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GROUNDWATER LEVEL FLUCTUATION STUDIES IN PART OF TINDIVANAM TALUK, VILLUPURAM DISTRICT, TAMIL NADU

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ABSTRACT

The study area, part of Tindivanam taluk in Villupuram district is located between 79°30' to 79°52' east longitudes and 12°18' to 12°24' north latitudes. The geology of the study area is made up of granite, granitic gneiss, and Charnockite of Archaean age which are with few intrusions by dolerite dyke and pegmatite. Groundwater being the only source of water in the study area, quantitative assessment of existing ground water resources and the influence of the monsoon rainfall on the groundwater has to be studied. Recharging depends on the factors like climate, geomorphology, topography, soil and most importantly sub surface geology. The study area receives rainfall through northeast monsoon, southwest monsoon and non monsoonal rainfall. The average annual rainfall of the study area is 1221 mm. The depth to the water level varies from 3.03 m to 30.30 m (bgl) during pre monsoon period and 1.52 m to 15.15 m (bgl) in post monsoon. The fluctuation of water level ranges from 0.00 m to 21.21 m. The water level is deeper in topographically elevated regions and shallower in plain surface terrain. From the water level maps, it is inferred the groundwater flow direction is north – south. The groundwater has been recharged by the monsoon rainfall to a considerable extent which has been reflected by the water level maps and chart. The geological and geomorphological features in the surface and subsurface of the study area favour the rainwater recharge and flow towards the plain land surface.

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INTRODUCTION

The science of hydrogeology is primarily concerned with the evaluation of occurrence, availability and quality of groundwater (Lohman, 1979). Evaluation of aquifer parameters is an important aspect of all groundwater resource assessment. Groundwater is basically a dynamic resource, which may be expressed as the quantity of water measured by the difference between optimum and minimum water table within the aquifer. This annual periodic fluctuation of water table results from the natural annual hydrological cycle where groundwater-yielding aquifer is principally recharged through rainwater (Satyajit Biswas, 2003). Recharging also depends on the other factors such as climate, geomorphology, topography, soil and most importantly sub surface geology. More than 50 % of rainfall of Tamil Nadu is contributed by the northeast monsoon, which occurs during the months of October, November and December. One or two cyclone crosses the area during this season with heavy rain. This state is also receiving rain through southwest monsoon and non-monsoon rain.

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Study Area

The study area falls between 79°30' and 79°52' East Longitudes and 12°18' and 12°24' North Latitudes and covered by Survey of India topo sheets 57P/11, 12, 15 & 16. The study area is administratively bounded by Kanchipuram district in the north and north east, Tiruvannamalai district in northwest. Marakkanam block, Vanur block, Villupuram block and Gingee block bounds the area in east, south east, south and west respectively (Figure. 1). The total aerial extent of the present study area is 600.14 Sq. Km.

Geology

The igneous rocks exposed over this block belong to the pre Cambrian age covering a span of geological time extending from 500-3500 m.y. The rock displays variation in their lithology, structure and tectonics from place to place. The hard rock has been classified in to consolidated and unconsolidated and the major rocks are granite, granitic gneiss, and charnockite of Archean with intrusion of dolerite dyke and pegmatite. These types of rocks are formed due to plutonic and high-grade

metamorphism. The granitic gneiss formation is massive and boulder type, forming denudational and residual hills. Feldspar and quartz are essential minerals while hornblende and biotite forms as secondary minerals. Dykes occur as concordant intrusive body along the weaker plane within the country rocks. Pegmatites possess feldspar and minor amount of quartz is noticed in a few locations.

cultivation of sugarcane, cotton, groundnut, plantains, millets and paddy. Agriculture is the prime occupation of the habitants in the study area. Well irrigation and canal irrigation are practiced.

The area receives rainfall mostly by the influence of the two monsoons, viz: Northeast Monsoon and Southwest Monsoon. Occasionally, non-monsoon rainfall

