GROUNDWATER LEVEL FLUCTUATION STUDIES IN TIRUPUR TALUK, TIRUPUR DISTRICT, TAMIL NADU, INDIA

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Abstract: The study area, part of Tirupur taluk is located in Tirupur district and falls between 77°15′ and 77°33′ east longitudes, 10°58′ and 11°15′ north latitudes. The geological formations identified in the study area are hornblende biotite gneiss and sillimanite gneiss, charnockite, granite and syenite, of Archaean age with intrusions of pegmatite and quartzite veins. Groundwater being the major source of water in the study area, quantitative assessment of existing groundwater 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, southwest and non monsoon seasons. The average annual rainfall of the study area is 647 mm. The depth to the water level varies from 4.94 to 28.67 m (bgl) during pre monsoon and 4.40 to 28.29 m (bgl) in post monsoon. The seasonal fluctuation shows a rise in water level, which ranges from 0.32 to 6.82 m bgl. The water level is deeper in topographically elevated regions and shallower in plain surface terrain. From the water level maps, it is inferred that 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.

Keywords: : Tiruppur Taluk, Monsoon, Rainfall, Groundwater Level, Fluctuation, Correlation

I. 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 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.

II. Study Area

The study area falls between 77°15′ and 77°30′ East Longitudes and 10°58′ and 11°15′ North Latitudes and (Fig 1). It falls in Survey of India map in 58 E/7, 8 and 58 F5. The study area lies on the western part of Tamil Nadu bordering the Western Ghats. The study area is surrounded by Coimbatore district in the west, Erode district to the north and northeast and Karur district in the east and Dindigul district in the southeast. To the south, the Idukki district the district is surrounded by Kerala state. The study area Tirupur Taluk has an area of 629 Sq. Km. The study area comprises of 23 Panchayat blocks with 39 villages.

III. Geology

Geology of area is underlain by a wide range of high grade metamorphic rocks of the Peninsular gneissic complex. These rocks are extensively weathered and overlain by recent alluvium at places. The geological formations of the study area are under Archean group representing hornblende biotite gneiss and sillimanite gneiss, charnockite, granite and syenite, pegmatite and quartzite veins. The charnockites and associated migmatities mostly occupy the study area. Hornblende biotite gneiss is dominant rock in the study area. It is highly migmatized at many places and show deep weathering (>20 m). Acid intrusive in the form of pegmatities and quartz veins are seen intruding in all the rock types.
IV. Geomorphology

The structures identified are plateau landforms, structural, denudational, residual hills of charnockite and gneisses, linear rides of basic dykes with undulating topography with gentle slope towards east except for the hilly terrain in the west. The prominent geomorphic units were identified through interpretation of satellite imagery with field check. The encountered geomorphic features are i) Pediment, ii) Shallow Pediments and iii) Deep Pediments. The shallow pediment observed along the stream courses joining to Noyyil River and the deep pediment is noticed along Noyyil river course from Sulur to Tirupur. In other areas pediments are seen. Pediment forms outcrop with or without soil cover run off zone with poor groundwater potential. Shallow Pediment is intermediate between pediment and deep pediments; weathering thickness appreciable, moderate infiltration and recharge is influenced by hydrogeological features with moderate groundwater potential. Deep pediments are shallow depressed low relief areas with good drainage networks so infiltration is moderate to good, recharge by hydrogeological feature, storage complemented by secondary fractures with good groundwater potential.

V. Climate and Rainfall

To have a better understanding in the field of hydrogeology, a periodical hydro meteorological monitoring is needed. Some of the important hydro meteorological parameters are rainfall, temperature, evaporation, evapotranspiration, humidity, soil moisture and wind velocity. The mean maximum and minimum temperatures for Tirupur city during summer and winter vary between 35°C to 18°C. The period from April to June is generally hot and dry. The temperature recorded varies from 11.7°C to 42.6°C. Most of the inhabitants in the study area are dependent on agriculture and the major part of the land is cultivated. Coconut and sorghum are the most common crops in the area. Other important crops are banana, maize, cotton, sugarcane and vegetables and these crops are often combined with coconut. Dug wells and Tube wells are the major source of water for irrigation. The southern and southwestern parts enjoy maximum rainfall, due to the surrounding of Western Ghats and rest of the area lies in the rain shadow region of it. From the rainfall data, average annual rainfall has been calculated for a period from the year 2008 to 2012. The average annual rainfall in the in the
study area is 646.6 mm. The average annual rainfall for five years (2008 to 2012) of the study area is 618.4 mm. The rainfall is low in north and shows an increasing trend along the southern direction (Fig. 2).

VI. 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 2008 to 2012 have been collected from Tamil Nadu Water Supply and Drainage Board (TWAD), Central Ground Water Board (CGWB) and State Ground and Surface Ground water Resource Data Centre (SG&SWRDC). Water levels for the year 2012 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.

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 4.94 m to 28.67 m (bgl) at Nachchipalaiyam and Tuttaripalaiyam locations respectively during pre monsoon period. During the post monsoon season the water level range between 4.40 to 28.29 m (bgl) at Nachchipalaiyam and Tuttaripalaiyam locations respectively (Table 1). The water level is deeper in topographically elevated regions and shallower in plain surface terrain. From the water level maps, it is inferred that the groundwater flow direction is north - south.
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 prepared to understand the difference in the water level during different seasons (Figure. 5). From this map, it is observed that the groundwater fluctuation between pre- and post monsoon ranges from 0.38 m to 6.32 m.

Maximum fluctuation is seen along north and central part of the study area in regions around Pongalur, Tirupur, and Semandapalayam. In general the water level fluctuation is below 1m in the study area. The groundwater flow of the study area is from north to south. Groundwater in and around Tuttaripalaiyam, Avinaspalaiyam, Nachchhipalaiyam, Pallapalaiyam 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 industry, agriculture and domestic purpose is very high by the means of both dug well and bore well as soon as the monsoon rainfall occurred. Hence, there is a high drop certain locations in water level are 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.

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

<table>
<thead>
<tr>
<th>Location No</th>
<th>Location Name</th>
<th>Water Level (m) (bgl)</th>
<th>Water Fluctuation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Monsoon</td>
<td>Post Monsoon</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Pallapalaiyam</td>
<td>10.38</td>
<td>9.54</td>
</tr>
<tr>
<td>2</td>
<td>Tirupur</td>
<td>11.56</td>
<td>8.94</td>
</tr>
<tr>
<td>3</td>
<td>Nachchipalaiyam</td>
<td>4.94</td>
<td>4.40</td>
</tr>
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<td>4</td>
<td>Pongalur</td>
<td>17.66</td>
<td>11.34</td>
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<td>5</td>
<td>Avinashipalaiyam</td>
<td>10.02</td>
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<td>6</td>
<td>Tuttaripalaiyam</td>
<td>28.67</td>
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<td>7</td>
<td>Semmandapalaiyam</td>
<td>9.04</td>
<td>7.28</td>
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References