For official use

Technical Report

DISTRICT GROUNDWATER BROCHURE
RAMANATHAPURAM DISTRICT, TAMIL NADU

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Government of India

Ministry of Water Resources

Central Ground Water Board

South Eastern Coastal Region
Chennai

April 2009

DISTRICT AT A GLANCE

(RAMANATHAPURAM DISTRICT)

S.NO	ITEMS	STATISTICS	
1.	**GENERAL INFORMATION**		
	i. Geographical area (Sq. km)	**4089. 57**	
	ii. Administrative Divisions as on 31-3-2007 Number of Taluks Number of Blocks Number of Villages	 7 11 400	
	iii. Population (as on 2001 Censes) Total Population Male Female	 1187604 583376 604228	
	iv. Average Annual Rainfall (mm)	827	
2.	**GEOMORPHOLOGY**		
	i. Major physiographic Units	Vast Plain with tidal lakes giving rise to Bird Foot Delta, Flood Plain, Beach Ridge Complex comprising sand dunes, swamps and backwaters and Shallow Buried Pediments	
	ii. Major Drainages	Gundar, Vaigai & Kottakaraiyar	
3.	**LAND USE (Sq. km) during 2005-06**		
	i. Forest area ii. Net area sown iii. Cultivable waste	44.88 1855.63 42.54	
4.	**MAJOR SOIL TYPES**	Sandy Soil, Black Clayey Soil, & Red Ferruginous soil	
5.	**AREA UNDER PRINCIPAL CROPS (AS ON 2005-2006)**	Paddy Groundnut Pulses	127395 (69%) 7996 (4%) 2738 (2%)
6.	**IRIGATION BY DIFFERENT SOURCES (During 2005-06)**	**Number**	**Area irrigated (Ha)**
	i. Dug wells	7736	11070
	ii. Tube wells	310	443
	iii. Tanks	1694	57034
	iv. Canals	Nil	Nil
	vi. Net irrigated area	68547 Ha	
	vii. Gross irrigated area	68547 ha	

7.	**NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (AS ON 31.03.2007)**		
	i. No of dug wells	23	
	ii. No of piezometers	3	
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Recent Alluvium, Laterite Cuddalore Sandstones & Crystalline rock (Quartzite, Gnessic complex, Hornblende granite).	
9.	**HYDROGEOLOGY**		
	i. Major water bearing formations	Sandstone, Limestone & weathered & fractured Gnessic rocks.	
	ii. Pre- monsoon depth to water level (May 2006)	0.95 – 8.80 m bgl	
	iii. Post- monsoon depth to water level (Jan'2007)	0.76 – 8.42. m bgl	
	iv. Long term water level trend in 10 years (1998-2007) in m/yr	**Annual**	
		Rise (m/year)	**Fall (m/year)**
		Min : 0.0102 Max :0.3331	Min : 0.0133 Max :1.2420
10.	**GROUND WATER EXPLORATION BY CGWB (As on 31-03-2007)**		
	i. Number of Exploratory wells ii. Number of Observation wells iii. Number of Piezometers under Hydrology Project.	43 13 03	
	iv. Depth range(m)	26 – 777	
	v. Discharge(lps)	2.8– 75	
	vi. Storativity (S)	2.722×10^{-5} –8.0×10^{-3}	
	vii. Transmissivity (m2/day)	7 – 630	
11.	**GROUND WATER QUALITY AS ON MAY 2006**		
	i. Presence of chemical constituents more than permissible limit	TH as $CaCO_3$, NO_3 &, F	
	ii. Type of water	NaCl , Na HCO_3 , $CaHCO_3$	
12.	**DYNAMIC GROUND WATER RESOURCES (as on 31.03.2004) in MCM**		
	i. Annual Replenishable Ground Water Resources	335.41	
	ii. Total Annul Ground Water Draft for all purposes	123.65	
	iii. Projected demand for Domestic and Industrial Uses up to 2025	9.64	
	iv. Stage of Ground Water Development	36.86 %	
13.	**AWARENESS AND TRAINING ACTIVITY**		
	i. Mass Awareness Programmes Organized	Nil	
	ii. Water Management Training Organized	Nil	

14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	Technical Guidance were provided as when sought
	i. Projects completed by CGWB in IX th five year plan (RWH Structures) ii Amount spent	Rainwater Harvesting in collectorate complex, Ramanathapuram Rs 14.200 (Lakhs)
15.	**GROUND WATER CONTROL AND REGULATION**	
	i. Number of OE Blocks	**Nil**
	ii. Number of Critical Blocks	1
	iii. Number of Blocks Notified	**Nil**
16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES.**	1. The formation water is brackish to saline below 6-9 m bgl in coastal part of the district and freshwater floats over as lenses. 2. The occurrence of saline aquifers even at different depths except for the Tiruvadanai aquifer makes the area water scarce. 3. The presence of poor quality formation water makes the recharge to aquifer futile and ooranis are the best-suited structures to increase the water availability. In the area.

1.0 INTRODUCTION

1.1 Administrative Details

Ramanathapuram district is divided into 7 taluks. The taluks are further divided into 11 blocks, which further divided into 400 villages.

S.No.	Taluk	Area in Hectares	No.of Villages	Block	No.of Villages
1	Paramakudi	73794	34	Paramakudi	34
2	Rameswaram	9048	59	Bogalur	23
				Nainarkovil	36
3	Ramanathapuram	77499	69	Ramanathapuram	25
				Mandapam	19
				Tiruppullani	25
4	Tiruvadanai	81461	98	Tiruvadanai	57
				R.S.Mangalam	41
5	Mudukulathur	48085	38	Mudukulathur	38
6	Kadaladi	61223	53	Kadaladi	53
7	Kamuthi	57847	49	Kamuthi	49
	Total	**408957**	**400**		**400**

1.2 Basin and sub-basin

The district is part of the composite east flowing river basin,"Between Gundar and Vaigai" as per the Irrigation Atlas of India. Virusuliaru, Kottakkarai, and Rameswaram Island are the important Sub-basins/Watershads.

1.3 Drainage

The major part of Ramanathapuram district falls in Gundar-Vaigai river basin. Vaigai and Gundar are the important rivers and in addition, Virusuli, Kottakariyar & Uppar are the other rivers draining the district. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period.