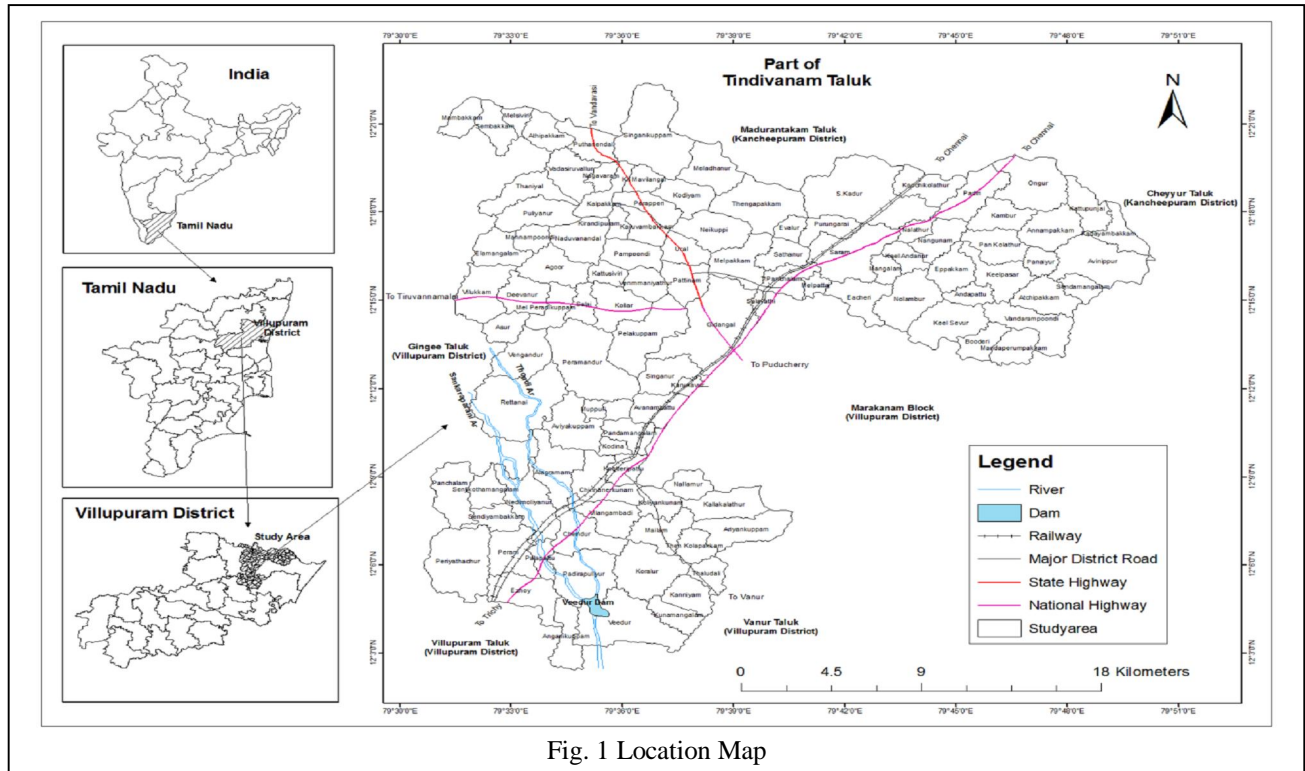


Fig. 1 Location Map

Geomorphology

The study area is a hilly terrain with, much undulation and major geomorphological units are pediplains, drainages, hillocks, rock exposures etc. The geomorphic unit plays a vital role in groundwater occurrence and help in locating groundwater potential horizons. The study area is marked with pediplains and good drainages which lead to Veedur dam. There are low undulating topography with clay, gravels and shales. Moderate infiltration with more runoff and their ground water potential is moderate.

Climate and Rainfall

To have a better understanding in the field of hydrogeology, a periodical hydrometeorological monitoring is needed. Some of the important hydrometeorological parameters are rainfall, temperature, evaporation, evapotranspiration, humidity, soil moisture and wind velocity.

The study area falls in tropical climate with the highest temperature of about 43°C during months of March, April and May, while the months October, November and December experience the lowest temperature of about 18°C. The soil types in this area are suitable for

also contributes sufficient amount of precipitation. From the rainfall data received from various government agencies, average annual rainfall has been calculated for a period from the year 2004 to 2008. The average annual rainfall of the study area is slightly above the state average which is 1080 mm (Ram Mohan, 1984). The average annual rainfall for five years (2004 to 2008) of the study area is 1221 mm. The rainfall is low in north and shows an increasing trend along the southern direction (Fig.2).

