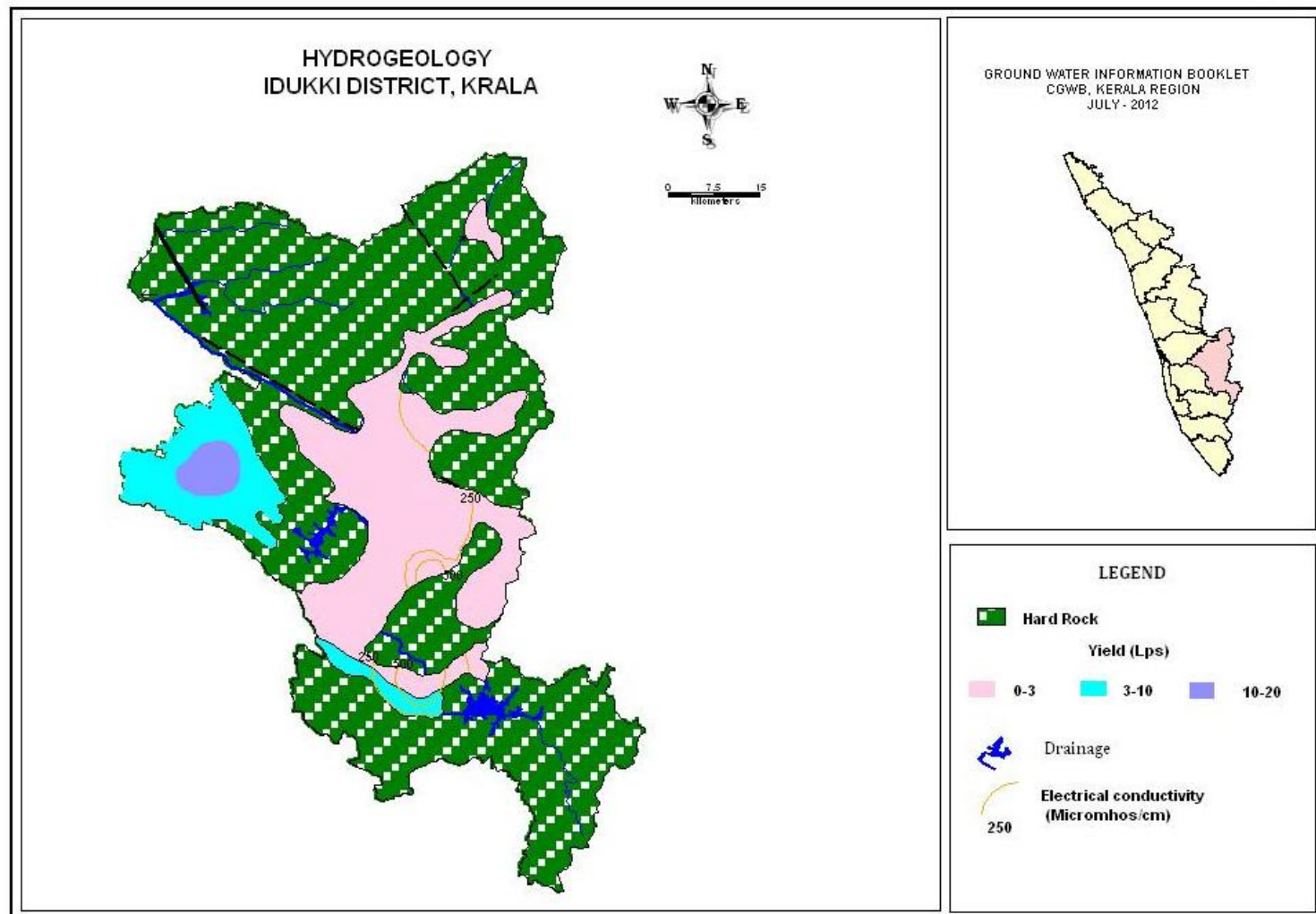


Figure 5: Categorisation of Blocks in Idukki District