Vaigai., which is one of the important rivers of the district, which is flow and drain in the Paramakudi, Bogalur, Tirupullani and Mandapam blocks. The Gundar river originates in Kottamalai hills in the Saptura forest and enters the district near Anankulam and flows in a south –eastern to due south direction and enters the Bay of Bengal neare Mukaiyur. The river assumes the name of " Reghunatha Cauveri " from Kamudhi.

The Kottakarai, Virusuli and Uppar are other rivers flowing in south easterly direction and entering the Bay of Bengal.

1.4 Irrigation Practices

The nine-fold lands use classification for the district is given below.(2005-06)

S.No	Classification	Area (Ha)
1	Forests	4488
2	Barren & Uncultivable Lands	4591

S.No	Classification	Area (Ha)
3	Land put to non agricultural uses	84483
4	Cultivable Waste	4245
5	Permanent Pastures & other grazing lands	154
6	Groves not included in the area sown	41210
7	Current Fallows	27784
8	Other Fallow Lands	56439
9	Net Area sown	185563
	Total	**408957**

(Source: Department of Economics & Statistics, Govt. of Tamil Nadu)

The chief irrigation sources in the area are the tanks, wells and tube/bore wells. The block wise and source wise net area irrigated in Ha is given below (2005-06).

S.No	**Block**	**Net area irrigated by**					**Total Net Area irrigated**
		Canals	**Tanks**	**Tube/ bore wells**	**Ordinary wells**	**Other Sources**	
1	Paramakudi	-	5529	170	590	0	6289
2	Bogalur	-	3134	40	194	0	3368
3	Nainarkovil	-	3676	42	743	0	4461
4	Ramanathapuram	-	4541	0	424	0	4965
5	Mandapam	-	121	0	3638	0	3759
6	Tiruppullani	-	2850	0	3278	0	6128
7	Tiruvadanai	-	8605	90	25	0	8720
8	R.S.Mangalam	-	9405	8	12	0	9425
9	Mudukulathur	-	4787	90	809	0	5686
10	Kadaladi	-	9151	3	433	0	9587
11	Kamuthi	-	5235	0	924	0	6159
	Total	**-**	**57034**	**443**	**11070**	**0**	**68547**

(Source: Department of Economics & Statistics, Govt. of Tamil Nadu)

1.5 Studies/Activities carried out by CGWB

Central Ground Water Board carried out the Systematic hydrogelogical surveys in the district during the period between 1975 - 76, 1978 – 79 and 1987 - 88 Reappraisal hydrogelogical surveys were conducted during the period of 1992 – 93.

Under the drought relief Programme (DRP) drilled the bore holes ranging in depth from 221to 490 m bgl during the period 1977-78. The board under its programme of deep exploration of Vaigai basin, drilled 3 bore holes ranging in depth from 384.45 to 777.00 during 1981-82. As a part of Technology mission programme for drinking water purpose drilled 20 exploratory wells and 7 observation wells during 1978 to 1989 and 24 wells on deposit basis ranging from 56 to 474 m.bgl for TWAD Board for their drinking water programmes. The board as a part of its ground water exploration programme to assess the brine water potential has drilled 6 EW and 4 Ow ranging in depth from28 to 200 m bgl in the district.

CGWB is monitoring the groundwater regime for the changes in water level and water

quality through 23 dug wells and 3 piezometers. The monitoring of water levels are carried out during May (Pre monsoon), August (Middle of south west monsoon), November (post south west monsoon & initial stage of north east monsoon) & January (Post North east monsoon) to study the impact of rainfall on groundwater regime. Water samples are collected during May for determining the changes in chemical quality of groundwater.

2.0 RAINFALL AND CLIMATE

The district receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the district. Most of the precipitation occurs in the form of cyclonic stoms caused due to the depressions in Bay of Bengal. The southwest monsoon rainfall is highly erratic and summer rains are negligible. Rainfall data from two stations over the period 1901-2000 were utilised and a perusal of the data shows that the normal annual rainfall over the district is 827mm with the maximum around Pamban and all along the coast and it decreases towards inland.

The district enjoys a Tropical climate. The period from May to June is generally hot and dry. The weather is pleasant during the period from December to January. Usually mornings are more humid than afternoons. The relative humidity is on an average between 79 and 84%. The mean minimum temperature is 25.7°C and mean maximum daily temperature is 30.6°C respectively.

3.0 GEOMORPHYLOGY AND SOIL TYPES

3.1 Geomorphology

Ramanathapuram district has a long coastline of around 260 km. The coastal areas are flanked by Beach ridge complex-sand dunes, swales, swamps and backwater. The sand flat is another feature of the coast comprising of clays and silts, often inundated by seawater and encrsted with salt. Other features are the shallow pediment plain of Kamdhi, parts of Paramakudi and Tiruvadanai taluks with thin veneer of soil cover over weathered hornblende gneiss, laterite and the buried pediments.

3.2 Soils

Soils in the area have been classified into i) Black Clayey soil, ii) Sandy soil and iii) Red –ferruginous soil.

In the Ramanathapuram district, majority of the area is covered by Black Clayey soil type. These soils are mostly black or black to brownish in colour and are found in parts of Ramanathapuram, Paramakudi, Kamuthi, Tiruvadanai and Mudukulathur blocks. Sand occur in flat elevation along the Rameshwaram and Kadaladi blocks, Alluvial soils occur along the river courses of Vaigai and Gundar river covering in the blocks Paramakudi, Tiruvadanai and Muthukulayhur. The Red ferruginous soil of the Chettinad plains occurs as few pockets around Paramakudi and Tiruvadanai blocks.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The district is underlain by both porous and fissured formations. . The important aquifer systems in the district are constituted by i) unconsolidated & semi-consolidated formations and ii) weathered and fractured crystalline rocks

The porous formations can be grouped into three aquifer groups, viz., Cretaceous sediments, Tertiary Sediments and Quaternary Sediments. The cretaceous aquifer is semi confined to confined in nature and consists of two zones. The top unit comprises fossiliferous sandstone red in colour and compact in nature, while the bottom is pinkish or grayish sandstone intercalated with shales. The aquifers are characterized by freshwater and occurs at the depth range of 116-407 and 205-777 m bgl and has thickness in the range of 68 to 535 m. The aquifer is made up of compact sandstone and the potential is limited. The wells may yield a discharge of 5-10 lps and can sustain a pumping of 10-15 hours a day. However, because of the presence of potential shallow tertiary aquifer, this aquifer has not been extensively developed.

