

**CHAPTER 4.1.9 GROUND WATER RESOURCES  
THANJAVUR DISTRICT**

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## **GROUND WATER REPORT OF THANJAVUR DISTRICT**

### **INTRODUCTION :**

In Tamil Nadu, the surface water resources are fully utilized by various stake holders. The demand of water is increasing day by day. So, groundwater resources play a vital role for additional demand by farmers and Industries and domestic usage leads to rapid development of groundwater. About 63% of available groundwater resources are now being used. However, the development is not uniform all over the State, and in certain districts of Tamil Nadu, intensive groundwater development had led to declining water levels, increasing trend of Over Exploited and Critical Firkas, saline water intrusion, etc.

### **ADMINISTRATIVE SET UP**

The geographical extent of Thanjavur district is 3, 39,657 hectares accounting for 3.5 percent of the total geographical area of Tamil Nadu State. The district has well laid out roads and railway lines connecting all major towns within and outside the state. For administrative purpose the district has been bifurcated into 8 Taluks, 14 Blocks and 50 Firkas. The district capital is Thanjavur, which is a major town with municipal status.

Thanjavur District is totally bifurcated into 50 Firkas.

### **1. HYDROGEOLOGY**

#### **(i) Major Geological formations:**

#### Geology

Geologically, the entire district can be broadly classified into Archaean rock (hard crystalline rock) and sedimentary (cretaceous, tertiary and alluvium) formations.

#### a) Hard rock formations

About 3.50 percent of the district alone is underlain by hard crystalline rocks of Archaean age, around Sengipatti village on the western part of the district. It comprises

of granitic gneiss and charnockite. The general strike of the formation is NE-SW and dipping towards east and south-east. There are some pegmatitic intrusions seen in some places. Generally there are well developed joints present.

Valley fill sediments composed of lateritic gravels, clays, silts and sand occur in Sengipatti and Vallam areas.

#### b) Sedimentary formations

More than 96.5 percent of this district is covered by sedimentary formations. The different sedimentary formations, which occur in this district, are discussed below.

##### i) Cretaceous formation

Cretaceous formations are exposed in a narrow belt in this district just adjacent and parallel to the Archaean formations. These formations consist mainly of clay, marl and silt stone. These formations are deposited under marine environment.

##### ii) Eocene formations

Eocene formations are not encountered as out crop in this district but they are met at depths. Micro fossils obtained from this formation in various bore holes indicate the lower, middle and upper stages of this formation. It includes silt, clay, shale, sand and limestones.

##### iii) Miocene

Miocene deposits occur extensively in this district and they form the most pre dominant and prolific aquifer in this district. The micro fossil study reveals the presence of upper, middle and lower stages of this deposit. The lower Miocene contains two different and distinct zones viz. Burdigalio: Upper and Aquitanian : Lower. The upper and middle Miocene consists of argillaceous sandstones intercalated with clays. The middle and deeper aquifer system in the Cauvery delta are formed of these deposits.

#### iv) Pliocene

Pliocene deposits outcrop in the whole of New Delta area. It consists of sandy deposits in the west and gradually transgresses into silty and clayey deposits towards east. It was deposited under fluvial environment in the west and in the east in semi marine environment.

#### v) Quarternary

The quarternary deposits are represented in Papanasam and Valangiman areas of this district. In this district these deposits are deposited under fluvial environment. It includes sands intercalated with brown and black clays and sandy clays.

#### Drilling of bore holes:

The State Ground and Surface Water Resources Data Centre of Public Works Department, Thanjavur has drilled about 250 bore wells in this district to find out the nature, and behaviour of the aquifers present in the various geological formations in the district. The pumping tests carried out in the bore wells drilled in the district shows that the behaviour of the aquifer varies in space. The alluvium and tertiary formations have got good yielding potential aquifer zones with varying thickness. A vertical lithological cross section of bore wells drilled in Thanjavur district is drawn based on the results of the bore hole drilled.

#### Aquifer parameters

More or less 96 percent of Thanjavur district is covered by sedimentary formations of tertiary and alluvial deposits.

The range of aquifer parameters for alluvium, tertiary, cretaceous and crystalline formations are furnished below.

### Range of alluvial parameters

Formation	Specific capacity lpm/m-d	Specific yield %	T m <sup>2</sup> -d	K m/d	Yield of wells lps
Alluvium	2.08	7.2	98	19.7	2.5
Tertiary	78.173	1.4-3.5	46-134	16-33	2.5
Cretaceous	33-782	0.3-2.56	33-782	10-66	1.1-3.5
Weathered crystalline	27-224	0.8-2.5	16-60	5-20	1-2

Source: State Ground and Surface Water Resources Data Centre, Chennai.

### (iii) Drilling:

The drilling types are different according to the formation of the terrain. In general, DTH rigs are used in Hard rock formations for drilling a borewell at a depth ranges from 30m to 200m, according to the extension of joints, fractures, lineaments, etc in an area. In Sedimentary formations, rotary rigs with different rotors used according to the Tube well's diameter. The Bento novate clay is used in rotary rigs to avoid the collapse of the Tube well. The sedimentary tube wells are drilled up to a depth of 30m to 300m depending on the area, yield,etc. In alluvial formations, the hand rotary used for drilling tube wells ranges from 10m to 15m. In river beds, infiltration tube wells used for extraction of groundwater.

In Hard rock, the well designing is simple. The upper top soil and highly weathered zone is cased with PVC pipe and the remaining weathered, Fissured, Jointed portion is left as it is. In Villupuram District, the weathered zone ranges from 1.0m to 12.0m. In Granitic gneiss area, the highly weathered portion will be more up to 15m but in charnockite area, the weathered zone will extend up to 8.0m to 10.m only. In Sedimentary area, the well construction depends on the occurrence of sand thickness in the referred area. The logger is also used in the construction to identify the area of good quality of water.

## **2. GROUNDWATER REGIME MONITORING:**

### **(i) Notes on existing water level scenario:**

The water level is being monitored by State Ground & Surface Water Resources Data Centre from 1971 onwards from a network of 1746 observation wells (shallow open wells) located all over the State. The water level readings are observed in the first week of every month by the field officers. In Thanjavur District, 34 observation wells and 109 piezometers, totally 143 wells are monitoring on Monthly basis. The Central Ground Water Board also monitors the water level from 900 numbers of wells spread all over the State. They observe water level four times in a year. ( i.e January, May, August and November). The collected water level data are uploaded in GWDES software and database is maintained regularly for analysing the water level trend with rainfall. From the Monitoring network of wells, the selected representative wells are taken for Resource Estimation computations.

In Thanjavur District, during the pre monsoon, the water level generally in declining trend ranges from G.L. to 15m. The depth of well below GroundLevel 12.0m are become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. The water level trend maps for pre and post monsoons are included as Annexure- I & II.

### **(ii) Long term trend of water level:**

The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Thanjavur District. The analysis reveals that the water level has gone down in the north, west and central parts of the Thanjavur District. The inference taken from the annual fluctuation is due to lack of rainfall which in turn affects the groundwater levels in phreatic aquifer. The seasonal fluctuation study reveals that due to necessity for development of ground water for different sector needs and due to failure of monsoons, the water level has gone down.

The hydrograph of observation wells water level trend from 2005 to 2017 enclosed as Annexure – III and water level trend from 2000 to 2017 of Piezometers enclosed as Annexure – IV for Thanjavur District.