MATERIALS AND METHODS

The depth to the water level is closely related to topography, influence of surface water bodies' extraction and rainfall. From the prevailing rainy seasons, September and January has been chosen for monitoring pre monsoon and post monsoon water levels respectively. Variation in the groundwater level reflects primarily the mass balance between recharge and discharge and secondarily by the influence of local transmissivity and storativity. The water level data of this area, from the year 2004 to 2007 have been collected from Tamil Nadu Water Supply and Drainage Board (TWAD) and Groundwater division of PWD. Water levels for the year 2008 have been measured in the wells during the pre- and post monsoon seasons. The average water levels during pre

monsoon and post monsoon for above-mentioned have been calculated. The difference in water levels which is known as water level fluctuation has been computed and shown in table 1.

prepared to study the difference in the water level during different seasons (Figure. 5). From this map, it is inferred that the groundwater fluctuation between pre- and post

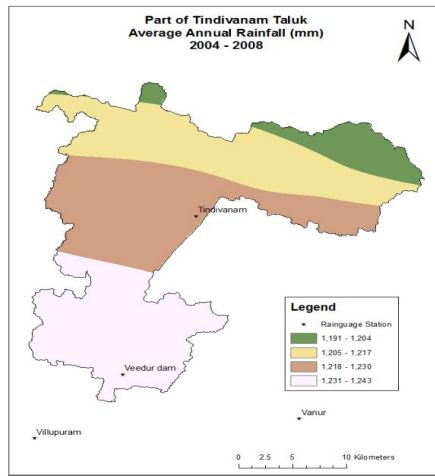


Fig. 2 Average annual rainfall (mm) 2004 – 2008

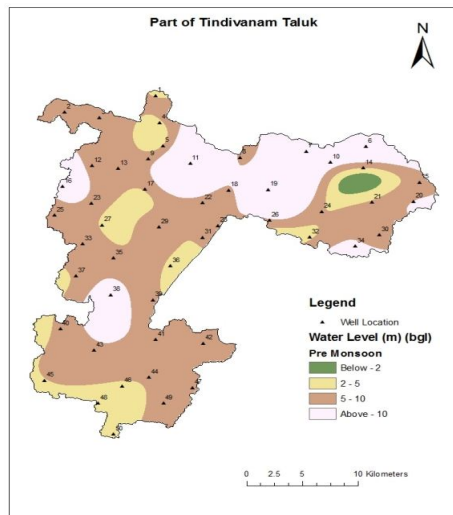


Fig. 3 Groundwater level during

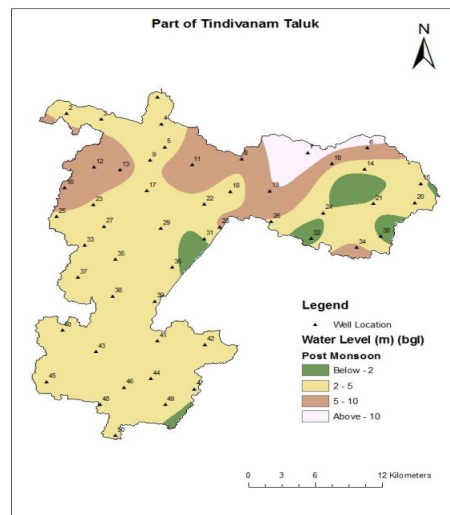
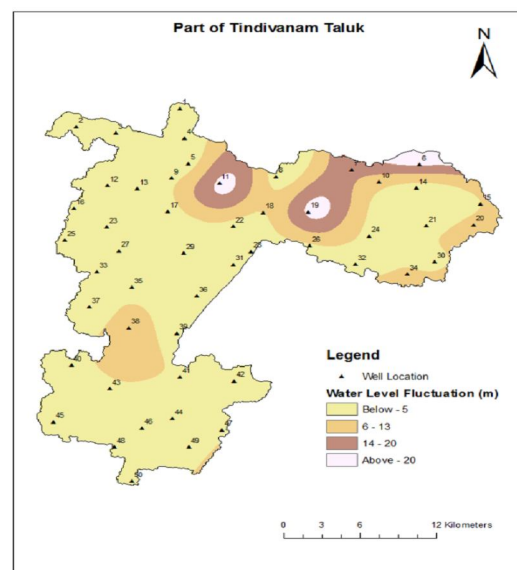


Fig.4 Groundwater level during

From this computation water level, contour maps have been prepared for both pre- and post monsoon seasons (Figure. 3 & 4). The depth to the water level varies from 3.03 m to 30.30 m (bgl) at Elay and Koochikulathur locations respectively during pre monsoon period. During the post monsoon season the water level range between 1.52 m to 15.15 m (bgl) at Kilsevar and Koochikulathur locations respectively (Table 1). The water level at Elay (3.03 m, bgl) remains the same during both the seasons which is due to the influence of Veedur dam situated along west of this region (Loc. No. 48). The water level is deeper in topographically elevated regions and shallower in plain surface terrain. From the water level maps, it is inferred the groundwater flow direction is north - south.