Cuddalore Sandstone of Tertiary sediments consists Sandstone, Clay & Conglomerate. They are encountered at the depth of 15-75 m bgl with the thickness ranging from 20 to 70 m. The groundwater occurs under unconfined condition with thickness varying from 15-20m and under confined condition in deeper depths. The unconfined aquifer can be tapped by dug well/ dug cum bore well and can yield about 10-15 lps and can sustain a pumping of 10-15 hours a day. The deeper tube wells can yield about 15-20 lps and can sustain a pumping of 10-15 hours a day.

Quaternary sediments comprises fluvial and coastal sands and laterites. The alluvium with alternate layer of sand and clay with a thickness of 15-25 m and are characterized by floating freshwater lenses limited to a depth 6-7 m bgl and can sustain a pumping of 2 – 3 hours and can yield about 2-5 lps.

The water-bearing properties of crystalline formations which lack primary porosity depend on the extent of development of secondary intergranular porosity . The occurrence and movement of ground water in these rocks are generally confined to such spaces. These aquifers are highly heterogeneous in nature due to variation in lithology, texture and structural features even within short distances. Ground water generally occurs under phreatic conditions in the weathered mantle and under semi-confined conditions in the fissured and fractured zones at deeper levels. The thickness of weathered zone in the district is in the range of 4 to 15 m. The depth of the wells ranged from 10.00 to 15.00 m bgl.

The yield of large diameter wells in the district, tapping the weathered mantle of crystalline rocks ranges from 40 to 110 lpm and are able to sustain pumping for 2 to 6 hours per day. The Specific capacity of large diameter wells tested in crystalline rocks ranges from 20.25 to 95 lpm / m. of drawdown. The yield characteristics of wells vary considerably depending on the topographic set-up, litho logy and nature of weathering. The transmissivity of weathered formations computed from pumping test data using empirical methods range < 1 m^2/day.

The yield of bore wells drilled down to a depth of 40 to 70 m, by various state agencies mainly for domestic purposes ranged from 10 to 250 lpm.

The depth to water level in the district varied between 0.67 – 12.12 m bgl during pre-monsoon depth to water level (May 2006) and varied between 0.49 – 8.78 m bgl during post monsoon depth to water level (Jan 2007). The seasonal fluctuation shows a rise in water level, which ranges from 0.35 to 2.8m bgl. The piezometric head varied between 3.49 to 16.23m bgl (May 2006) during premonsoon and 1.29 to 8.06 m bgl during post monsoon.

4.1.1 Long Term Fluctuation (1998-2007)

The long term water level fluctuation for the period 1998-2007 indicates rise in water level in the range of 0.0009 - 0.3944 m/year and fall in the range between 0.0635 - 0.2693 m/year.

4.1.2 Aquifer Parameters

Aquifer	Transmissivity (m^2/day)	Storativity	Specific Yield (%)
Weathered Crystallines	< 1	-	<2
Fractured Crystallines	1-10	1.32×10^{-3} to 8.0×10^{-3}	-
Cretaceous Aquifer	50-500	2.7×10^{-5} to 5.5×10^{-4}	2-5
Tertiary Aquifer	5-3000	2.5×10^{-5}	-
Quaternary Aquifer	5- 50	-	6-10

4.2 Ground Water Resources

The ground water resources have been computed jointly by Central Ground Water Board and State Ground & Surface Water Resources and Development Centre (PWD, WRO, Government of Tamil Nadu) as on 31st March 2004 using GEC-97 methodology and the salient features of the computations are furnished below.

4.3 Ground Water Quality

The chemical characteristics of ground water in the phreatic zone in Ramanathapuram district has been studied using the analytical data of ground water samples collected from Network Hydrograph Stations of Central Ground Water Board. The study of quality of ground water in deeper aquifers in the district has been attempted using the data collected from exploratory bore/tube wells constructed in the district.

Ground water in phreatic aquifers in Ramanathapuram district, in general, is colourless, odourless and slightly alkaline in nature. The specific electrical conductance of ground water in phreatic zone (in MicroSeimens at 25° C) during May 2006 was in the range of 409 to 4350 in the district. It is between 750 and 2250µS/cm at 25°C in the major part of the district. Conductance below 750 µS/cm have been observed in ground water in parts of Sattur and Watrap blocks, whereas conductance exceeding 2250 µS/cm have been observed in part of Rajapalayam and Virudhunagar blocks.

Stage of Groundwater Development of Ramanathapuram District as on 31st March 2004 (in Ha.m.)									
S.No		**Net Groundwater Availability**	**Existing Gross Draft for Irrigation**	**Existing Gross Draft for Domestic and industrial water supply**	**Existing Gross Draft for all uses**	**Allocation for Domestic and Industrial Requirement supply upto next 25 years (2029)**	**Net groundwater Availability for future Irriation Development**	**Stage of Groundwater Development**	**Category**
1	Bogalur	2114.28	208.36	24.99	233.36	25.84	1880.08	11	Safe
2	Kadaladi	3149.58	452.97	88.14	541.10	91.12	2605.49	17	Safe
3	Kamuthi	3262.04	726.67	123.78	850.45	127.98	2407.39	26	Safe
4	Mandapam	4727.58	3816.53	236.61	4053.15	244.63	666.42	86	Semi Critical
5	Mudukulathur	4070.82	452.97	93.03	546.00	96.18	3521.67	13	Safe
6	Nainarkoil	5508.94	799.75	102.44	902.20	105.91	4603.27	16	Safe
7	Paramakudi	2520.00	521.13	56.46	577.59	58.37	1940.49	23	Safe
8	R.S.Mangalam	2296.98	152.28	44.33	196.60	45.83	2098.87	9	Safe
9	Ramanathapuram	1844.75	1508.89	25.60	1534.49	26.47	309.39	83	Semi Critical
10	Thirupullani	3020.09	2699.47	88.72	2788.19	91.73	228.89	92	Critical
11	Thiruvadanai	1025.93	94.32	48.02	142.34	49.65	881.96	14	Safe
	District Total	**33540.99**	**11433.35**	**932.11**	**12365.46**	**963.70**	**21143.94**	**37**	

It is observed that the ground water is suitable for drinking and domestic uses in respect of all the constituents except total hardness and Nitrate in more than 90 percent of samples analysed. Total Hardness as CaCo3 is observed to be in excess of permissible limits in about 49 percent of samples analysed whereas Nitrate is found in excess of 45 mg/l in about 30 percent samples. The incidence of high total hardness is attributed to the composition of lithounits constituting the aquifers in the district, whereas the Nitrate pollution is most likely due to the use of pesticides and fertilisers for agriculture.