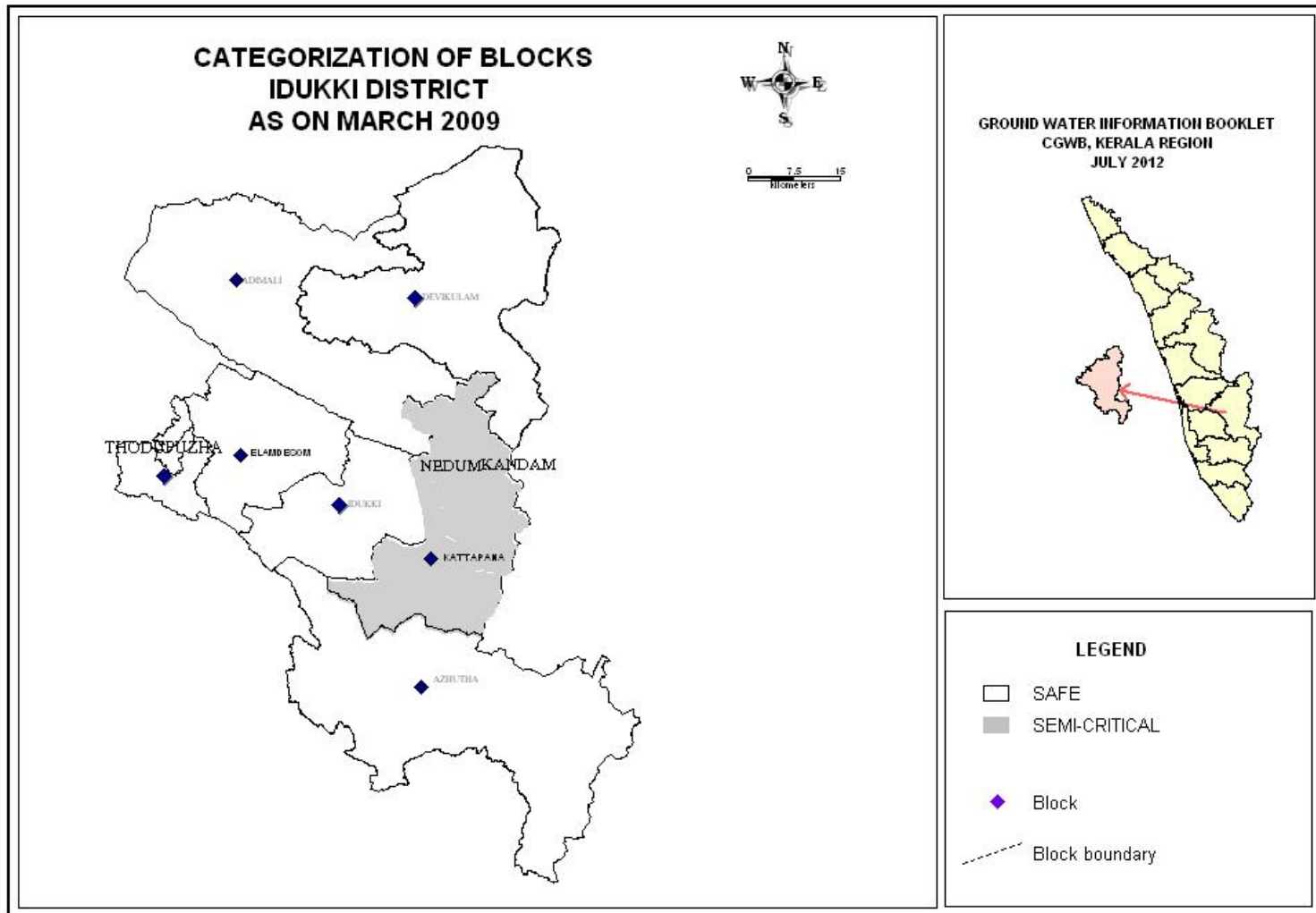
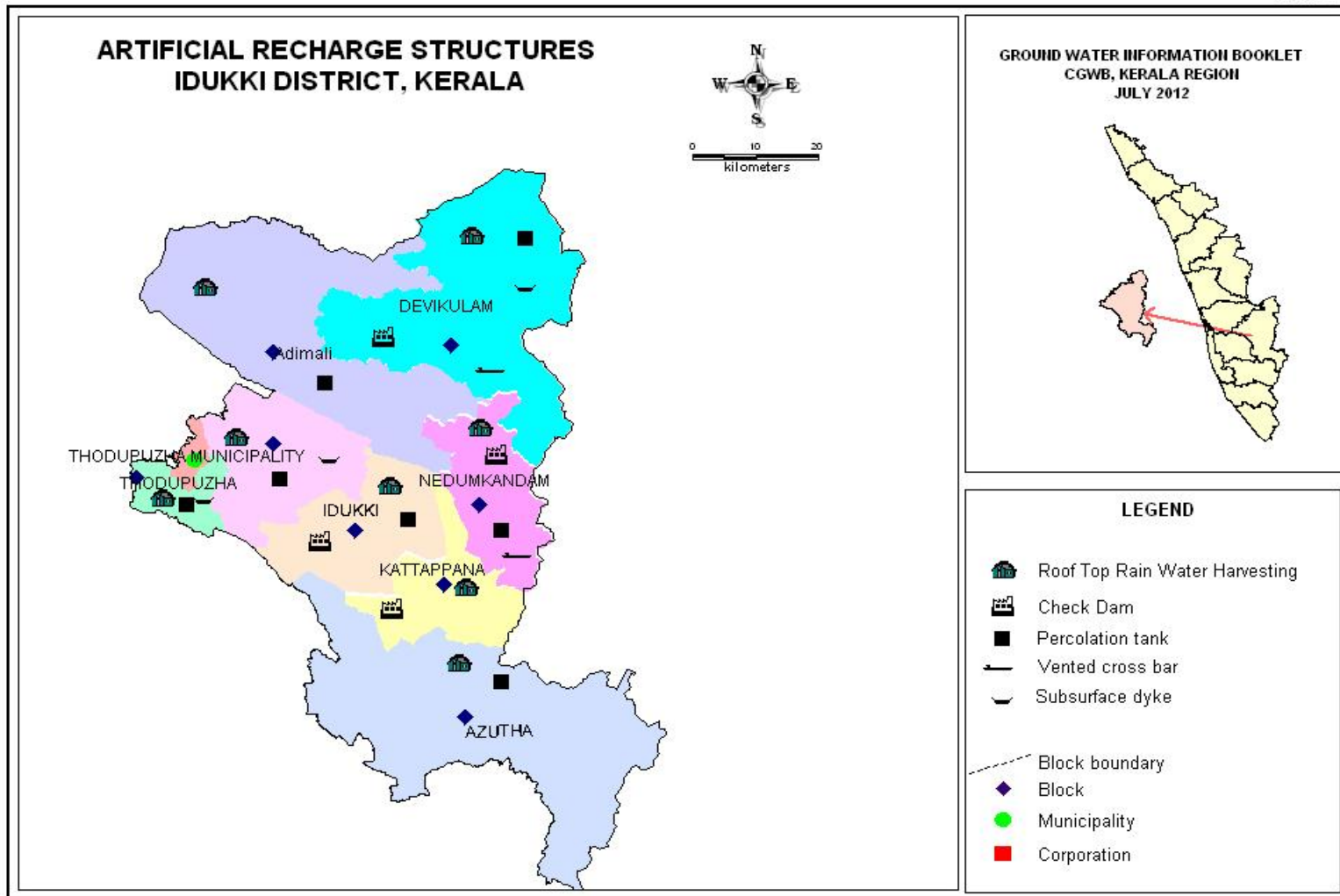