(iii) Existing network of Monitoring wells:

In Thanjavur District, the existing network of monitoring wells is 143 wells, 34 wells are observation wells and 109 wells are piezometers. These wells are observed for every month water level.

**Thanjavur District: Observation Wells - Location and Co-ordinates**

Well No	District	Tahsil / Taluk	Block / Mandal	Village	Latitude	Longitude
43042	Thanjavur	PATTUKOTTA I	PERAVURANI	ADHIRAMAPATTINA M	10°20'35"	79°23'40"
43056	Thanjavur	KUMBAKONA M	KUMBAKONA M	THIRUPURAMBIUM	11°00'20"	79°20'00"
43001	Thanjavur	THANJAVUR	THANJAVUR	THANJAVUR	10°46'30"	79°08'40"
43003	Thanjavur	THIRUVAIYAR U	THIRUVAIYAR U	THIRUVAIYARU	10°52'52"	79°06'30"
43004	Thanjavur	THIRUVAIYAR U	THIRUVAIYAR U	VILANGUDI	10°55'08"	79°06'10"
43006	Thanjavur	THANJAVUR	BUDALORE	KUDANAL	10°50'10"	78°57'45"
43007	Thanjavur	THIRUVAIYAR U	BUDALORE	THOGUR	10°49'40"	78°48'30"
43009	Thanjavur	THANJAVUR	BUDALORE	VALLAM	10°43'06"	79°03'40"
43010	Thanjavur	KUMBAKONA M	KUMBAKONA M	KUMBAKONAM	10°57'30"	79°22'27"
43033	Thanjavur	KUMBAKONA M	THIRUPANAN DAL	LOWER ANAICUT	11°08'00"	79°27'20"
43035	Thanjavur	PAPANASAM	AMMAPETTAI	AMMAPETTAI	10°47'30"	79°19'16"
43038	Thanjavur	ORATHANAD	THIRUVONAM	THIRUVONUM	10°38'18"	79°09'44"
43039	Thanjavur	PATTUKOTTA I	PATTUKOTTAI	PATTUKOTTAI	10°25'05"	79°19'44"
43047	Thanjavur	PAPANASAM	PAPANASAM	PAPANASAM	10°55'30"	79°16'30"
43061	Thanjavur	PAPANASAM	PAPANASAM	THIRUKARUGAVUR	10°52'05"	79°16'30"



43062	Thanjavur	KUMBAKONAM	Kumbakonam	THIPPIRAJAPURAM	10°54'30"	79°24'10"
43065	Thanjavur	THANJAVUR	THANJAVUR	PUDUVUR	10°43'35"	79°11'50"
43069	Thanjavur	ORATHANAD	ORATHANAD	ORATHANAD	10°37'45"	79°15'15"
43072	Thanjavur	PATTUKOTTA I	VADASERI	ALATHUR	10°29'25"	79°20'55"
43076	Thanjavur	THANJAVUR	THANJAVUR	MARUNGULAM	10°40'18"	79°08'22"
43077	Thanjavur	Thanjavur	Budalur	Sengipatti	10°43'00"	78°57'00"
43078	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Maruvur	10°51'02"	78°56'51"
43079	Thanjavur	Papanasam	Papanasam	Kabisthalam	10°53'26"	79°10'34"
43080	Thanjavur	Kumbakonam	Kumbakonam	Swamimalai	10°56'43"	79°15'28"
43081	Thanjavur	Thiruvaidaimarudhur	Thiruvaidaimarudhur	Thiruvaidaimarudhur	11°01'24"	79°29'22"
43082	Thanjavur	Kumbakonam	Thiruvaidaimarudhur	Krishnapuram	10°56'38"	79°28'57"
43082A	Thanjavur	Kumbakonam	Thiruvaidaimarudhur	Krishnapuram (alternate)	10°56'38"	79°28'57"
43084	Thanjavur	Peravurani	Peravurani	Periyamayagipuram	10°20'32"	79°09'42"
43085	Thanjavur	Pattukkottai	Peravurani	Palathalai	10°20'07"	79°15'51"
43086	Thanjavur	Pattukkottai	Pattukkottai	Veppankadu	10°29'18"	79°16'19"
43087	Thanjavur	Pattukkottai	Madhukkur	Periyakottai	10°29'14"	79°25'42"
43088	Thanjavur	Orathanadu	Orathanadu	Avidanallavijayapuram	10°33'49"	79°10'19"
43089	Thanjavur	Thanjavur	Thanjavur	Mathur	10°52'26"	79°09'55"
43090	Thanjavur	Thiruvaidaimarudhur	Thiruppanandal	Kathiramangalam	10°52'25"	79°09'57"

**Thanjavur District - Piezometers - Location and Co-ordinates**

Well no	District	Tashil/Taluk	Block/Mandal	Village	Latitude	Longitude
08001 D	Thanjavur	Thanjavur	Budalur	Pudukudi	10.725000	78.887500
08002 D	Thanjavur	Thanjavur	Budalur	Manaiyeripatti	10.725000	78.918611
08003 D	Thanjavur	Thanjavur	Budalur	Pudupatti	10.745833	78.979167
08004 D	Thanjavur	Thanjavur	Budalur	Budalur	10.795833	78.979167
08005 D	Thanjavur	Thanjavur	Budalur	Kottarapatti	10.795833	78.925000
08006 D	Thanjavur	Thanjavur	Budalur	Sengipatti	10.716667	78.950000
08007 D	Thanjavur	Thanjavur	Budalur	Cholagampatti	10.788889	78.900000
8008	Thanjavur	Pattukottai	Pattukottai	Pattukottai	10.418056	79.328889
8009	Thanjavur	Peravurani	Sethubavachatram	Sethubavachatram	10.066667	79.281944
08010 D	Thanjavur	Peravurani	Peravurani	Thiruchitrambalam	10.363889	79.202778
08011 D	Thanjavur	Thiruvaidaimarudur	Thirupanandal	Thirupanandal	11.097222	79.466667
08012 D	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Vilangudi	10.918889	79.102778
08013 D	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Ammanpettai	10.837222	79.122778
08014 D	Thanjavur	Thanjavur	Thanjavur	Eachankottai	10.662500	79.169444
8015	Thanjavur	Orathanadu	Orathanadu	Neivasal	10.697222	79.290278
8016	Thanjavur	Orathanadu	Orathanadu	Poyyundarkottai	10.616667	79.147222
8017	Thanjavur	Orathanadu	Orathanadu	Vadasery	10.566667	79.375000
8018	Thanjavur	Peravurani	Peravurani	Peravurani	10.283333	79.202778
08021D-A	Thanjavur	Kumbakonam	Kumbakonam	Kumbakonam-1	10.958333	79.374167
08022D-B	Thanjavur	Kumbakonam	Kumbakonam	Kumbakonam-2	10.958333	79.374167
08023D-A	Thanjavur	Thiruvaidaimarudur	Thiruvaidaimarudhur	Aduthurai-1	11.016667	79.486111
08024D-B	Thanjavur	Thiruvaidaimarudur	Thiruvaidaimarudhur	Aduthurai-2	11.016667	79.486111
08025D-C	Thanjavur	Thiruvaidaimarudur	Thiruvaidaimarudhur	Aduthurai-3	11.016667	79.486111
8026	Thanjavur	Papanasam	Ammappettai	Kovarthakudi-1	10.838889	79.238889
8027	Thanjavur	Papanasam	Ammappettai	Kovarthakudi-2	10.838889	79.238889
8028	Thanjavur	Thanjavur	Budalur	Thirukattupalli	10.850000	78.991667
8029	Thanjavur	Thanjavur	Budalur	Thogur	10.827778	78.808333
8030	Thanjavur	Thanjavur	Thanjavur	Thanjavur	10.783333	79.133333
41018	Thanjavur	Papanasam	Papanasam	Pasupathikovil	10.888889	79.176667
41030-B	Thanjavur	Kumbakonam	Kumbakonam	Neerathanallur	11.033333	79.361111
41041	Thanjavur	Papanasam	Ammappettai	Saliyamangalam	10.780556	79.269444
41044-B	Thanjavur	Thiruvaiyaru	Budalur	Thirukkattupalli	10.847778	78.955556
8006 A	Thanjavur	Thanjavur	Budalur	Sengippatti	10.716667	78.950000