With regard to irrigation suitability based on specific electrical conductance and Sodium Adsorption Ratio (SAR), it is observed that ground water in the phreatic zone may cause high to very high salinity hazard and medium to high alkali hazard when used for irrigation. Proper soil management strategies are to be adopted in the major part of the district while using ground water for irrigation.

4.4 Status of Ground Water Development

The estimation of groundwater resources for the district has shown that 1 block is over exploited and 1block is under “critical” category.

The shallow alluvial aquifers along Vaippar and Gundar rivers serve as an important source of drinking water irrigation development for Virudhunagar district. Dug wells are the most common ground water abstraction structures used for irrigation in the district. The yield of dug wells range from <50 to 200 m3/day in weathered crystalline rocks, 20 to 100 m3/day in Tertiary formations and upto 400 m3/day in Recent alluvial formations along major drainage courses. The dug wells in hard rock terrain tapping the entire weathered residuum are capable of yielding 6 – 7 lps, requiring the installation of 5 HP centrifugal pumps for extraction of ground water.

5.0 Groundwater Management Strategy

5.1 Groundwater Development

In view of the comparatively high level of ground water development in the major part of the district and the quality problems due to lithogenic and anthropogenic factors, it is necessary to exercise caution while planning further development of available ground water resources in the district.

The yields of dug wells in crystalline and Tertiary formations are improved at favorable locations by construction of extension bores which are 20 to 40m. deep. In recent years, a large number of bore wells have also been drilled by farmers for irrigation purposes.

The development of ground water for irrigation in the district is mainly through dug wells tapping the weathered residuum or recent alluvial deposits. Bore wells have also become popular as the source for irrigation in the district in recent years. Dug wells with extension bores wherever necessary is ideal for hard rock areas whereas large diameter dug wells with radials is suitable for alluvial areas.

Large diameter collector wells are ideal structures for ground water extraction in the river alluvial tracts, where the granular zones are generally restricted to 35 m bgl. The

coastal sands in the eastern part of the district also form good aquifer material. The tube wells may be constructed down to a maximum depth of 40 m bgl in the district. The width and position of the screen in the wells may be decided based on the depth to piezometric surface and discharge required. The expected discharges corresponding to the screen lengths are given below for reference.

Hydraulic Conductivity (m/d)	Screen Length (m)	Discharge (m^3/hr)
20	6	17
30	6	30
40	6	35
30	9	45
40	9	50

The map showing the development prospects for the district is shown in Plate VI.

5.2 Water Conservation and Artificial Recharge

The topography of Virudhunagar district, in general, is suited for construction of various artificial recharge structures such as percolation ponds, check dams and sub-surface dykes. However, detailed studies are necessary to formulate a comprehensive scheme for artificial recharge of phreatic ground water in the district in view of the variations in the geomorphic set-up and the complex hydrological and hydrogeological conditions.

The artificial recharge to ground water is recommended giving priority to blocks where the development of ground water resources is comparatively high, Site specific design has to be adopted depending on the on the aquifer geometry and availability of surplus non committed runoff

There is considerable scope for implementation of rain water harvesting in the district, especially in the area underlain by Recent alluvial formations. Such schemes, which are simple in design and are comparatively cheap, could serve to arrest the decline in ground water levels and improve ground water quality, if taken up in sufficient numbers. Recharge pits / Shafts / trenches of suitable design are ideal structures for rain water harvesting in such areas. Free technical guidance for implementation of roof-top rain water harvesting schemes is also being provided by Central Ground Water Board, and manual is also published to give more scientific design tips.

6.0 Groundwater related Issues & Problems

Based on the high level of ground water development, it is inferred that a major part of the district could be considered vulnerable to water level depletion. A considerable amount of ground water is being developed from the eastern part of the district from a number of well-fields for water supply to Virudhunagar district. As the ground water in the alluvial aquifer in the eastern part of the district is in hydraulic connection with the weathered and fractured rock, The maintenance of base flow in rivers in essential for supports the drains of water head works in river bed

Prevention/arresting of sea water intrusion by injection of fresh water through a battery of recharge wells have been successfully demonstrated elsewhere in Tamil nadu, However, availability of source water in such large amounts for recharge is a

major constraint in successful implementation of the scheme, and the flood water available in 4-5 year cycle can also be considered for such large scale injection in vulnerable/ Ground water threat 'hot Rpots'

7.0 Awareness & Training Activity

Nil

8.0 Area Notified by CGWA/SGWA

Central Ground Water Authority has not notified any area in the district. Government of Tamil Nadu vide G.O.No. 53 has banned groundwater development for irrigation in the over exploited blocks of Tamil Nadu and there is no over expoited block in the district.

9.0 Recommendations

As the development of ground water has already reached an optimal stage in many blocks of this district, further development of ground water for creation of additional irrigation potential has to be carried out with extreme caution.

Waste land development programme and micro irrigation system has to be implemented for increasing the agricultural produces by way of more food and income per drop of water in view of the limited water resources in the districts.

PLATE - I

CENTRAL GROUND WATER BOARD, SECR, CHENNAI

RAMANATHAPURAM DISTRICT, TAMIL NADU

LOCATION

(NOT TO SCALE)