Figure 6: Artificial Recharge Structures proposed in Idukki District



**Annexure – I Salient Details of Exploratory Bore Wells Constructed by CGWB in Idukki District**

Sl. NO	Location	Year of construction	Depth drilled (m)	Depth of casing (m.bgl)	Fracture zones, mbgl	Discharge (lpm) during drilling	SWL, mbgl	Rock type
1	Muttam	2003-04	37.10	6.20	16.7-17.7, 23.9-24.9, 32.33-35.37	840	2.4	Hornblende Biotite Gneiss
2	Padikodikulam	2003-04	110.50	1.45	45.5-46.5	72	6.5	Hornblende Biotite Gneiss
3	Arikuzha	2003-04	110.35	10.30	17.0-18.0, 22.0-23.0	180	4.5	Hornblende Biotite Gneiss
4	Vandanmedu	2003-04	119.60	27.00	55.5-56.0, 96.0-97.0	12	31.5	Hornblende Biotite Gneiss
5	Kumili	2003-04	119.50	14.20	100.0-101.0	15	27.9	Hornblende Biotite Gneiss
6	Vallakadavu	2003-04	119.60	13.55	24.0-25.0, 64.0-65.0	30	7	Hornblende Biotite Gneiss
7	Pachakanam	2003-04	119.60	13.50	55.0-56.0	6	12.5	Hornblende Biotite Gneiss
8	Vandiperiyar	2003-04	119.50	4.70	7.65-8.65, 55.45-56.45, 67.65-68.65	6	5.03	Charnockite & Hornblende Biotite Gneiss
9	Upputhara	2003-04	72.00	6.00		180	4.3	Hornblende Biotite Gneiss
10	Thankamani	2003-04	34.50	10.60	12.0-13.0, 16.0-17.0, 19.0-20.0, 34.0-34.5	420	2.7	Hornblende Biotite Gneiss
11	Adimali	2004-05	108.80	17.00	15.5 - 20.5, 28.00 -31.00 98.50 - 108.80	720	0.11	Granite gneiss
12	Udumbanchola	2004-05	202.00	5.50	60.00 - 64.00 105.00 - 110.00 142.00 - 146.00	12	55.1	Hornblende Biotite Gneiss
13	Nedunkandam	2004-05	207.25	7.10	54.00 - 62.00 150.00 - 152.00 161.00 - 165.00 176.00 - 181.00	150	23.47	Charnockite
14	Thukkupalam	2004-05	77.70	2.65	38.00 - 41.00 57.00 - 62.00 75.00 - 77.70	840	12.4	Hornblende biotite gneiss
15	Kumily	2004-05	228.00	9.00	59.00 - 62.00 123.00 - 124.00 161.00 - 166.00 207.00 - 215.00	264	3.9	Charnockite gneiss
16	Vandi periyar	2004-05	155.50	7.00	32.00 - 35.00 62.00 - 72.50 98.40 - 103.60 120.00 - 124.00	372	3.68	Charnockite
17	Aladi	2004-05	119.00	8.00	18.00 - 20.00 52.00 - 57.00 101.00 - 118.00	480	26.2	Granite Hornblende biotite gneiss
18	Erattayar	2004-05	150.30	11.50	34.00 - 36.00 65.00 - 69.00 110.00 - 118.00	300	35.2	Hornblende Biotite gneiss
