

# EXPLORING GROUNDWATER LEVEL OF NAMAKKAL DISTRICT IN TAMIL NADU BY EMPLOYING GEOGRAPHIC INFORMATION SYSTEM

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**Abstract** - Groundwater is one of the important resources for living organism's life. It will act as a life bearing layer when rainfall fails. India is an agriculture country and mostly depends on monsoon rainfall, the study on ground water is very important. This study focuses groundwater level of Namakkal district in Tamil Nadu. Nearly 34 years (1980 to 2013) of secondary data has been analyzed with simple statistical method and the result was brought out using Geographical Information System technology. The data were analysed based on seasonal and mean annual level. The overall study identified that at seasonal level the average maximum fall in groundwater level is identified in south west monsoon at Thimmanaickenpatti (22.20 m) and minimum is identified in north east monsoon season at Mohanur (1.45 m). The mean annual groundwater level within the district is identified over the period of study indicates that the lower level of 1.82 m is at Thimmanaickenpatti and highest level of 19.82 m at Pudupatti of Namagiripettai Block. Based on the availability of ground water level, the selection of agricultural crops and irrigation may be decided. Incorporating GIS in water resources study may provide better understanding on the area for the planners to prepare the action plan.

**Key Words:** Monsoon, Ground water Level, Rainfall, GIS and Statistics.

## 1. INTRODUCTION

Water level, being directly measurable, is an important parameter for the study of aquifer systems and their dynamic behavior. Water level in an unconfined aquifer is a continuous variable showing spatial variability, variations in rate of change arise due to the heterogeneity of the aquifer. Groundwater is an important water resource in India for domestic, irrigation, and industrial needs (Mamatha and Rao, 2010). India is the largest groundwater user in the world. Groundwater has played a significant role in the maintenance of India's economy, environment and standard of living. Groundwater is, however, the main and more reliable resource of irrigation. Both over-exploitation from aquifers to address the irrigation needs, and drought events have caused severe water table level drop in many areas. Where groundwater is used for irrigation, aquifers are also being depleted at an alarming rate. Li and Revesz (2004) applied several interpolation methods to investigate the Spatio - temporal variation of regionalized variables. Tuckfield (1994) used the appropriate sampling frequency for monitoring groundwater well contamination. He used

temporal variogram to find the suitable sampling interval. Monitoring groundwater level fluctuation data on seasonal basis can identify early indicators of changes in the groundwater resource and help to understand how to protect it (Holmes *et.al.*, 2001).

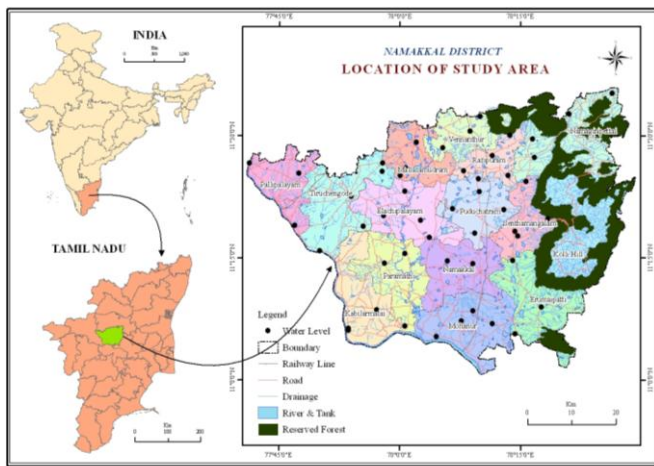
## 2. STUDY AREA

The Namakkal District lies in the interior part of Tamil Nadu and extends between 11<sup>00</sup>' to 11<sup>36</sup>' north Latitudes and 77<sup>40</sup>' to 78<sup>30</sup>' east longitudes. The total geographical area of the district is 3429.3 sq.km. Namakkal district is divided into five Taluks namely, Namakkal, Tiruchengode, Paramathi, Rasipuram and Kollimalai. Administratively Namakkal district has 15 blocks and 396 Panchayat villages. The District area covers 2.64% of the total area of Tamil Nadu state. The location of the study area is shown in (Fig.1). The district experiences subtropical climate with moderate temperature. The maximum temperature ranges from 24<sup>0</sup>C to 39<sup>0</sup>C and the minimum temperature from 13<sup>0</sup>C to 28<sup>0</sup>C. The average annual rainfall of the district is 785.4 mm. The major soil types found in this district are Black soil, Brown soil, Alluvial soil and Mixed soil. The major rivers flowing in the Namakkal district are Cauvery and Thirumanimuthar. The total population of Namakkal district as per 2011 is 1,726,601. The population density of Namakkal district for 2011 is 505 people per sq. km. Average literacy rate are 74.63 and Sex Ratio is 986 per 1000 male.