8031	Thanjavur	Kumbakonam	Kumbakonam	Sundadraperumalkovil	10.936944	79.301944
8032	Thanjavur	Kumbakonam	Kumbakonam	Cholapuram	11.031944	79.362500
8033	Thanjavur	Kumbakonam	Kumbakonam	Thirupurambiyam	11.012778	79.334167
8034	Thanjavur	Kumbakonam	Kumbakonam	Thillaiyampur	10.936111	79.403056
8035	Thanjavur	Thanjavur	Thanjavur	Kurungulam	10.656944	79.101111
8036	Thanjavur	Orathanadu	Orathanadu	Orathanadu	10.610833	79.257778
8037	Thanjavur	Orathanadu	Thiruvonam	Thiruvonam	10.506111	79.159444
8038	Thanjavur	Pattukkottai	Pattukkottai	Pattukkottai	10.420000	79.328056
8039	Thanjavur	Papanasam	Papanasam	Papanasam	10.925556	79.274167
8040	Thanjavur	Pattukkottai	Madukkur	Madukkur	10.486667	79.395000
8041	Thanjavur	Papanasam	Ammappettai	Ammappettai	10.791389	79.317500
8042	Thanjavur	Thanjavur	Thanjavur	Vallam	10.718333	79.061944
8043	Thanjavur	Thanjavur	Thanjavur	Thanjavur (fcs)	10.771111	79.136944
8044	Thanjavur	Thanjavur	Thanjavur	Kurungulam Fcs	10.700000	79.091667
8045	Thanjavur	Papanasam	Ammappettai	Senbagapuram	10.741667	79.236944
8046	Thanjavur	Thanjavur	Budalur	Budalur Fcs	10.795833	78.979167
08001 D	Thanjavur	Thanjavur	Budalur	Pudukudi	10.725000	78.887500
08002 D	Thanjavur	Thanjavur	Budalur	Manaiyeripatti	10.725000	78.918611
08003 D	Thanjavur	Thanjavur	Budalur	Pudupatti	10.745833	78.979167
08004 D	Thanjavur	Thanjavur	Budalur	Budalur	10.795833	78.979167
08005 D	Thanjavur	Thanjavur	Budalur	Kottarapatti	10.795833	78.925000
08006 D	Thanjavur	Thanjavur	Budalur	Sengipatti	10.716667	78.950000
08007 D	Thanjavur	Thanjavur	Budalur	Cholagampatti	10.788889	78.900000
8008	Thanjavur	Pattukkottai	Pattukkottai	Pattukkottai	10.418056	79.328889
8009	Thanjavur	Peravurani	Sethubavachatram	Sethubavachatram	10.066667	79.281944
08010 D	Thanjavur	Peravurani	Peravurani	Thiruchitrambalam	10.363889	79.202778
08011 D	Thanjavur	Thiruvidaimarudur	Thirupanandal	Thirupanandal	11.097222	79.466667
08012 D	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Vilangudi	10.918889	79.102778
08013 D	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Ammanpettai	10.837222	79.122778
08014 D	Thanjavur	Thanjavur	Thanjavur	Eachankottai	10.662500	79.169444
8015	Thanjavur	Orathanadu	Orathanadu	Neivasal	10.697222	79.290278
8016	Thanjavur	Orathanadu	Orathanadu	Poyyundarkottai	10.616667	79.147222
8017	Thanjavur	Orathanadu	Orathanadu	Vadasery	10.566667	79.375000
8018	Thanjavur	Peravurani	Peravurani	Peravurani	10.283333	79.202778
08021D-A	Thanjavur	Kumbakonam	Kumbakonam	Kumbakonam-1	10.958333	79.374167
08022D-B	Thanjavur	Kumbakonam	Kumbakonam	Kumbakonam-2	10.958333	79.374167
08023D-A	Thanjavur	Thiruvidaimarudur	Thiruvidaimarudhur	Aduthurai-1	11.016667	79.486111

08024D-B	Thanjavur	Thiruvaidaimarudur	Thiruvaidaimarudhur	Aduthurai-2	11.016667	79.486111
08025D-C	Thanjavur	Thiruvaidaimarudur	Thiruvaidaimarudhur	Aduthurai-3	11.016667	79.486111
8026	Thanjavur	Papanasam	Ammapettai	Kovarthakudi-1	10.838889	79.238889
8027	Thanjavur	Papanasam	Ammapettai	Kovarthakudi-2	10.838889	79.238889
8028	Thanjavur	Thanjavur	Budalur	Thirukattupalli	10.850000	78.991667
8029	Thanjavur	Thanjavur	Budalur	Thogur	10.827778	78.808333
8030	Thanjavur	Thanjavur	Thanjavur	Thanjavur	10.783333	79.133333
41018	Thanjavur	Papanasam	Papanasam	Pasupathikovil	10.888889	79.176667
41030-B	Thanjavur	Kumbakonam	Kumbakonam	Neerathanallur	11.033333	79.361111
41041	Thanjavur	Papanasam	Ammapettai	Saliyamangalam	10.780556	79.269444
41044-B	Thanjavur	Thiruvaiyaru	Budalur	Thirukkattupalli	10.847778	78.955556
8006 A	Thanjavur	Thanjavur	Budalur	Sengippatti	10.716667	78.950000
8031	Thanjavur	Kumbakonam	Kumbakonam	Sundadraperumalkovil	10.936944	79.301944
8032	Thanjavur	Kumbakonam	Kumbakonam	Cholapuram	11.031944	79.362500
8033	Thanjavur	Kumbakonam	Kumbakonam	Thirupurambiyam	11.012778	79.334167
8034	Thanjavur	Kumbakonam	Kumbakonam	Thillaiyampur	10.936111	79.403056
8035	Thanjavur	Thanjavur	Thanjavur	Kurungulam	10.656944	79.101111
8036	Thanjavur	Orathanadu	Orathanadu	Orathanadu	10.610833	79.257778
8037	Thanjavur	Orathanadu	Thiruvonam	Thiruvonam	10.506111	79.159444
8038	Thanjavur	Pattukkottai	Pattukkottai	Pattukkotai	10.420000	79.328056
8039	Thanjavur	Papanasam	Papanasam	Papanasam	10.925556	79.274167
8040	Thanjavur	Pattukkottai	Madukkur	Madukkur	10.486667	79.395000
8041	Thanjavur	Papanasam	Ammapettai	Ammapettai	10.791389	79.317500
8042	Thanjavur	Thanjavur	Thanjavur	Vallam	10.718333	79.061944
8043	Thanjavur	Thanjavur	Thanjavur	Thanjavur (fcs)	10.771111	79.136944
8044	Thanjavur	Thanjavur	Thanjavur	Kurungulam Fcs	10.700000	79.091667
8045	Thanjavur	Papanasam	Ammapettai	Senbagapuram	10.741667	79.236944
8046	Thanjavur	Thanjavur	Budalur	Budalur Fcs	10.795833	78.979167
08001 D	Thanjavur	Thanjavur	Budalur	Pudukudi	10.725000	78.887500
08002 D	Thanjavur	Thanjavur	Budalur	Manaiyeripatti	10.725000	78.918611
08003 D	Thanjavur	Thanjavur	Budalur	Pudupatti	10.745833	78.979167
08004 D	Thanjavur	Thanjavur	Budalur	Budalur	10.795833	78.979167
08005 D	Thanjavur	Thanjavur	Budalur	Kottarapatti	10.795833	78.925000
08006 D	Thanjavur	Thanjavur	Budalur	Sengipatti	10.716667	78.950000
08007 D	Thanjavur	Thanjavur	Budalur	Cholagampatti	10.788889	78.900000
8008	Thanjavur	Pattukkottai	Pattukkottai	Pattukkottai	10.418056	79.328889
8009	Thanjavur	Peravurani	Sethubavachatram	Sethubavachatram	10.066667	79.281944