19	Moolamattom	2004-05	114.00	17.50	38.40 - 41.40 48.80 - 51.80 57.00 - 68.00 85.00 - 90.00 110.00 - 114.00	720	11.58	Garnet biotite gneiss
20	Vannapuram	2004-05	233.20	17.70	38.00 - 42.00 75.00 - 78.00 124.00 - 128.00 150.00 - 154.00 20.20 - 21.00 220.00 - 228.00	60	26.7	Hornblende biotite gneiss



**Annexure – 2: Hydrochemical Data of Select Dug Wells in Idukki District, Kerala**

No	Location	pH	EC, µs/cm at 250 C	TH as CaCO <sub>3</sub>	Ca	Mg	Na	K	CO <sub>3</sub>	HCO <sub>3</sub>	SO <sub>4</sub>	Cl	F	NO <sub>3</sub>
1)	Chinikuzhi	10.19	119	22	8	0.49	8.7	1.3	-	-	3.4	16	0	1.4
2)	Churuli	9.4	138	24	9.6	0	7.3	1.6	14	20	1.5	13	0	12
3)	Elapara	9.53	156	28	10	0.49	14	5.6	7.2	2.4	6.5	20	0	9.9
4)	Idukki	8.25	80	16	4.8	0.97	7.9	1.6	0	24	0.7	7.1	0.15	3
5)	Kaliyar	8.08	186	30	10	0.97	17	6.9	0	17	4.4	27	0	13
6)	Karimkunnam	9.29	276	48	18	0.97	16	8.9	9.6	17	8.3	33	0	32
7)	Karumannor	9.69	119	26	7.2	1.9	16	1.1	-	-	2.2	17	0	3.2
8)	Kattapana	5.55	793	135	30	15	66	16	0	4.9	1.6	122	0	149
9)	Koilkadavu	-	232	44	11	3.9	-	-	-	-	-	31	0	1.9
10)	Kulamavu	7.93	163	28	5.6	3.4	16	2.4	0	9.8	0.4	21	0	24
11)	Kumili	8.65	372	82	14	11	24	2.6	24	110	3.9	65	0.64	1.5
12)	Kuttikanam	7.68	52	12	4	0.49	3.5	2.2	2.4	12	0.24	4.3	0.29	4.5
13)	Moolamattom	10.86	144	36	11	1.9	9.1	1	9.6	12	2.7	20	0.12	16
14)	Munnar	7.39	81	18	4.8	1.5	5.2	2.4	0	17	0.3	9.9	0.16	13
15)	Nedumkandam	7.85	371	90	27	5.4	24	4.5	-	-	30	47	0.28	3.5
16)	Nirmala city	8.2	67	10	4	0	7.8	2.1	0	32	2.3	9.9	0.4	0.7
17)	Peruvanthanam	7.57	55	12	4	0.49	3.6	4.2	17	22	7.7	7.1	0.2	0.43
18)	Poopara	10.72	497	94	30	4.4	44	7.4	6	6.1	11	84	0.2	83
19)	Thumbachi	-	90	28	10	0.49	-	-	--	-	-	5.7	0.61	7.6
20)	Udumbanchola	8.18	245	40	16	0	24	7.4	0	22	5.7	37	0.15	42
21)	Valara	8.14	78	16	6.4	0	2.8	0.9	0	20	0.48	8.5	0.36	6.1
22)	Vallakadavu	-	115	24	7.2	1.5	-	-	-	-	-	8.5	0.12	1.5
23)	Vazhitala	8.78	58	16	4.8	0.97	4.2	1.1	4.8	12	1.9	7.1	0.03	0.79
24)	Vellathuval	-	62	10	4	0	-	-	-	-	-	4.3	0.36	0.51
25)	Vellilamkandam	7.67	51	12	3.2	0.97	4.3	1.7	0	20	2.3	8.5	0.2	0.58
26)	Marykulam	-	74	20	6.4	0.97	-	-	-	-	-	7.1	0.35	8.3
27)	Kandiyoor	-	403	118	39	4.9	-	-	-	-	-	23	0.52	1.4
28)	Anakkara	-	93	30	12	0	-	-	-	-	-	4.3	0.31	1.00