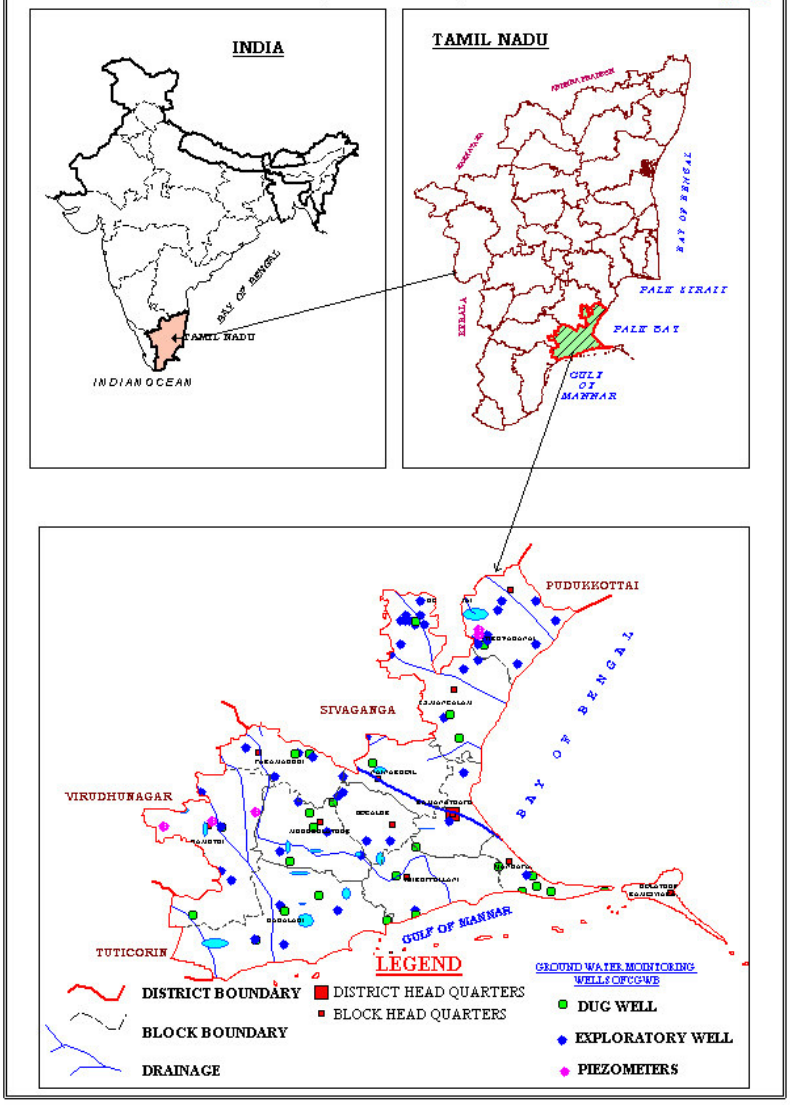
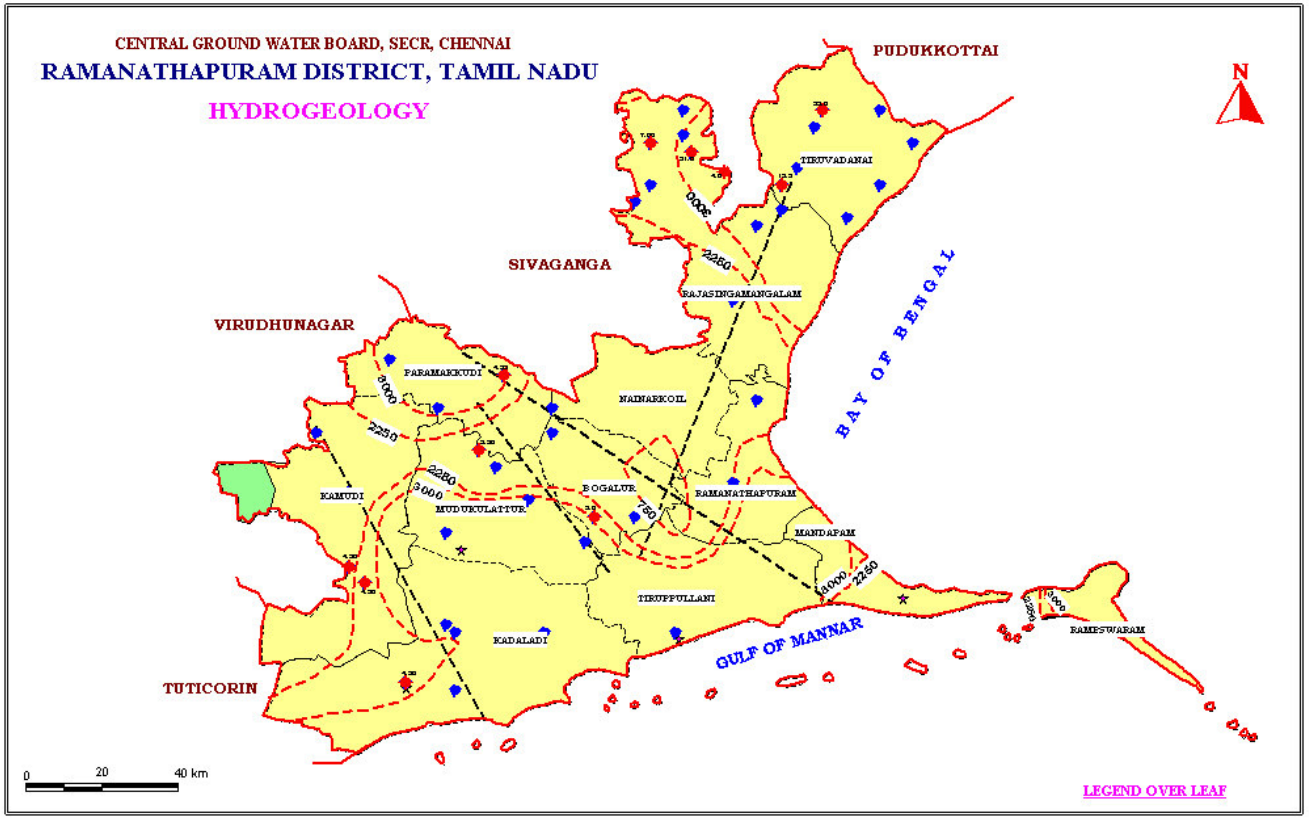


PLATE - II


CENTRAL GROUND WATER BOARD, SECR, CHENNAI
RAMANATHAPURAM DISTRICT, TAMIL NADU
HYDROGEOLOGY
PUDUKKOTTAI
SIVAGANGA
VIRUDHUNAGAR
TUTICORIN
BAY OF BENGAL
GULF OF MANNAR
N
TIRUVADANAI
RAJASINGAMANGALAM
PARAMAKKUDI
NAINARKOIL
KAMUDI
MUDUKULATTUR
BOGALUR
RAMANATHAPURAM
MANDAPAM
TIRUPPULLANI
KADALADI
RAMESWARAM
2250
3000
2200
750
0
20
40 km
LEGEND OVER LEAF