08010 D	Thanjavur	Peravurani	Peravurani	Thiruchitrambalam	10.363889	79.202778
08011 D	Thanjavur	Thiruvidaimar udur	Thirupanandal	Thirupanandal	11.097222	79.466667
08012 D	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Vilangudi	10.918889	79.102778
08013 D	Thanjavur	Thiruvaiyaru	Thiruvaiyaru	Ammanpettai	10.837222	79.122778
08014 D	Thanjavur	Thanjavur	Thanjavur	Eachankottai	10.662500	79.169444

**(iv) Data Constraints:**

The following are constraints in collecting the water level data in the field and validating the data are:

- 1) The water level data are collected on the monthly basis in the referred observation wells and piezometers. The collected data is not sufficient quantity for analyzing purpose due to drying of wells, Wells abounded by various reasons, lack of selecting the alternate wells, lack of open wells available for monitoring purpose due to increased usage of bore wells in the villages, Panchayats, etc. In many villages, the water supply schemes implemented by overhead tank supply or mini energised pumps and the existing open wells are not used generally by the villagers and moreover, they filled with garbage.
- 2) The number of bore wells should be increased for monitoring purpose.
- 3) The site selection of new bore wells should be based on the Geological methods.
- 4) Strengthening the network of monitoring wells by closing the gaps in the network.
- 5) Maintenance cost should be allotted to maintain the bore wells on the periodical basis to maintain the quality as well as yield.
- 6) Installation of Automatic water level recorders in the sensitive and more water level fluctuation in the bore wells will helpful to monitor the extensive depletion of groundwater areas.
- 7) Upgrading the measuring instruments will helpful to take accurate reading of water levels in the field.
- 8) Upgrading the soft ware will helpful to minimize the errors and increasing the accuracy of data.
- 9) Erecting the Telemetric water level recorders in the over exploited Firkas will helpful to monitor the over extraction of groundwater.
- 10) Lack of manpower and transporting vehicles are also major problems for data collection in the field in proper time.

### 3. DYNAMIC GROUND WATER RESOURCES:

The State Ground and Surface Water Resources Data Centre has estimated the ground water resources of Tamil Nadu periodically in co-ordination with the Central Ground Water Board, Government of India , Ministry of Water Resources, Chennai, based on the Methodology evolved by the Ground Water Resources Estimation Committee, 1997 (GEC 97).

Groundwater potential assessment is a dynamic one and not static. While assessing an area, the following factors can be considered such as Geology, Total Irrigated Area, Total Number of Wells used for Irrigation, Water Level Data for the past five years, Average Rainfall, Total Recharge, Irrigation methods adopted in the area, Cropping pattern details, Seepage factor, Specific yield, Geological conditions prevailing in that area, Recharge through Artificial recharge structures, etc.

Groundwater potential assessment proposal should be presented for approval in the Central and State Level Working Group Committees and then, presented for final approval in the Central Level Committee as well as State Level Committees.

**The Ground Water Potential Assessments as on January 1992 and January 1997** were done in the State, taking the Panchayat Union Block as an Assessment Unit and the entire State **was categorized as Dark, Grey and White areas**. The Blocks with more than 85% to 100% ground water development (extraction) were categorized as “Dark Blocks” and the blocks with ground water development between 65% to 85% were categorized as “Grey Blocks” and blocks with less than 65% ground water development were categorized as “White Blocks”.

Subsequently, the **Ground Water Potential Assessment was done as on March 2003 and as on March 2009**. In these assessments, the Panchayat Union Blocks in Tamil Nadu were **categorized as Over-Exploited, Critical, Semi-Critical, Safe and Saline instead of Dark, Grey and White blocks**. The Blocks with more than 100% extraction were categorized as “Over Exploited Blocks”, the blocks with 90% to 100% extraction as “Critical Blocks”, the blocks with 65% to 90% extraction as “Semi Critical Blocks”, the blocks with less than 65% extraction as “Safe Blocks” and the bad quality blocks were categorized as “Saline Blocks”. No schemes should be

formulated in over exploited and critical blocks - “Notified Blocks – A category – (Stage of Groundwater extraction is 90% and above)”.

The re-estimation of groundwater resources in the State as on March 2011 and as on March 2013 can be assessed in Micro Level basis. In these assessments, the assessing unit is Firka ( Unit of Taluk) and **categorized as Over-Exploited, Critical, Semi-Critical, Safe, and Saline Firkas**. As on March 2013 assessment, in the Villupuram District

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2013, Out of 1139 Firkas in the State, 358 Firkas are categorized as “Over Exploited Firkas”, 105 Firkas are categorized as “Critical Firkas”, 212 Firkas are categorized as “Semi Critical Firkas”, 429 Firkas are categorized as “Safe Firkas” and 35 Firkas are categorized as “Saline Firkas”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” comes down from 374 to 358 Firkas, the “Critical Firkas” increased from 48 to 105 Firkas, the “Semi Critical Firkas” comes down marginally from 235 to 212 Firkas, the “Safe Firkas” comes down marginally from 437 to 429 Firkas and the “Saline Firkas” remains same as 35 Firkas. The alteration of Firkas are due to the construction of Artificial Recharge structures such as Check Dams, Recharge Wells, Recharge shafts, percolation ponds; etc was constructed in the “Over Exploited Firkas” by various departments.