## 3. METHODS

This study purely based on the secondary data collected from the state ground and surface water resources data centre, Chennai. The year chosen for this analysis is from 1980 to 2013. The water level data collected from the centre has been analysed by using simple statistical techniques. The water level data was categorized into seasonal and annual to check the spatial variation of water level over the district. Using GIS technique has created the database of water level. Spatial analysis tool has been used extensively in this analysis mainly interpolation technique because, it is a technique used to find out the unknown values from the known values. The results are brought out using cartographic technique as a map.

**Fig- 1:** Location of study area – Namakkal District



### 3. RESULTS AND DISCUSSION

#### 3.1 Mean annual water level

The mean annual water level has been varied from 1.82 to 19.82 m over the period of study. The minimum water level is found in Palapatty village of Mohanur block and the maximum is found in Pudupatti village of Namagiripet taluk. It clearly indicates from the figure that the water level < 2 m is mainly found in the southern part of the district because it is adjoining to the Cauvery River. The rise in mean water level between 2 to 5 m is found in north western and central eastern part of the district. The water level of 5 to 10 m is found in the central and western part of the district. Among the blocks Erumaipatti, Mohanur, Senthamangalam, Puduchatram, Rasipuram, Elachipalayam, Namagiripet and Kabilarmalai have the water level between 10 to 20 m during the study area. The water level of > 20 m is found mainly in the eastern part under the foothills of Kolli hill (Fig. 2).

maximum is found in Pudupatti village of Namagiripet taluk. The range of water level has been varied from 1.72 to 17.0 m. It clearly indicates from the figure that the water level < 2 m is mainly found in the southern part of the district because it is adjacent to the Cauvery River. Among the blocks Pallipalayam, Tiruchengode, southern part of Kabilarmalai and Mohanur having the water level of 2 to 5 m mainly because of river Cauvery. The spatial distribution of water level between 5 to 10 m is almost found in entire block of the district except Namagiripet. The area having the water level between 10 to 20 m is found in the eastern and central part comprising the blocks of Erumaipatti, Mohanur, Senthamangalam, Puduchatram, Rasipuram, Elachipalayam and Namagiripet. The water level of > 20 m is found mainly in the eastern part under the foothills of Kolli hill (Fig. 3).

#### 3.3 Summer

The mean water level in the season is varies from 2.07 to 20.29 m. The minimum value of water level is found in Palapatty village of Mohanur block and the maximum is found in Pudupatti village of Namagiripet taluk. During this season the water level of < 2 m is found in the southern part of the district mainly in Kabilarmalai and Mohanur. The water level between 2 to 5 m is found in north western and central eastern part of the district. The water level of 5 to 10 m is found in the entire blocks of the district (Fig.3). Among the blocks Erumaipatti, Mohanur, Senthamangalam, Puduchatram, Rasipuram, Elachipalayam Namagiripet and Kabilarmalai recorded the water level between 10 – 20 m during summer. It is interesting that even though Kabilarmalai block is near to river Cauvery, it records the lowest water level during summer. The mean water level of > 20 m is found around the foothills of Kollihill block in the eastern part and as a patch in the northern part of Mallasamudram block.

#### 3.4 Southwest Monsoon Season

The mean water level during this season is varies from 1.97 to 22.20 m. The minimum value of water level is found in Palapatty village of Mohanur block and the maximum is found in Thimmanaickenpatti village of Namagiripet taluk. Even though this season gets some proportion of rainfall during this season, there is no drastic change in the area having the water level of < 2 m compared to winter and summer season. The water level of 2 to 5 m is found in the north eastern part of the district comprising the block of pallipalayam and Tiruchengode. The spatial distribution of water level between 5 to 10 m is reduced in an area and mainly found in the western part of the district. It is to be noted that the water level between 10 to 20 m areas has been increased even though this season gets some rainfall. This situation is mainly found in the central and north eastern part of the district. The water level of > 20 m is found in the eastern part around Kollimalai and also found as patches in Mallasamudram and Rasipuram block of the district (Fig.3).