LEGEND FOR PLATE - II

ADMINISTRATIVE SETUP

- STATE BOUNDARY
- DISTRICT BOUNDARY
- BLOCK BOUNDARY

GROUND WATER HYDROLOGY

- EXPLORATORY BORE WELL [CGWB]
- HIGH YIELDING BORE WELL [CGWB]

HYDROCHEMISTRY

- 750 — ISOCONS [Sp ELECTRICAL CONDUCTANCE [µs /Cm at 25° C]
- FLUORIDE > 1.5 (mgl)

STRUCTURE

- TRACE OF LINEAMENT

AQUIFER	AGE	LITHOLOGY	GROUND WATER CONDITIONS	YIELD PROSPECTS (CU.M/D)	GROUND WATER DEVELOPMENT STRATEGIES
UNCONSOLIDATED	RECENT	RIVER ALLUVIUM, VALLEY FILL-DEPOSITS	DISCONTINUOUS, THIN, UNCONFINED TO SEMI CONFINED	> 200	DEVELOPMENT THROUGH LARGE DIAMETER DUG WELLS AND SHALLOW TUBE WELLS.
CONSOLIDATED	ARCHAEAN	GRANITES, GNEISSES, CHARNOCKITE.	DISCONTINUOUS, UNCONFINED TO SEMICONFINED AQUIFERS,RESTRICTED TO WEATHERED RESIDUUM AND FRACTURES	< 50 NEAR WATERSHED DIVIDES & HIGH GROUNDS. 50 - 200 NEAR THIRD ORDER STREAMS AND LOW GROUNDS.	SUITABLE FOR DEVELOPMENT THROUGH DUG WELLS.BOREWELLS FEASIBLE IN FRACTURE ZONES, BEST LOCATIONS BEING INTERSECTION OF FRACTURES

PLATE - III

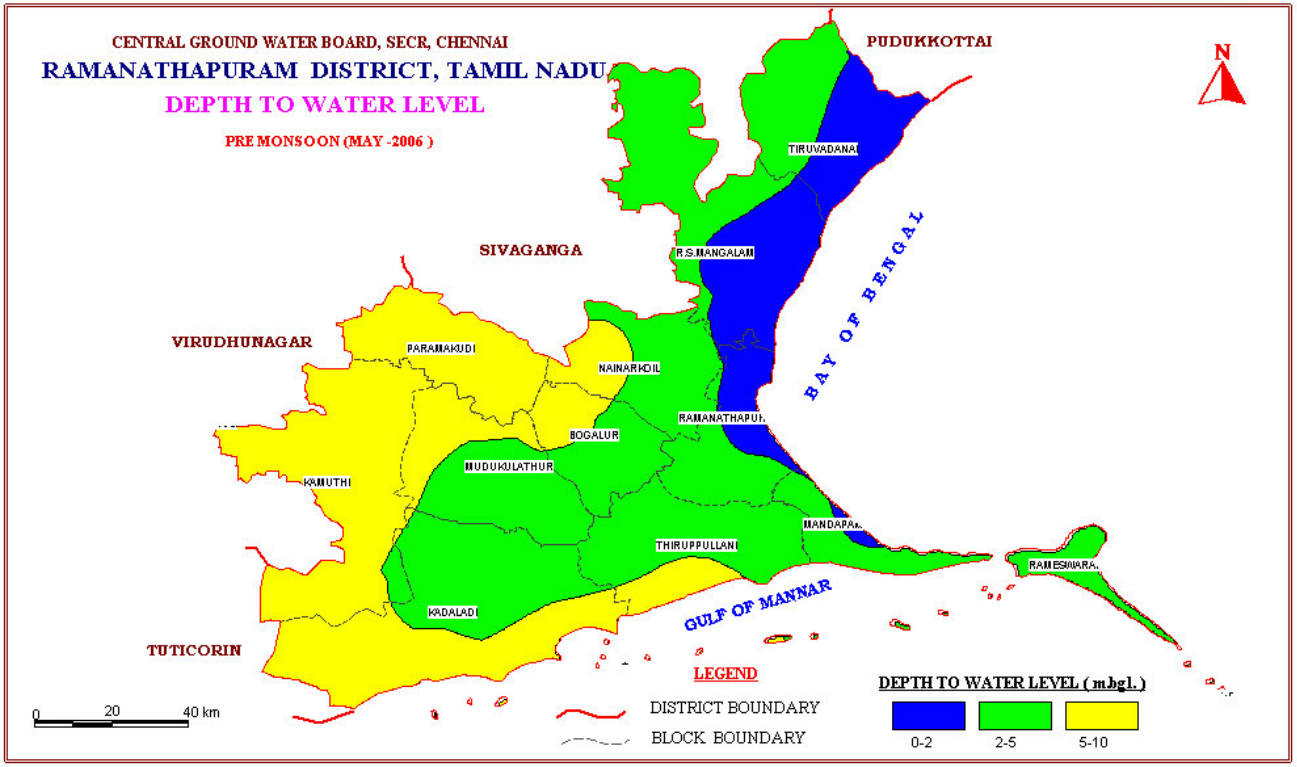

CENTRAL GROUND WATER BOARD, SECR, CHENNAI
RAMANATHAPURAM DISTRICT, TAMIL NADU
DEPTH TO WATER LEVEL
PRE MONSOON (MAY -2006)
N
PUDUKKOTTAI
TIRUVADANAI
R.S.MANGALAM
SIVAGANGA
VIRUDHUNAGAR
PARAMAKUDI
NAINARKOIL
RAMANATHAPUR.
BOGALUR
MUDUKULATHUR
KAMUTHI
MANDAPAM
THIRUPPULLANI
RAMESWARAM
KADALADI
TUTICORIN
BAY OF BENGAL
GULF OF MANNAR
LEGEND
DISTRICT BOUNDARY
BLOCK BOUNDARY
DEPTH TO WATER LEVEL (m.bgl.)
0-2
2-5
5-10
0
20
40 km