#### **Methodology adopted for Estimation of Ground Water Potential :**

**The present methodology used for resources assessment is known as Ground Water Resource Estimation Methodology - 1997 (GEC'97) .In GEC'97, two approaches are recommended - water level fluctuation method and norms of rainfall infiltration method. The water level fluctuation method is based on the concept of storage change due to differences between various input and output components. Input refers to recharge from rainfall and other sources and subsurface inflow into the unit of assessment. Output refers to ground water draft, ground water evapotranspiration, base flow to streams and subsurface outflow from the unit. Since the data on subsurface inflow / outflow are not readily available, it is advantageous to adopt the unit for ground water assessment as basin / sub basin / watershed, as the inflow / outflow across these**

**boundaries may be taken as negligible.**

**In each assessment unit, hilly areas having slope more than 20% are deleted from the total area to get the area suitable for recharge. Further, areas where the quality of ground water is beyond the usable limits should be identified and handled separately. The remaining area after deleting the hilly area and separating the area with poor ground water quality is to be delineated into command and non-command areas. Ground water assessment in command and non-command areas are done separately for monsoon and non-monsoon seasons.**

**The rainfall recharge during monsoon season computed by Water Level Fluctuation (WLF) method is compared with recharge figures from Rainfall Infiltration Factor (RIF) method. In case the difference between the two sets of data are more than 20% then RIF figure is considered, otherwise monsoon recharge from WLF is adopted. While adopting the rainfall recharge figures, weight age is to be given to WLF method over adhoc norms method of RIF. Hence, wherever the difference between RIF & WLF is more than 20%, data have to be scrutinized and corrected accordingly.**

**During non-Monsoon season, rainfall recharge is computed by using Rainfall infiltration Factor (RIF) method. Recharge from other sources is then added to get total non-Monsoon recharge. In case of areas receiving less than 10% of the annual rainfall during non-monsoon season, the rainfall recharge is ignored.**

The total annual ground water recharge of the area is the sum-total of monsoon and non-monsoon recharge. An allowance is kept for natural discharge in the non-monsoon season by deducting 5 to 10 % of total annual ground water recharge.

The balance ground water available accounts for existing ground water withdrawal for various uses and potential for future development. This quantity is termed as Net Ground Water Availability.

Net Ground Water Availability = Annual Ground Water Recharge - Natural discharge during non-monsoon season.



GEC'97 methodology has recommended norms for various parameters being used in ground water recharge estimation. These norms vary depending upon water bearing formations and agroclimatic conditions. While norms for specific yield and recharge from rainfall values are to be adopted within the guidelines of GEC'97, in case of other parameters like seepage from canals, return flow from irrigation, recharge from tanks & ponds, water conservation structures, results of specific case studies may replace the adhoc norms.

**The Gross yearly ground water draft is to be calculated for Irrigation, Domestic and Industrial uses. The gross ground water draft would include the ground water extraction from all existing ground water structures during monsoon as well as during non-monsoon period. While the number of ground water structures should preferably be based on latest well census, the average unit draft from different types of structures should be based on specific studies or adhoc norms given in GEC'97 report.**

**The stage of Ground water Development is defined by**

$$\text{Stage of Ground water Development (\%)} = \frac{\text{Existing Gross Ground water Draft for all uses}}{\text{Net annual Ground Water Availability}} \times 100$$

**The units of assessment are categorized for ground water development based on two criteria – a) stage of ground water development and b) long-term trend of pre and post monsoon water levels. Four categories are - Safe areas which have ground water potential for development; Semi-critical areas where cautious ground water development is recommended; Critical areas; Over -exploited areas where there should be intensive monitoring and evaluation and future ground water development be linked with water conservation measures.**

The criteria for categorization of assessment units are as follows:

S. No.	Stage of Groundwater Development	Significant Long term Decline		Categorization
		Pre-monsoon	Post -monsoon	
1.	<=70%	No	No	SAFE
		Yes / No	No / Yes	To be re-assessed
		Yes	Yes	To be re-assessed
2.	>70% and <=90%	No	No	To be re-assessed
		Yes / No	No / Yes	SEMI – CRITICAL
		Yes	Yes	SEMI – CRITICAL
3.	>90 and <=100%	No	No	To be re-assessed
		Yes / No	No / Yes	CRITICAL
		Yes	Yes	CRITICAL
4.	>100%	No	No	To be re-assessed
		Yes / No	No / Yes	OVER- EXPLOITED
		Yes	Yes	OVER- EXPLOITED

Note: 'To be re-assessed' means that data is to be checked and reviewed. If the ground water resources assessment and the trend of long term water levels contradict each other. This anomalous situations requires a review of the ground water resource computations, as well as the reliability of water level data.

The long term ground water level data should preferably be for a period of 10 years. The significant water level decline may be taken in consideration between 10 to 20 cm/ year depending upon the local hydro geological conditions.

**Dynamic Ground Water Resources Estimation of TamilNadu As on March 2013**

**District Summary**

**( in ha.m )**

<b>THANJAVUR DISTRICT</b>							
Sl.No ( District))	District	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses (4+5)	Stage of Ground Water Development $\{(6/3)*100\}$ %	No of Over Exploited Firkas
1	2	3	4	5	6	7	8
1	THANJAVUR	74,652.08	73,452.65	2,517.97	75,970.62	102	24

**Firka Wise Summary**

**(in ha.m)**

<b>THANJAVUR DISTRICT</b>							
Sl. No	Assessment Unit (Firka)	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses (4+5)	Stage of Ground Water Development $\{(6/3)*100\}$ %	Category of the Firka
1	ADIRAMPATTINAM	856.05	733.70	26.18	759.88	89	SEMI CRITICAL
2	ADUTHURAI	1,012.86	1,558.00	62.67	1,620.67	160	OVER EXPLOITED
3	AGARAPETTAI	1,636.94	1,044.00	40.68	1,084.68	66	SAFE

4	AMMAPET	1,569.93	1,983.20	45.82	2,029.02	129	OVER EXPLOITED
5	ANDIKKADU	1,263.26	1,045.55	50.84	1,096.39	87	SEMI CRITICAL
6	AVANAM	1,139.88	1,582.20	45.17	1,627.37	143	OVER EXPLOITED
7	AYYAMPETTAI	1,462.67	1,879.20	83.99	1,963.19	134	OVER EXPLOITED

### THANJAVUR DISTRICT

Sl. No	Assessment Unit (Firka)	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses (4+5)	Stage of Ground Water Development $\{(6/3)*100\}$ %	Category of the Firka
8	BUDALUR	2,027.99	1,691.50	64.18	1,755.68	87	SEMI CRITICAL
9	CHOLANMALIGAI	1,374.15	908.80	102.65	1,011.45	74	SEMI CRITICAL
10	DEVANANCHERI	1,292.60	2,090.00	53.50	2,143.50	166	OVER EXPLOITED
11	EACHANKOTTAI	2,040.46	904.50	37.32	941.82	46	SAFE
12	KABISTHALAM	1,961.18	1,812.80	86.01	1,898.81	97	CRITICAL
13	KANDIYUR	1,335.26	1,308.00	62.21	1,370.21	103	OVER EXPLOITED
14	KATHIRAMANGALAM	975.42	1,060.00	59.73	1,119.73	115	OVER EXPLOITED
15	KAVALIPATTI	1,623.93	1,308.60	53.29	1,361.89	84	SEMI CRITICAL
16	KUMBAKONAM	1,401.28	2,349.20	49.26	2,398.46	171	OVER EXPLOITED
17	KURICHI	1,191.71	946.25	37.45	983.70	83	SEMI CRITICAL
18	KURUVIKARAMBAI	1,442.31	2,113.70	58.59	2,172.29	151	OVER EXPLOITED
19	MADUKKUR	1,130.93	464.50	44.46	508.96	45	SAFE
20	MELATTUR	1,412.29	1,403.60	28.28	1,431.88	101	OVER EXPLOITED
21	MURUKKANGUDI	1,238.72	1,768.00	50.86	1,818.86	147	OVER EXPLOITED
22	NACHIYARKOIL	998.70	1,086.40	78.05	1,164.45	117	OVER EXPLOITED
23	NADUKAVERI	1,210.31	1,291.60	56.33	1,347.93	111	OVER EXPLOITED

