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GROUNDWATER FLUCTUATION IN PALANI TALUK, DINDIGUL DISTRICT, TAMILNADU, INDIA

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ABSTRACT

Without ground water, humanity cannot survive in this world. Groundwater is significant for farming, household and industrial needs. Insufficient of groundwater result the major economic setback of our nation. In India, especially in Tamilnadu groundwater were extracted more and to a greater extent and most of the studies and report state that, most of the safe groundwater zone area converted into the over-exploited and critical zone area. The public in the Palani Taluk largely depends upon groundwater for urban and agricultural needs. Therefore, monitoring the groundwater level and its fluctuation is important, which helps to categorise the review region based on the groundwater level. The objective of the research is to recognise groundwater fluctuation zones based on pre-monsoon and post monsoon season in Palani Taluk, to achieve this, GIS Technology got unique and advanced tools to evaluating the enormous quantity of various spatial and characteristic records.

Key words: Groundwater fluctuation, Groundwater level and GIS

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1. INTRODUCTION

Most invaluable natural resources of the earth are ground water, indirectly its relate to peoples' health and economic growth. “Due to its several inherent qualities (e.g. Consistent temperature, widespread and continuous availability, excellent natural quality, limited exposure, low development cost and drought reliability), it has become an important and reliable source of water supplies in all climatic areas, letting in both urban and rural areas of developed and developing countries” (Todd and Mays, 2005) [1]. Of the 37Mkm^3 of freshwater estimated to be present in the land, some 22% exists as groundwater, which comprises approximately 97% of all liquid freshwater potentially available for human use (Foster, 1998) [2]. “Pollutants accumulated in groundwater and soil due to the processes of continuous discharge of industrial, agricultural and domestic effluents” (Sathish Kumar S et al. 2011) [3]. Due to the remarkable development of industry and agriculture, the water scarcity become in recent years. “The expanding industrialisation, urbanisation, and husbandry, which lead to population growth, which straight away brought unavoidable water emergencies” was stated by (Yadav Janeswar et al. 2013) [4].

Palani Taluk, Dindigul District, Tamilnadu, India are facing a severe water shortage problem for the irrigation, industrial and residential purposes. In recent years Monsoon period was unpredictable, and the availability of surface water cannot assure in the right quantity at the required time. Thus, most of the area in the Palani Taluk is depend upon groundwater, which gained from burrowing wells and tube wells. However, unlimited excessive pumping of groundwater has decreased the level of groundwater in a few areas of the review region. During the summer period, burrowed wells and hand pumps also dried up, inward this way of frustrating water issue a raise in Palani Taluk. The target of the present study is to categorise the review region into various classes based on the groundwater depth level by utilising GIS programming, which helps to identify groundwater fluctuation of study area in-between Pre and Post Monsoon.