PLATE - IV

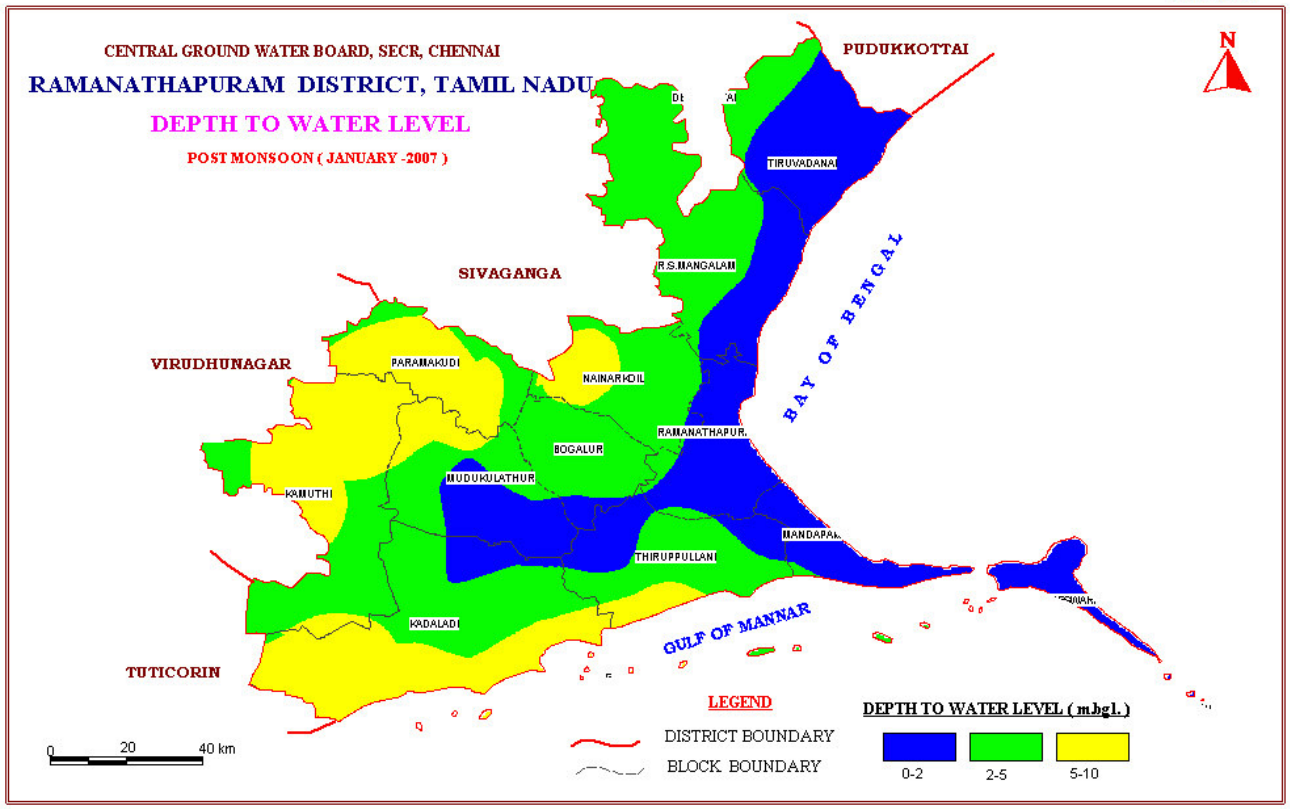
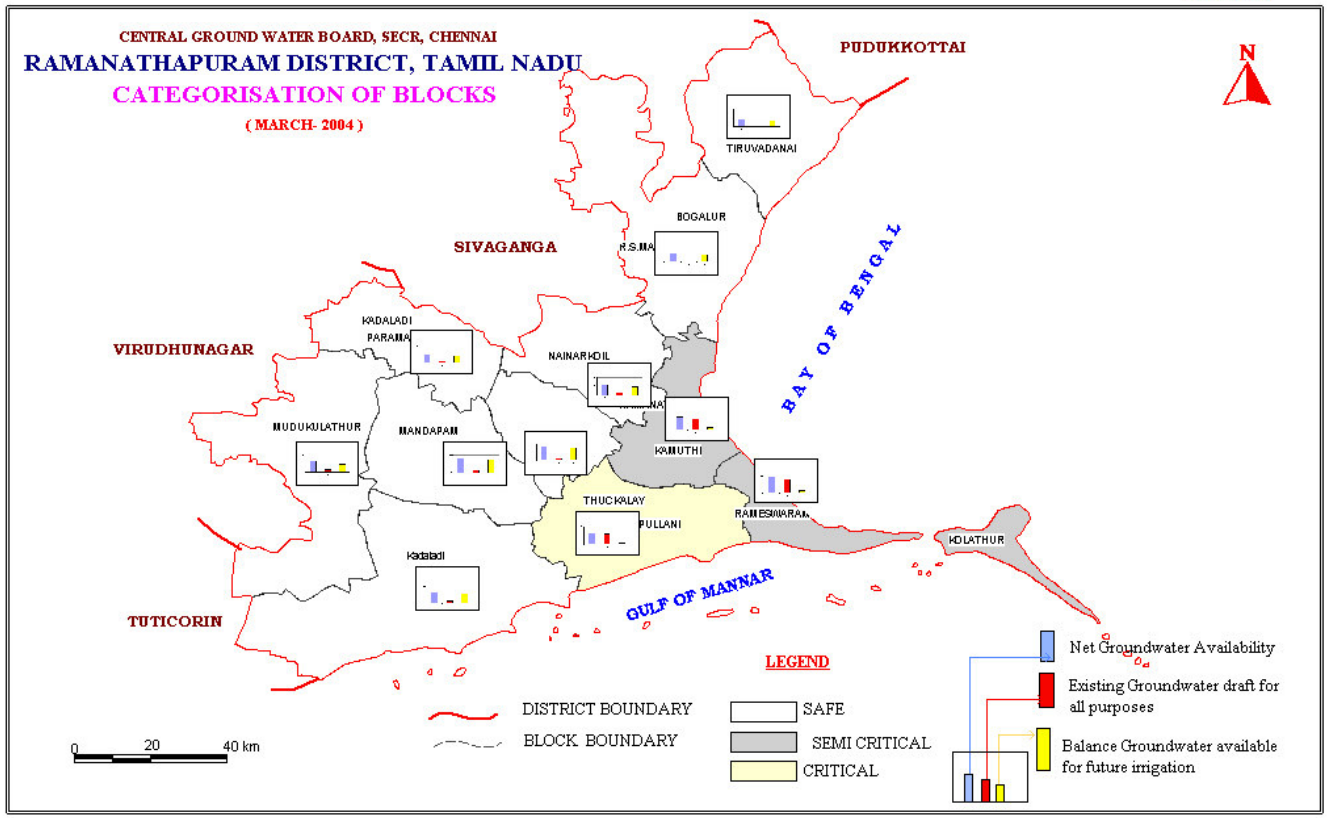
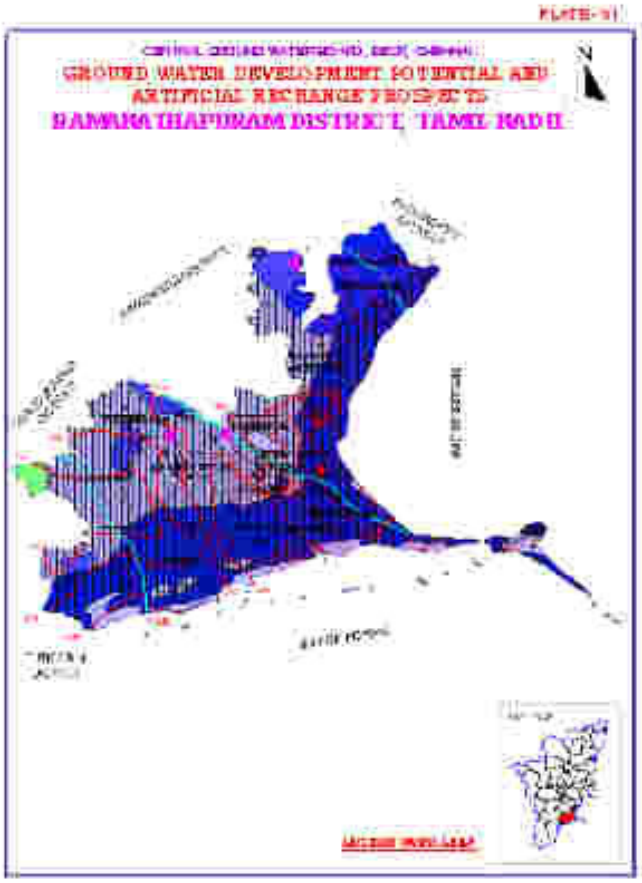