24	NAMBIVAYAL	1,248.03	970.15	45.03	1,015.18	81	SEMI CRITICAL
25	NANJIKOTTAI	1,816.82	2,889.90	57.28	2,947.18	162	OVER EXPLOITED
26	ORATHANAD	2,663.72	1,666.50	47.45	1,713.95	64	SAFE
27	PANDANALLUR	1,109.00	1,719.20	59.19	1,778.39	160	OVER EXPLOITED
28	PAPANASAM	1,165.17	1,813.20	47.32	1,860.52	160	OVER EXPLOITED
29	PATTUKKOTTAI	1,736.90	1,568.25	50.60	1,618.85	93	CRITICAL
30	PERAMBUR	1,036.48	738.00	24.78	762.78	74	SEMI CRITICAL
31	PERAVURANI	1,238.50	766.85	24.11	790.96	64	SAFE
32	PERIYAKOTTAI	1,153.68	546.75	35.43	582.18	50	SAFE
33	PERUMAGALUR	954.73	412.15	31.14	443.29	46	SAFE
34	RAMAPURAM	963.72	1,489.65	45.35	1,535.00	159	OVER EXPLOITED
35	SALIYAMANGALAM	1,566.52	720.90	62.02	782.92	50	SAFE
36	SENGIPATTI	2,320.26	628.00	36.92	664.92	29	SAFE
37	SILLATHUR	1,715.60	1,417.50	45.29	1,462.79	85	SEMI CRITICAL
38	THAMBIKKOTTAI	811.52	559.00	20.08	579.08	71	SEMI CRITICAL
39	THANJAVUR	1,548.71	1,442.95	57.11	1,500.06	97	CRITICAL
40	THEKKUR	2,743.30	1,287.50	50.84	1,338.34	49	SAFE
41	THIRUKKATTUPALLI	1,644.49	1,461.00	38.44	1,499.44	91	CRITICAL
42	THIRUMANGALAKOTTAI	3,066.28	2,936.85	42.72	2,979.57	97	CRITICAL
43	THIRUVAIYARU	1,002.70	1,269.20	54.25	1,323.45	132	OVER EXPLOITED
44	THIRUVIDAMARUDUR	905.77	1,676.15	37.51	1,713.66	189	OVER EXPLOITED
45	THONDARAMPATTU	2,104.38	2,710.00	51.68	2,761.68	131	OVER EXPLOITED
46	THUVARANKURICHI	1,333.31	1,359.00	54.47	1,413.47	106	OVER EXPLOITED
47	TIRUCHITRAMBALAM	1,561.86	1,748.20	77.39	1,825.59	117	OVER EXPLOITED
48	TIRUPPANANDAL	1,234.47	1,808.40	51.22	1,859.62	151	OVER EXPLOITED
49	ULUR	2,407.78	1,791.05	52.19	1,843.24	77	SEMI CRITICAL
50	VALLAM	1,999.53	3,723.05	40.62	3,763.67	188	OVER EXPLOITED
<b>TOTAL</b>		<b>74,652.08</b>	<b>73,452.65</b>	<b>2,517.97</b>	<b>75,970.62</b>	<b>102</b>	

#### **4. Groundwater quality issues:**

The rainfall is the main source for the availability of water both in surface and sub surface. The quantum of rainfall varies every year depending upon the monsoon. However, the extraction of surface and sub surface water is increasing year by year. It leads to environmental impact on the water sources like depletion of water level, deterioration of water quality. It makes the demand for the quantification of available water and also its quality for various purposes like agriculture, industries, drinking and domestic purposes.

For the present assessment, the value of Total Dissolved Solids (TDS) have been considered for demarcation of good / bad quality areas. For this purpose, the TDS value of less than or equal to 2000 mg/l have been considered as good quality and the value more than 2000 mg/l have been considered as bad quality areas.

The presence of fluoride in natural Ground Water is having its merits and demerits depending upon the concentration. Presence of fluoride <1.0 mg/l in drinking water reduces dental diseases whereas higher level > 1.50 mg/l will affect the health and causes dental fluoridise. Nitrate is noted significantly in Ground Water due to use of chemical fertilizer for agriculture and other local pollution rocks and soils are also contributing nitrate to Ground Water. Arsenic is another poisonous heavy metal in Ground Water. The allowable limits for drinking purposes are 0.05 mg/l.

In Thanjavur District, the quality of Ground Water generally ranges from moderate to good quality both in the shallow dug well and bore wells except in & around the Kazhuveli tank, where the water quality is poor due to seawater intrusion in the lagoons during high tide seasons, the production of salt and Aquaculture farming.

#### **5. Groundwater issues and challenges:**

The groundwater quantity and quality are to be highlighted and may be analyzed in terms of :

**(i) Problems posed by nature:**

In terms of Quantitative aspects, nowadays, rainfall may more within the short period of duration. Due to this aspect, recharge is less and runoff will be more.

The availability of groundwater is less due to over extraction than recharge. The Percentage of OE/Critical Firkas increased due to this reason. Increasing the artificial recharge structures in the proper areas may avoid the depletion of groundwater especially in OE/Critical Firkas.

**(ii) Problems caused by anthropogenic activities:**

The problems caused due to intensive groundwater extraction, intensive surface water irrigation, intensive mining activities, growing urban complexes and industrial establishments will lead to drastic depletion in groundwater resources only. Proper alternative recharge structures must be established.

**(iii) Problems caused by socio-economic condition:**

The land holdings of farmers may be different from another. One farmer having more than 5 Acres has less expense than a farmer having one acre. The free electric supply to all farmers have chance to extract more groundwater. To avoid this, proper guidance will be given to the farmers for the usage of groundwater.

**(iv) Administrative issues:**

To control, regulate and manage the Ground Water Resources in the State, there is no groundwater act, now in force. But, the **Chennai Metropolitan Area Ground Water (Regulation) Act, 1987** is in force and it extends to Chennai City and notified 302 revenue villages in Kanchipuram and Thiruvallur Districts, only.

The rest of Tamilnadu, **G.O.(Ms).No.142, Public Works (R2) Department, dated: 23.07.2014** and **G.O.(Ms).No.113, Public Works (R2) Dept , Dt:09.06.2016** are regulate and manage the groundwater resources. The Government of Tamil Nadu had enacted the **Tamil Nadu Ground Water (Development and Management) Act, 2003**. However, this **Act was repealed on 14.09.2013**, in order to enact a comprehensive law to develop and manage the groundwater in the changed scenario in the State.

The pricing policy for groundwater users is also an important strategy in controlling the illegal extraction of groundwater by taking from lorries, etc. The unused dug wells and bore wells can be used as artificial recharge structures will be good concept in recharging the ground water.