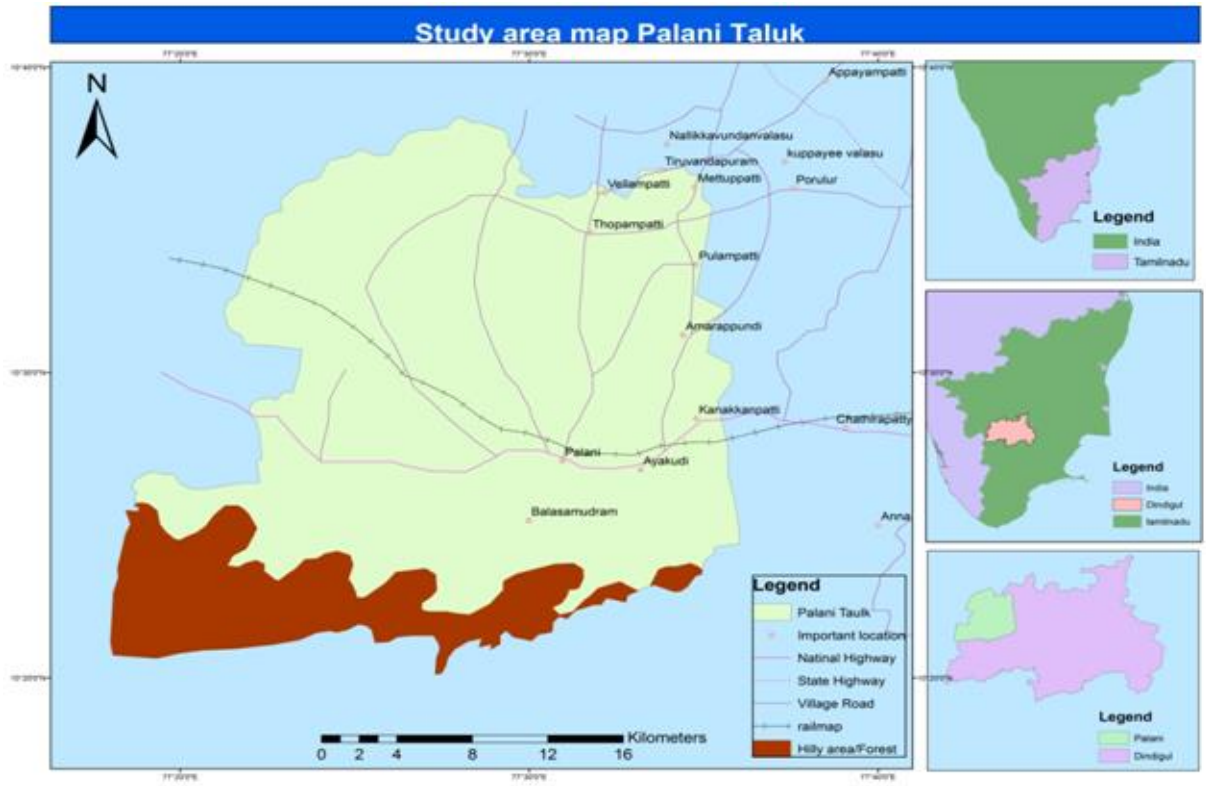

Figure 1 Palani Taluk map, Dindigul District, Tamilnadu, India

2. STUDY AREA

The review zone latitudes lie between 10°20'2'' N to 10°38'24'' N as well as longitudes 77°18'6'' E to 77°35'41'' E covering a region of 766.83 $km^{2.}$ Out of which hilly landforms cover an area of 116.85 km^2 shown in Figure 1. The review territory comes in Dindigul District of Tamilnadu. The significant source of groundwater is precipitation, south-west season. The normal average rainfall is 690mm for 33 years (1980 – 2013). As the review region is underlain throw Archean crystalline rocks, groundwater stored in fractured zones. In Palani taluk, the groundwater quality of (for drinking purpose) groundwater is in the proper level based on BIS standards. The groundwater depth level was collected from existing bore wells at 27 randomly selected locations, where groundwater necessity in agriculture, Industrial, and human needs are shown in Figure 2.