CENTRAL GROUND WATER BOARD, SECR, CHENNAI
RAMANATHAPURAM DISTRICT, TAMIL NADU
DEPTH TO WATER LEVEL
POST MONSOON (JANUARY -2007)
N
PUDUKKOTTAI
TIRUVADANAI
R.S.MANGALAM
SIVAGANGA
VIRUDHUNAGAR
PARAMAKUDI
NAINARKOIL
RAMANATHAPUR.
BOGALUR
MUDUKULATHUR
KAMUTHI
MANDAPAM
THIRUPPULLANI
KADALADI
TUTICORIN
BAY OF BENGAL
GULF OF MANNAR
0 20 40 km
LEGEND
DISTRICT BOUNDARY
BLOCK BOUNDARY
DEPTH TO WATER LEVEL (mbgl.)
0-2
2-5
5-10

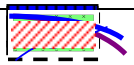
PLATE - IV


CENTRAL GROUND WATER BOARD, SECR, CHENNAI
RAMANATHAPURAM DISTRICT, TAMIL NADU
CATEGORISATION OF BLOCKS
(MARCH- 2004)
PUDUKKOTTAI
N
TIRUVADANAI
BOGALUR
SIVAGANGA
R.S.MA
KADALADI
PARAMA
VIRUDHUNAGAR
NAINARKOIL
BAY OF BENGAL
MUDUKULATHUR
MANDAPAM
KAMUTHI
THUCKALAY
PULLANI
RAMESWARAM
KOLATHUR
Kadaladi
TUTICORIN
GULF OF MANNAR
LEGEND
DISTRICT BOUNDARY
BLOCK BOUNDARY
SAFE
SEMI CRITICAL
CRITICAL
Net Groundwater Availability
Existing Groundwater draft for all purposes
Balance Groundwater available for future irrigation
0
20
40 km



LEGEND FOR PLATE - VI

DISTRICT – RAMANATHAPURAM

	**Wells Feasible**	**Rigs Suitable**		**Discharge (LPM)**	**Suitable Artificial Recharge Structures**
Hard Rock Aquifer	Dug Well Bore Well	Manual DTH	10 – 18 60 – 120	10 - 60	Check Dams/Recharge Wells/ Gully Plugs
Soft Rock Aquifer	Dug Well Tube Well	Manual Direct Rotary	6 – 12 20 - 60	60 – 200	Percolation Ponds/ Recharge Wells/ Check Dams
Soft Rock Aquifer	Tube Well	Direct Rotary	50-100	150 - 300	Recharge Tube Wells Percolation Ponds
Soft Rock Aquifer	Dug Well Tube Well	Manual Direct Rotary	6-10 100 – 400	100 – 300 300 - 600	Percolation Ponds/ Recharge Tube Wells/ Surface Water Storage
Soft Rock Aquifer	Dug Well Tube Well	Manual Rotary	10 - 18 100 - 400	60 – 200	Check Dams/Recharge Tube Wells/ Gully Plugs/ Surface Water Storage
Hard Rock Aquifer	Saline Water For Industries	Rotary	30 – 400	500 - 1500	Rain Water Harvesting In Storage Tanks
	District Boundary			Block Boundary	
	District Headquarters			Block Headquarters	
5	Water Level-Pre-Monsoon (Decadal Mean 1993-2002) Mbgl		1250	EC In Microsiemens / Cm At 25°C	
	River			Lineament	
	Fluoride Greater Than Maximum Permissible Limit (1.5mg/L)			Nitrate Greater Than Maximum Permissible Limit (45mg/L)	
R	Recommended Site For Artificial Recharge Structure			Palaeo Channel	

OTHER INFORMATION

Geographical area	4089.57 Sq.km.
Number of blocks	11
Major Drainage	Manimuthar, Vaigai & Vaippar.
Population (2001)	11,87,604
Average annual Rainfall	827 mm
Annual Range of Temperature	22 –39°C
Regional Geology	**Hard Rocks:** Quartzites and Gneisses **Soft RocksL** Alluvium, Sandstone and Shale
Net Ground water Availability for future irrigation	211.44 MCM/Yr
Stage of Ground water Development as on January 2003	37 %
Names of Block showing Intensive Ground Water development	☆ **Critical**: Tiruppullani

SAVE WATER

AND

CONSERVE WATER

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