RESULTS AND DISCUSSION

Groundwater recharged in the Northern part of the study area during the monsoon season reaches the central and southern portion and raise the groundwater level nearer to the surface. Groundwater level fluctuation map has been



Groundwater level Fluctuation (m)

Fig.5

Table 1
Groundwater Level (m) bgl in Part of Tindivanam Taluk

Location No.	Location Name	Water Level (m) (bgl)		Water Fluctuation (m)
		Pre Monsoon	Post Monsoon	
1	Singanikuppam	4.85	2.36	2.48
2	Sembakkam	6.97	4.55	2.42
3	Neduntondi	7.88	4.55	3.33
4	Dadapuram	4.55	2.42	2.12
5	Kodiyam Pudur	5.15	2.70	2.45
6	Ongur	30.30	9.09	21.21
7	Koochikulathur	30.30	15.15	15.15
8	Tengapakkam	9.16	6.06	3.10
9	Vadampundi	7.27	3.94	3.33
10	Mel Olakkur	15.15	6.06	9.09
11	Vairapuram	30.30	9.09	21.21
12	Pulinayanur	9.09	6.06	3.03
13	Kalpakkam	6.97	5.76	1.21
14	Kambur	5.15	2.73	2.42
15	Vadakkalavay	7.58	2.12	5.45
16	Ilammangalam	12.12	7.58	4.55
17	Pampundi	5.45	3.03	2.42
18	Sathanur	9.09	3.64	5.45
19	Saram	30.30	9.09	21.21
20	Avanippur	10.00	2.73	7.27
21	Panaiyur	5.45	2.12	3.33
22	Mel Pakkam	6.97	3.64	3.33
23	Akkur	8.48	4.55	3.94
24	Yeppakkam	5.45	2.12	3.33
25	Villukam	6.97	4.55	2.42
26	Ichcheri	9.09	4.55	4.55
27	Mel Peradikuppam	4.55	3.03	1.52
28	Salavathi	9.09	5.15	3.94
29	Vempundi	6.97	3.64	3.33
30	Vandranpundi	6.67	1.82	4.85
31	Tindivanam	6.06	2.12	3.94
32	Kil Sevir	4.55	1.52	3.03
33	Vengandur	9.09	4.55	4.55
34	Mandaperumpakkam	11.52	5.45	6.06
35	Peramandur	6.97	3.03	3.94
36	Jakkampettai	4.55	2.42	2.12
37	Rettanai	6.06	4.55	1.52
38	Avayyarkuppam	12.12	4.55	7.58
39	Kenipattu	6.06	3.03	3.03
40	Se Kothamangalam	6.36	3.33	3.03
41	Kolliyankulam	7.58	3.03	4.55
42	Kallakulathur	7.58	4.24	3.33
43	Nedummoliyanur	9.09	4.55	4.55
44	Kuralur	5.45	4.55	0.91
45	Periathatchur	4.85	4.55	0.30
46	Padiripuliyur	4.55	3.03	1.52
47	Taludali	7.27	2.73	4.55
48	Elay	3.03	3.03	0.00
49	Konamangalam	6.06	3.03	3.03
50	Ganapathipattu	3.64	3.17	0.47

monsoon ranges from 0.00 m to 21.21 m. High fluctuation is seen along north and north eastern part of the study area in regions around Ongur, Vairapuram and Saram. In

general the water level fluctuation is below 5 meters in the study area. The groundwater flow of the study is from north to south. Veedur dam and surrounded areas situated

in the southern part of the study area holds major groundwater that has been recharged in the northern portion of the study area. Groundwater in and around Koochikulathur and Avayyarkuppam region show a considerable change in water levels between the pre- and post monsoon period. This change in water level is due to the remarkable recharge in groundwater in this region by the means of weathered and fractured zones present in the study area. Over exploitation of groundwater for agriculture and domestic purpose is very high by the means of both bore well and open well as soon as the monsoon rainfall occurred. Hence, there is a high drop in water level is noted during the pre monsoon season. In general the groundwater has been recharged by the monsoon rainfall to a considerable extent which has been reflected by the water level maps and fluctuation map. The geological and geomorphological features in the surface and subsurface of the study area favour the rainwater recharge and flow towards the plain land surface.

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