## 6. Groundwater Management and Regulations:

### (i) Statute/Law/Policy/Regulations if any:

The Central Ground Water Authority has been constituted to regulate, control, development and management of ground water resources for whole country based on overall situation prevailing in India. But, the ground water conditions are varying from State to State. **Ground Water is a State subject and the State Government has every right to protect and regulate their own precious ground water resources according to the prevailing conditions in the State.**

The Tamil Nadu Government had enacted “**The Tamil Nadu Ground Water (Development and Management) Act, 2003**” which was subsequently **repealed in 2013**, so as to bring out an effective management Act considering the present scenario. **As an interim measure, for regulating the exploitation of ground water, the Government have issued G.O. (Ms) No.142,PWD dated 23.07.2014 for regulations for management of ground water for safe guarding the scarce groundwater resources in Tamil Nadu State.** In the absence of an Act, the Government executes this Government order to control, regulate and manage the Ground Water Resources while taking into consideration of the future of the State and its people.

**The State Ground and Surface Water Resources Data Centre has estimated the Ground Water resources of Tamil Nadu State periodically** in co-ordination with the Central Ground Water Board, Government of India, SECR, Chennai, based on the Methodology evolved by Ground Water Resources Estimation Committee, 1997 (GEC 97).

Accordingly, **the Ground Water Potential Assessment done as on January 1992 and as on January 1997 on the basis of Panchayat Union Blocks as assessment units** in Tamil Nadu and **categorized as Dark, Grey and White areas.** The Blocks with more than 85% to 100% ground water development were categorized as “Dark Blocks” and the blocks with ground water development between 65% to 85% were categorized as “Grey Blocks” and less than 65% ground water development were categorized as “White Blocks” and the Government approved



the categorisation and released as Government order and G.O.No:326, PW (R2) Dept, dated: 23.11.1993. It was in effect up to the next assessment done as on March 2003.

Subsequently, **the Ground Water Potential Assessment done as on March 2003, categorized the blocks as Over Exploited, Critical, Semi Critical, Safe, Saline instead of Dark, Grey and White blocks.** The Blocks with more than 100% were categorized as “Over Exploited Blocks”, the blocks in between 90% to 100% as “Critical Blocks”, the blocks in between 65% to 90% as “Semi Critical Blocks” and less than 65% as “Safe Blocks” and the bad quality blocks were categorized as “Saline Blocks” and the same was approved by the Government and released as G.O.No:51, PW (R2) Dept, dated: 11.02.2004. It was in effect up to the next assessment done as on March 2009.

The Next **Ground Water Potential Assessment done as on March 2009**, and the same was approved by the Government and **released as G.O.No:52,PW(R2) Dept, dated: 02.03.2012.**

As per G.O.No.52,PW(R2) Dept, dated: 02.03.2012 and G.O. (Ms) No.142,PW(R2)Dept dated 23.07.2014, the State Government have authorized and empowered the Chief Engineer, State Ground and Surface Water Resources Data Centre, Chennai for issuing permission or license or No Objection Certificate/renewal for drawal and transportation of Ground Water based on the hydro geological conditions to the New Industries, Packaged Drinking Water Companies, Infrastructures and Mining projects, etc except the areas to which the Chennai Metropolitan Area Ground Water (Regulation) Act,1987 extends.

Subsequently, the next **Ground Water Resources Assessment of the State was completed as on March 2011** and taking **Firka as an assessment unit** in the State of Tamil Nadu. Based on the above assessment, **the Government had approved and issued G.O.(Ms).No.113, Public Works (R2) Dept , Dt:09.06.2016** for categorisation of the Firkas in the State as Over Exploited, Critical, Semi-Critical and Safe Firkas. All the Over Exploited and Critical Firkas are notified as **“A” Category** (where the stage of ground water extraction is 90% and Above) and all the Semi Critical and Safe Firkas are notified as **“B” Category** (where the stage of ground water extraction is below 89%). In this Government Order, the Government had

directed that **no Schemes should be formulated in the “A” Category Firkas and in “B” Category Firkas, all the Schemes should be formulated through State Ground and Surface Water Resources Data Centre by issuing No Objection Certificate for Ground Water Clearance.**

The term “Schemes” excludes Energisation of Agricultural pump sets by the Tamil Nadu Electricity Board. The present order may also exclude the Ground Water drawal for a). Domestic purpose by individual household, b). Domestic Infrastructure project (Housing), c). Government’s Drinking Water Supply Schemes and d). non water based industries, (i.e.- the industries which do not require and use water, either as raw material or for other processing). However, the domestic use of water by this non water based industries will be permitted by the Chief Engineer / State Ground and Surface Water Resources Data Centre based on hydro geological conditions. (i.e. NOC from Chief Engineer, State Ground and Surface Water Resources Data Centre, Water Resources Department, Chennai). The list of non water based industries will be issued by the Industries Department of Government of Tamil Nadu separately.

Appropriate rain water harvesting and Artificial recharge schemes should be carried out in the categories viz , Over exploited , Critical , Semi Critical and Safe blocks of Tamil Nadu. While carrying out the above schemes, priority should be given to marginal quality and bad quality areas so as to avoid further deterioration.

All the schemes and proposals based on Ground Water will have to adhere to the Government orders and conditions. The Chief Engineer, State Ground and Surface Water Resources Data Centre had received the Government approval on Groundwater Assessment as on March 2011.

Regarding granting permission/ License for transportation of ground water for water suppliers/ private water tankers for selling the water on commercial basis, the State Ground and Surface Water Resources Data Centre, Public Works Department is not issuing any No Objection Certificate.

The Chief Engineer, SG&SWRDC have empowered to issue the NOC for drawal of Ground Water is up to 1 Million Gallons per day. Beyond this, the firms should get an approval in Water Utilisation Committee for drawal of both Surface and Ground Water resources in Tamil Nadu.

**(ii) Suggestions for improvement of groundwater governance.**

Groundwater is recognized as a common pool resource. The use of groundwater by anybody should in no way cause adverse impacts on realization of other person's fundamental right to safe water for life. Access to groundwater without any discrimination, equitable distribution, and sustainable use considering the needs of future generations are considered. Right to water for life is the first priority and then to agriculture, and eco system needs. The precautionary principle and the polluter pay principle only to conserve and recharge groundwater.

The responsibility of the State for ensuring every person's right to safe water even when water service is delegated to a private agency. Groundwater is not amenable to ownership by the State, communities or persons and the State is the public trustee of groundwater. It also deals elaborately on groundwater protection and groundwater security plans.

The Groundwater Act should incorporate legal pronouncement on groundwater such as the public, trust doctrine and recognition of the right to groundwater. It addresses the deficiencies in the present legal frame work in dealing with over exploitation and includes the improvements to the control mechanism to ensure the qualitative and quantitative sustainability of groundwater resources. It proposes to strengthen the regulating powers of Panchayat and Municipal bodies related to Ground water in line with articles 243G and 243W of the constitution.

The Pricing of Ground Water for irrigation, Industrial and domestic purposes and collecting fees by water users association should be left to the State decision.

**(iii) Institutions governing/managing/monitoring the resources and Institutional structure, gaps if any :**

While framing the Groundwater Act, the recommendation for the constitution of (1) Gram Panchayat Groundwater Sub-Committee, (2) Block Panchayat Groundwater Management, (3) Ward Groundwater Committee, (4) Municipal Water Management Committee, (5) District Ground Water Council and (6) State Ground Water Advisory Council to control and manage Ground water should be considered.