**Annexure – 3: Hydrochemical Data of Select Bore Wells in Idukki District, Kerala**

No	Location	pH	EC, $\mu\text{s/cm}$ at 250 C	TH as $\text{CaCO}_3$	Ca	Mg	Na	K	$\text{CO}_3$	$\text{HCO}_3$	$\text{SO}_4$	Cl	F	$\text{NO}_3$
				mg / L										
1	Muttam	7.6	269	110	27	10	9.2	1.9	0	154	4.2	7.1	0.35	1
2	Padi	8.14	323	126	32	11	13	4.2	0	188	0.9	2.8	0.24	0.2
3	Arikuzha	8.6	269	118	24	14	9	2.3	4.8	149	3.3	7.1	0.1	2.4
4	Kumily	8.24	388	154	38	14	21	1.9	4.8	246	2.2	5.7	0.3	1
5	Vandanmedu	7.7	221	76	16	8.8	12	3.5	0	122	4	4.3	1.17	1.2
6	Pachakanam	8.85	576	-	-	-	-	-	-	-	-	-	-	-
7	Vallakadavu	8.04	683	75	20	6.1	114	1.3	0	189	160	11	0.54	0
8	Vandiperiyar	7.87	369	152	33	17	13	2.6	0	210	2.2	13	0.25	0.2
9	Upputhara	7.91	388	142	32	15	29	1.7	0	178	54	5.7	0.22	0.7
10	Thankamani	8.22	234	90	18	11	7.9	3.7	0.01	102	3.8	23	0.22	2.3
11	Kumily	6.8	505	89	24	6.8	72	3.5	0	233	10	39	0.31	0
12	Nedumkandam	7.5	875	12	3.2	1	147	0	0	251	90	24.8	0.98	0
13	Erattayar	7	615	182	48.8	14.5	54	3	0	154	14	78	0.39	27
14	Moolamattom	7.4	270	112	28.8	9.8	9.9	0.6	0	161	3.5	10.6	0.29	0
15	Aladi	7.5	290	112	28.0	9.8	15	0.4	0	167	1.4	14.2	0.58	0
16	Vandiperiyar	7.5	260	102	24.8	9.8	9.4	0.4	0	127	10.2	21.3	0.44	0
17	Thukkupalam	7.8	440	175	37.6	20	19.5	0.4	0	255	11	24.8	0.16	0
18	Adimali	7.8	285	127	36	9.2	7.5	0	0	153	2.2	10.6	0.53	0
19	Vannapuram	8.2	325	118	29.6	10.7	15	1.8	0	165	4.8	10.6	0.37	2.1
20	Udumbanchola	8.1	295	138	28	16.5	9.7	1.7	0	165	5.2	21.3	0.49	0