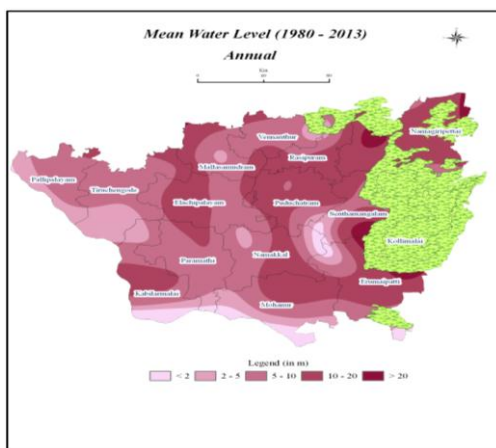


Fig- 2: Mean Annual water level – Namakkal district

#### 3.2 Winter

During this season the value of mean water level is found minimum in the Palapatty village of Mohanur block and the

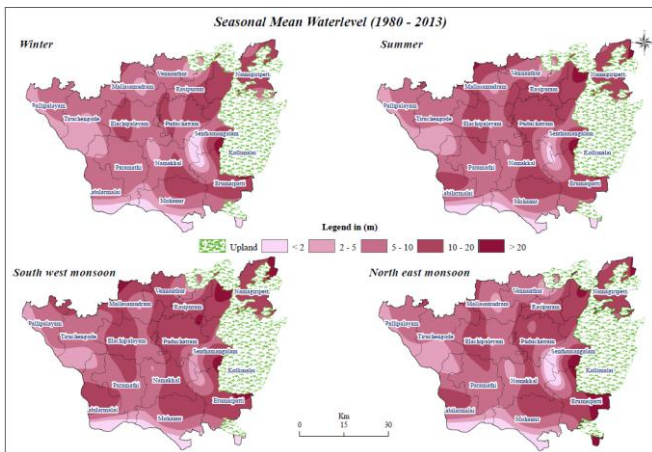


Fig- 3: Seasonal Mean water level – Namakkal district

### 3.5 North East Monsoon Season

This district almost gets equal rainfall during this season. The minimum value of mean water level is found in Palapatty village of Mohanur block and the maximum is found in Pudupatti village of Namagiripet taluk. The water level during this season is varies from 1.45 to 19.07 m. As like Southwest monsoon, the water level < 2 m is found in the southern part of the district. But, there is a raise in water level in the central eastern part of the study area (Fig.3). The mean water level between 2 to 5 m is found in the north western part comprising the block of Pallipalayam and Tiruchengode followed by Namakkal, Mallasamudram and Vennanthur as patches during this season. The spatial distribution of mean water level between 5 to 10 m clearly indicates that there is a raise in water level during this season and it has been noted almost in all the blocks except the block found in the eastern part of the district. The mean water level of 10 – 20 m is found in the central and eastern part of the district. The water level of > 20 m is found mainly in the eastern part under the foothills of Kollu hill.

Table -1 Water Level in Namakkal district (1980 – 2013) Mean Values

Sl. No	Well No	Village	Ann ual	Win ter	Sum mer	SW M	NE M
1	5360 1	Naducombai	10.3 8	10.3 0	10.40	10. 25	10. 57
2	5360 2	Erumaipatti	13.3 3	12.1 7	12.51	14. 09	13. 94
3	5360 3	Kalkurichi	14.1 3	13.7 4	13.78	14. 54	14. 19
4	5360 4	Solaiyudaiyampatti	13.7 8	12.6 0	14.00	14. 46	13. 44
5	5360 5	Pattathiyankutti	7.67	6.06	7.54	9.1 7	6.8 9
6	5360 6	Muthugapatti	4.89	3.75	5.26	5.8 1	4.0 6
7	5360 7	Mettupatti	6.22	6.07	6.29	6.3 1	6.1 4
8	5360 8	Parali	9.87	8.99	9.66	10. 59	9.7 0
9	5360 9	Aniyapuram	13.9 0	12.8 0	13.31	14. 98	13. 80