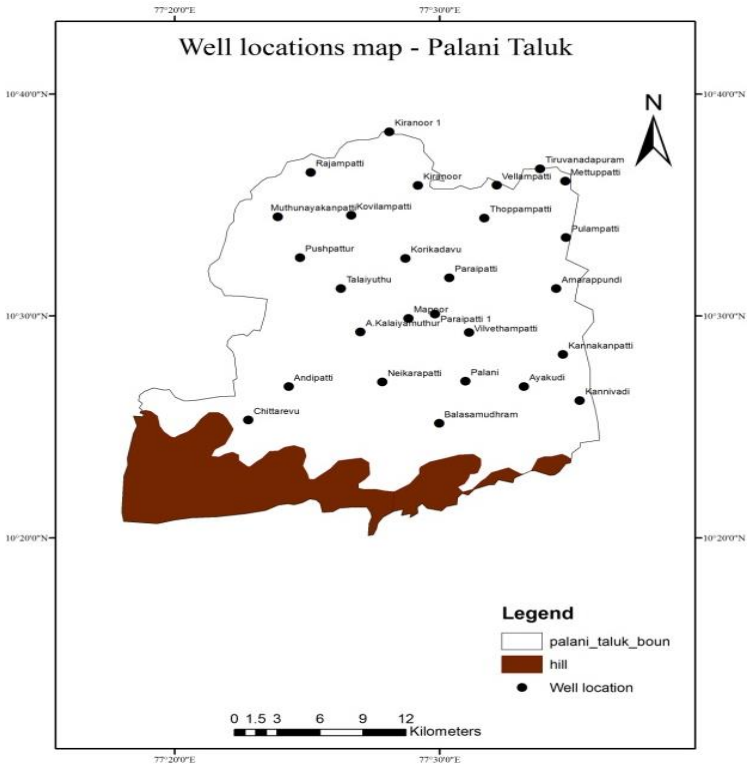

Figure 2 Existing well location map of Palani Taluk

3. GEOLOGY MAP OF PALANI TALUK

Geology of the review region classified into three types; they are Hornblende biotite-gneisses, Charkonite, and Granite. Hornblende biotite gneiss covered about 95% of the entire survey area, and Charkonite covered nearly 4%, and Granite covered 1% of the entire survey area. Among the lithological types, Charkonite have good groundwater prospects, Hornblende biotite-gneiss have moderate groundwater prospects, and granite has poor ground water prospects shown in Figure 3.

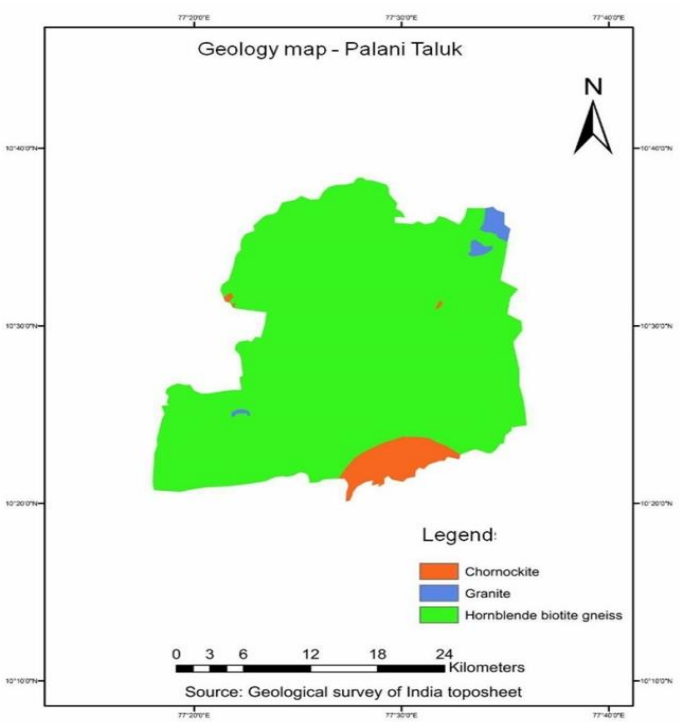

Figure 3 Geology map of Palani Taluk

4. GEOMORPHOLOGY MAP OF PALANI TALUK

There are five different natures of geomorphology was occupied in the study region such as Denudational Origin, water bodies, structural origin, Fluvial origin and Anthropogenic origin. Geomorphology map prepared from Resourcesat – I, LISS III imagery which scanned, traced and digitised in GIS software, was shown in Figure 4. There are five different types of geomorphology was occupied in the study area such as Denudational Origin, Water bodies, Structural origin, Fluvial origin and Anthropogenic origin. As per ground water prospects is concerned, Fluvial origin covers excellent ground water prospects, and 1.6% of the total area has a fluvial origin. Surface water bodies cover 7.2 % of the total area and Anthropogenic Origin covers very small that is 0.2 % of the total area. Surface water bodies and anthropogenic origin cover good ground water prospects, Denudational Origin comprises moderate groundwater prospects, 75.7 % of the total area was occupied by Denudational Origin and structural origin cover poor ground water prospects, and it covers nearly 15.3 % of the total area.