- The constitution of aforesaid committees is completely based on administrative boundaries such as village, block, ward, municipality, district etc. But, with respect to water resources control and management issues and conflicts, the boundary should be based on river basins to have efficient monitoring and management of water resources. The Government of India, in all issues related to water resources considered only the basin boundary concept. Hence, the institutional frame work has to be revised so as to have the jurisdiction of the committees with respect to basin / watershed concept. Further, Government of India, MoWR, RD &GR advocates time and again integrated water resources management. The above institutional frame work separately for groundwater is not in line with that.
- Further, it has also provided for many committees, viz., Gram Panchayat Groundwater Sub-Committee, Village Water and Sanitation Committee, Ward Committee, Municipal Committee, Block level Committee, District level Committee and State level Committee. For managing surface water resource water users association already exists. Too many committees at village / ward level would jeopardize the very purpose of managing the Groundwater resources efficiently and may invite lot of conflicts.

**(iv) Areas of people/private participation if any:**

The participation of people or private parties in the groundwater management is not suggestible, acceptable one and more chances of making litigations in the society and has unnecessary law and order problems may arise.

**7. Tools and Methods**

**(i) Water Level and quality measurements through wells, piezometers, DWLR with telemetry, ground water elevation.**

In general, water levels in the observation wells and piezometers can be taken manually by measuring tape. This is the simple, cost effective, good accuracy and less maintenance method. Water Levels are observed above the Measuring point.

Monitoring water level in DWLR with telemetry is costly, high maintenance, good accuracy, get the data immediately on desktop, easy to analysis purpose.

The water quality generally is analysed in the Chemical Lab only by collecting water samples in Pre Monsoon and post Monsoon period in the field. Sometimes, instant kits are used for analyzing the TDS and Ph level in the water.

**(ii) Metering water supply to confirm contribution from groundwater.**

Metering the water supply is essential one to monitor the overall usage of groundwater by different sectors. Flow meter must be fixed in every extraction structure and it has to be monitored periodically by Government officials.

**8. Performance Indicators:**

**(i) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/ standards currently.**

The Ground Water resources of State periodically estimated in co-ordination with the Central Ground Water Board, Government of India, SECR, Chennai, based on the Norms evolved by Ground Water Resources Estimation Committee, 1997 (GEC 97).

The ground water potential assessment can be assessed based on the bench marks such as Average Rainfall, Total recharged Area, Monthly Water Level Data, Total no of wells in the area, Irrigation methods adopted, Cropping pattern details, Geological conditions prevailing in that area, Specific yield, Seepage factor, Constructed Artificial recharge structures, etc and various calculations methods, etc, have to be considered.

**Status of various Performance Indicators**

**(ii) Percentage of over exploited ,critical, Semi critical , Safe and Saline/Poor quality Firkas/area units**

- Trend of over exploited and critical Firkas to total Firkas as per pervious assessment. ( 2009 Assessment Vs 2011 Assessment)

The Ground Water Potential Assessment as on March 2009, Out of 14 blocks in Thanjavur District, 10 blocks are categorized as Over Exploited and remaining 4 blocks are categorized as Semi Critical and Safe blocks.

The next Ground Water Resources Assessment of the State was done as on March 2011 and taking Firka as an assessment unit. In Thanjavur District, totally 50 Firkas, 29 Firkas are categorized as Over Exploited and remaining 13 Firkas are categorized as Semi Critical and Safe blocks and Saline.

Instead of taking Block as an assessment, Firka can be taken as assessment unit is to concentrate the assessment in micro level. For Eg, a block contains more than three to four Firkas. In this block, two Firkas may have good groundwater potential than other two Firkas but it may to categorize as Over Exploited. To avoid this, assessment done on the basis of Firkas for the benefit of farmers to the implementation of schemes related to Irrigation.

The percentage of over exploited and critical Firkas has been increased by changing the concept from Block to Firka assessment. The total percentage of over exploited and critical Blocks for 2009 Assessment is 71.42%, but, the total percentage of over exploited and critical Firkas as on March 2011 Assessment is 58%, in the Thanjavur District.

- Trend of over exploited and critical Firkas to total Firkas as per latest assessment  
The percentage of over exploited and critical Firkas has been decreased in 2013 latest assessment when compared to 2011 assessment. In 2011 assessment, out of 50 Firkas, the total percentage of over exploited and critical Firkas is 58%, but, In 2013 assessment, out of 50 Firkas, it has been come down marginally to 60.71%, in the Thanjavur 58% District.
- Existing state of groundwater resources as compared to previous assessment ( 2013 Vs 2011 assessment).

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2013, Out of 50 Firkas in the District, 24 Firkas are categorized as “Over Exploited Firkas”, 5 Firkas are categorized as “Critical Firkas”, 11 Firkas are categorized as “Semi Critical Firkas”, 10 Firkas are categorized as “Safe Firkas”.

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2011, Out of 50 Firkas in the District, 29 Firkas are categorized as “Over Exploited Firkas”, 8 Firkas are categorized as “Semi Critical Firkas”, 11 Firkas are categorized as “Safe Firkas”, 11 Firkas are categorized as “Saline”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” decreased from 29 to 24 Firkas, the “Critical Firkas” increased from Nil to 5 Firkas, the “Semi Critical Firkas” increased marginally

from 8 to 11 Firkas, the “Safe Firkas” increased from 11 to 10 Firkas and the “Saline Firkas” decreased from 2 to Nil Firkas. The alteration of Firkas are due to the construction of Artificial Recharge structures such as Check Dams, Recharge Wells, Recharge shafts, percolation ponds; etc was constructed in the “Over Exploited Firkas” by various departments.

S.No	Categorisation	No of Firkas	
		2011	2013
1	Over Exploited	29	24
2	Critical	Nil	5
3	Semi Critical	8	11
4	Safe	11	10
5	Saline	2	Nil
TOTAL		50	50

(iii) Water Level(Well hydrographs and water level trends – pre and post monsoon such as declining trend/rising trend,etc).

(iv) Comparison of area irrigated from groundwater resources (Current assessment 2013 to previous assessment 2011).

S.No	Description	2011 Assessment	2013 Assessment
1	Area Irrigated from ground water resources( In hm)	6538.07	6505.06

(v) No. of groundwater abstraction structures (existing no. over the year and trends).

S.No	Description	2011 Assessment	2013 Assessment
1	No of groundwater abstraction structures for Irrigation	1,71,071 Wells	1,70,983 Wells

**(vi) Trend in water quality ( no of habitations affected with groundwater contamination like As, F, Salinity etc. Change in contamination level over the years.**

**(vii) Source augmentation (Groundwater)**

- Area covered with infrastructure for recharging groundwater:

The proper artificial recharge structures has to be constructed based on local geological conditions in the areas of existing infrastructure for recharging groundwater according to their extraction needs.

- GW recharge plan to combat adversaries:

Groundwater recharge plans has to be strictly followed by with of implementing the groundwater laws to combat adversaries.

9. Reforms undertaken/being undertaken/proposed if any.

10. Road Map of activities/tasks proposed for better governance with timelines and agencies responsible for each task/activity.