10	5361 0	Nallipalayam	12.0 2	10.3 1	11.59	13. 72	11. 33
11	5361 1	Thalambadi	9.80	8.37	9.74	11. 17	8.9 7
12	5361 2	Manoochavadi	11.0 7	8.76	10.77	12. 82	10. 55
13	5361 3	Puduchatram	10.9 1	9.36	11.04	11. 82	10. 63
14	5361 4	Elur	11.5 0	10.5 6	11.55	12. 11	11. 26
15	5361 5	Ernapuram	5.95	5.33	6.21	6.4 0	5.5 1
16	5361 7	Velur	2.61	2.21	2.85	2.8 6	2.3 2
17	5361 9	Nallur (Kandampalaya m)	10.4 0	8.93	10.06	11. 52	10. 23
18	5362 0	Kabilarmalai	9.70	8.45	9.26	10. 58	9.8 1
19	5362 1	Pandamangalam	3.64	3.27	3.77	3.8 5	3.4 7
20	5362 3	Pottanam	12.1 3	10.6 9	11.72	12. 98	12. 39
21	5385 1	Thimmanaicken patti	19.3 3	15.5 8	18.32	22. 20	19. 02
22	5385 2	Malayalapatti	6.15	5.10	6.10	6.9 3	5.8 7
23	5385 3	Ayilpatti	12.1 8	10.1 9	12.37	13. 45	11. 61
24	5385 4	Pudupatti	19.8 2	17.0 0	20.29	21. 44	19. 07
25	5385 5	Namagiripet	17.9 7	15.7 4	18.41	18. 93	17. 72
26	5385 7	Pallavanaickanp attimettur	7.62	6.86	7.77	8.4 8	6.8 3
27	5385 9	Pillanallur	12.3 1	9.71	13.32	13. 88	10. 95
28	5386 0	Ayeepalayam	7.76	6.49	7.90	9.0 5	6.7 5
29	5386 1	Sowdapuram	9.02	7.45	9.03	10. 31	8.3 7
30	5390 1	Vaiappamalai	11.5 6	9.68	12.04	12. 99	10. 43
31	5390 2	Bommanpatti	10.6 8	9.43	10.68	11. 58	10. 33
32	5390 3	Velegoundanpatt i	5.54	4.74	5.49	6.0 4	5.4 3
33	5390 4	Sanarpalayam	8.07	7.06	8.09	8.8 2	7.7 1
34	5390 5	Elachipalayam	11.0 8	9.42	11.69	12. 56	9.6 0
35	5390 6	Ramapuram	7.81	6.61	7.80	8.7 1	7.4 4
36	5390 7	Mallasamudram	7.22	5.35	7.95	9.3 3	4.9 2
37	5390 8	Morepalayam	11.4 0	8.70	11.37	13. 25	10. 76
38	5390 9	Pathampatti	10.2 1	8.54	10.13	11. 18	10. 12
39	5391 0	Unjanai	13.2 0	11.9 1	12.96	14. 06	13. 14
40	5391 1	Chithalandur	7.06	6.02	6.49	7.6 6	7.5 4
41	5391 2	Thiruchengodu	6.90	5.75	7.06	7.4 9	6.7 0
42	5391 3	Makkiripalayam	8.93	8.13	8.54	9.5 5	9.0 2
43	5391 4	Erayamangalam	3.99	4.03	4.10	4.3 5	3.3 5

44	5391 5	Kokorayanpattai	4.27	3.81	4.37	4.7 1	3.8 8
45	5391 6	Komarapalayam	2.64	2.79	2.39	2.7 6	2.6 3
46	5391 8	Chinnamanali	7.69	6.85	8.02	8.4 7	6.8 9
47	5361 6A	Palapatty	1.82	1.72	2.07	1.9 7	1.4 5
48	5362 2AY	Ayyampalayam	4.86	4.07	4.76	5.4 1	4.7 3
49	5385 6A	Rasipuram	9.52	8.22	9.20	11. 11	8.5 8
50	5385 8A	Singalandapura m	18.3 1	16.0 3	18.29	20. 34	17. 15

### 3. CONCLUSIONS

The minimum water level is found common in all the seasons including annual in the village Palapatty of Mohanur block. Except southwest monsoon season the maximum water level is common in Pudupatti village of Namagiripet taluk. The water level is found minimum in the areas where it is adjoining to the river Cauvery. There is a variation in water level has been identified in all the seasons. During northeast monsoon season the variation of water level is minimum that indicates that during this season, Namakkal district gets maximum amount of rainfall. This kind of studies along with GIS techniques is useful for the policy makers to prepare water management facilities for agriculture as well as domestic purposes.

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