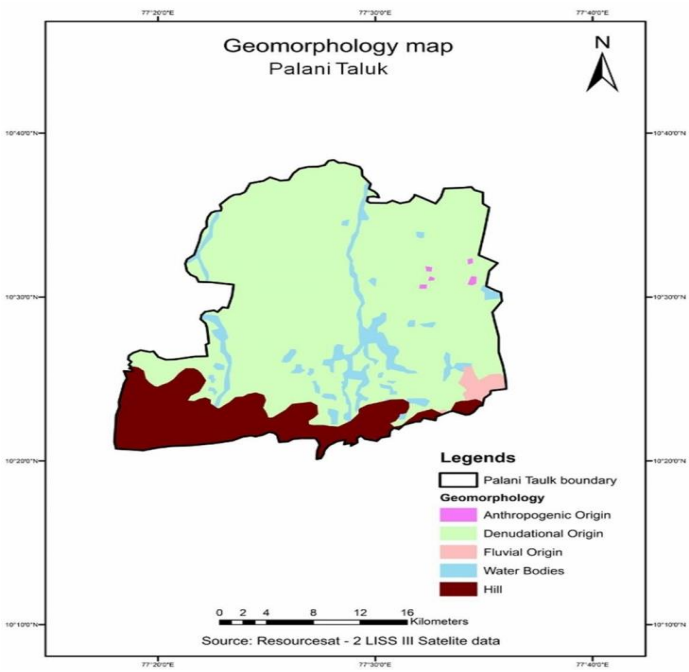

Figure 4 Geomorphology map of Palani Taluk

5. RAINFALL MAP OF PALANI TALUK

Palani Taluk rainfall data collected from Statistical Department, Dindigul for the past three decades that are from 1980 to 2014. Once data were gathered in spreadsheet format, it imported into GIS software, and the rain gauge station place loaded as a point feature in GIS program, after adding the point feature we need to integrate both spreadsheet and point feature with the unique id column value. Once the table added in point feature, we need to generate a spatial distribution map for rainfall data with the aid of an Inverse Distance weighted tool in GIS software. The rainfall map is shown in Figure 5, which gives an average rainfall of Palani Taluk for 35 years from 1980 to 2014.

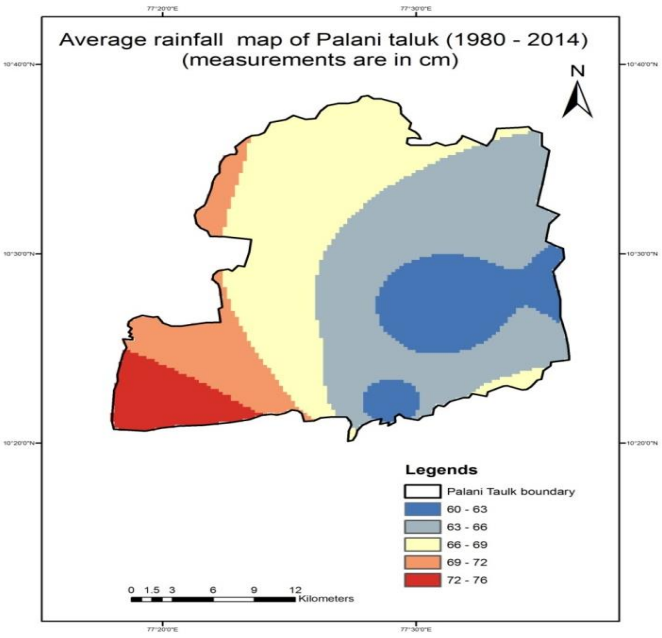

Figure 5 Rainfall map of Palani Taluk

6. MATERIALS AND METHODS

Groundwater level determined for the past three years (2014 – 2016), both in Pre & Post monsoon period in 27 existing bore well points shown in Figure 2. Once field data collected the data was imported to GIS environment, and 27 existing bore well points converted into point feature with the help of GPS and the collected field integrated into GIS program with unique values. By using the IDW tool in GIS software, the spatial distribution map of groundwater depth level maps generated for Palani Taluk.

7. RESULTS AND DISCUSSIONS

Average groundwater depth levels during pre-monsoon and post-monsoon for the above cited have intended. The deviation in water levels which are known as water level fluctuation has been computed and presented in Table 1, and appropriate pre-monsoon, post monsoon and fluctuation map were exposed in Figure 6, Figure 7 and Figure 8. The minimum and maximum variation of the groundwater level map of pre-monsoon and post-monsoon of the review region shown in Table 2. Groundwater depth fluctuation map for Palani Taluk shown in Fig 9, in Tab. 1, the groundwater fluctuation minimum of 0.41 fluctuation on talaiyuthu and maximum groundwater fluctuation takes place in ayakudi. The fluctuation map states that more review region falls below the groundwater fluctuation range in between 2 to 5-meter change in groundwater during pre and post monsoon time.

Table 1 Groundwater depth level (mbgl) - Palani Taluk (2014 – 2016)

S.No	Location	Pre-monsoon	Post monsoon	Fluctuation (m)
1	Balasamudhram	4.45	1.98	2.47
2	Vellampatti	11.59	5.51	6.07
3	Ayakudi	13.33	4.14	9.19
4	Tiruvanadapuram	12.34	6.71	5.63
5	Amarappundi	14.10	5.51	8.59
6	Mettuppatti	10.13	8.24	1.89
7	Pulampatti	11.19	6.54	4.64
8	Kannakanpatti	7.00	5.38	1.62
9	Talaiyuthu	6.81	6.40	0.41
10	Thoppampatti	13.25	4.37	8.89
11	Palani	8.77	6.59	2.19
12	Pushpattur	8.27	7.40	0.86
13	Neikarapatti	5.89	5.10	0.79
14	Andipatti	2.64	1.49	1.15
15	Paraipatti	5.73	7.10	1.37
16	A.Kalaiyamuthur	5.81	5.01	0.81
17	Paraipatti 1	11.45	4.08	7.37
18	Kiranoor 1	10.72	12.49	1.77
19	Muthunayakanpatti	3.40	1.90	1.49
20	Kannivadi	9.98	5.73	4.25
21	Mapoor	3.81	4.73	0.92
22	Kiranoor	11.06	5.21	5.85
23	Rajampatti	11.11	3.09	8.02
24	Kovilampatti	5.96	6.67	0.72
25	Korikadavu	7.51	3.13	4.38
26	Chitarevu	4.39	0.70	3.69
27	Vilvethampatti	12.00	5.74	6.25

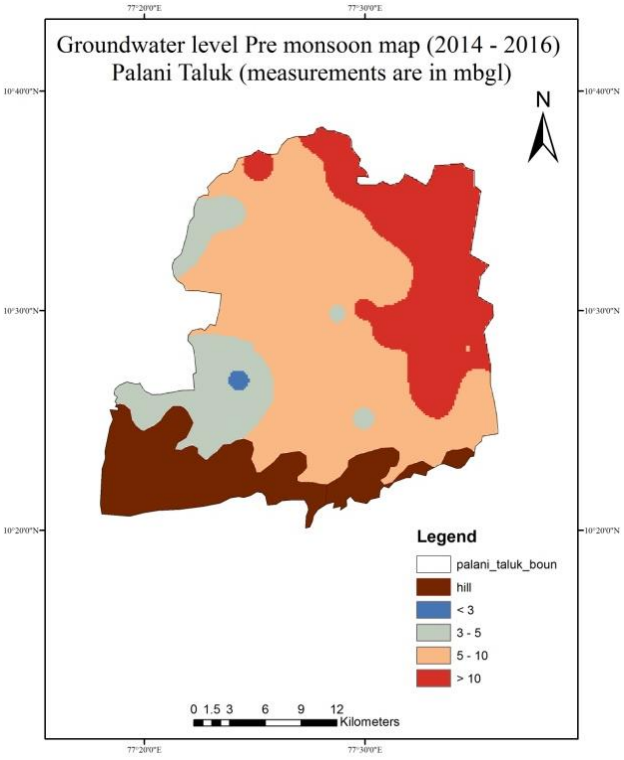

Figure 6 Groundwater depth level Pre-Monsoon map of Palani taluk (2014 to 2016)

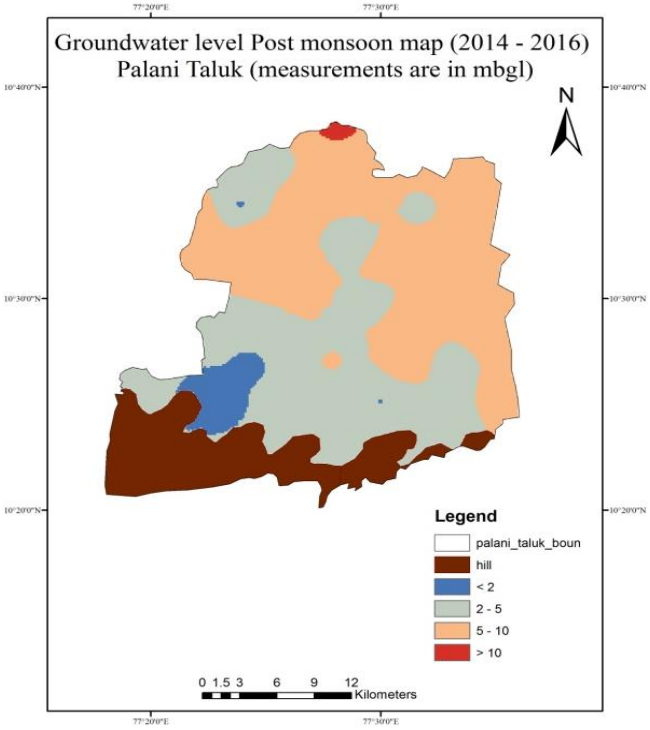

Figure 7 Groundwater depth level Post Monsoon map of Palani taluk (2014 to 2016)

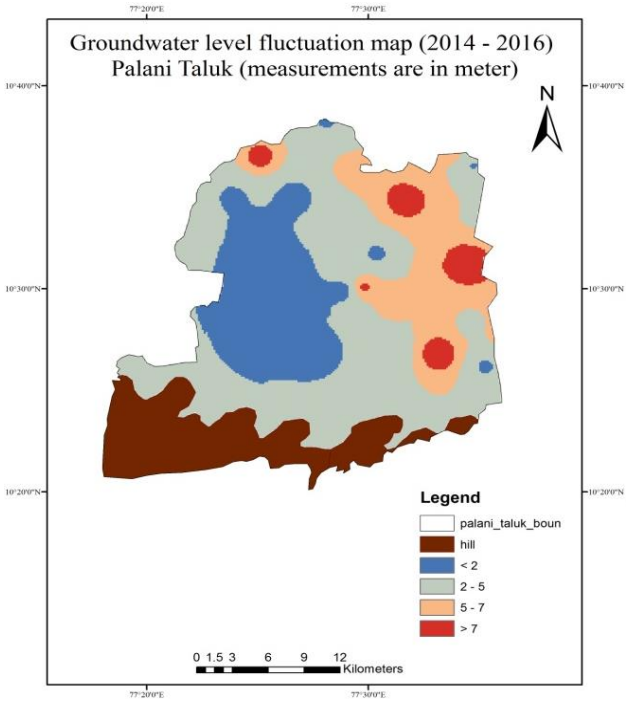

Figure 8 Groundwater depth fluctuation map of Palani Taluk from 2014 to 2016

Table 1 Location of Minimum and maximum ground water depth level of pre-monsoon and post-monsoon season (2014 - 2016) Palani Taluk

Pre-monsoon				**Post monsoon**			
Minimum		Maximum		Minimum		Maximum	
Location	mbgl	Location	mbgl	Location	mbgl	Location	mbgl
Muthunayakanpatti	3.40	Amarappundi	14.10	Chitarevu	0.70	Kiranoor 1	12.49

8. CONCLUSIONS

More groundwater fluctuation occurs in the location of Ayakudi, Amarapoondi, Rajampatti, Paraipatti 1 and Thoppampatti locations. In this area, there is a remarkable change in groundwater level due to weather and fractured layer. More fluctuation of groundwater in the study area was occurred due to irrigation needs, due to this reason; huge extraction of groundwater from bore wells and open wells takes place in the monsoon precipitation period. Hence there may be a sudden change in groundwater depth level during pre-monsoon period. Once demarcate the region based on the groundwater level, and then by utilising proper artificial recharge structure, we can improve the groundwater level.

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