Chapter-3

Topography, Geology and Meteorology of the study area
TOPOGRAPHY OF THE STUDY AREA

3.1 INTRODUCTION

For any hydro-chemical study of an area and further modeling of groundwater chemistry and its movements, large amounts of data pertaining to geology, hydrogeology, rainfall, groundwater, surface water chemistry are required. The geological and hydrogeological data have been collected from the Department of Mines and Geology, Harapanahalli, Karnataka. The population data have been collected from the District Statistical Officer. The rainfall data and soil properties data have been collected from meteorological department and agricultural department of Harapanahalli. The details of small scale industries located in and around Harapanahalli have been obtained from the office of the Assistant Director for small and large scale industries, Harapanahalli. This chapter describes an overview of the study area which includes location and physiography, meteorology, population and geology of the study area, land use is presented as below.

3.2 STUDY AREA

Harapanahalli is one of the taluk comes under Davanagere District(Fig-3.1), situated about 60 km from Davanagere, Karnataka state (South India). The taluk shares its boundaries with Hadagali taluk towards North, on the west by Ranebennur taluk, on the South by Harihar and Davangere taluks and East by Jagalur taluk.

Harapanahalli taluk has three chemical factories, some small scale industrial units like automobiles, food and intoxicants, cement bricks, rice mills and poultry farms etc.
3.3 PHYSIOGRAPHY

Harapanahalli Taluk (Fig 3.1) in Davanagere district is located in the southern peninsular region of India. It lies between $14^018'\text{to}14^025'\text{ North}
latitude & $75^046'\text{to}75^055'\text{ East longitudes. As a whole, the region has hilly}
areas and flat plain land with an average elevation of 625.00 meters above
mean sea level. It comprises of four hoblis and a total eighty villages with an
average rainfall of about 656mm/annum. The total population of 2, 68,793 as
per 2001 Census.

The taluk has a geological area of 1, 43,024 hectares. Out of which, the
total cultivable land is about 88,332 hectares, barren land 6,258 hectares and
non-agricultural land of 11,245 hectares. It has a forest area of about 22,230
hectares.

3.4 GEOLOGY OF STUDY AREA

The Indian subcontinent is divided into three well-marked regions, each
having distinguishing characteristics of its own. The Peninsular or peninsula
shied in according to Rao (1962) is to the south of plains of Indus and Ganga
River system. The Indo-genetic “Alluvial plains” stretched across northern
India. The ‘extra peninsular’ occupies the mountainous region of Himalayas.

Harapanahalli taluk in Davangere district is situated in the peninsular
region (Fig-3.2) which is composed of geologically ancient rocks of diverse
origin and most of them have undergone metamorphism (Ministry of ecology
and environment, Govt. of India, 1986). It represents a stable land of earth’s
crust. The peninsular gneiss consists of alternate dark and light bands. At
places they grade into granitic gneisses or even into unfoliated granites. They
contain usually biotite in dark band and quartz, feldspars in the light bands.
Peninsular gneisses form the largest suit of rocks distributed in south India.
Generally, in the present investigation is observed that groundwater available is under water table condition. The depth of water table below the ground depends upon the geological and hydrological situations.

Most of study area composed of hard rocks, which includes Granites, grey wackes and schist’s. The rock such as pegmatite’s and schist generally associated with igneous rocks like granites in the form of veins, said to be responsible for the cause of excess of Fluoride in ground water (Karanth, 1989). Biotite and muscovite, micas and chlorite, which are usually associated in schistose belt are responsible for causing high degree of hardness and nitrates in the aquifer systems (Arthor Holmes, Mukherjee).

In the study area, the domestic and agricultural activity is dominated. It comprises 60% of the total land area. The study area comes under granites & gneissic formation, which is generally called as “hard rock terrain”. However, greenstone belt consisting of chlorite-schist, mica-schist along with clay formations have been observed in the hard rock formation of Harapanahalli taluk. It comes under black cotton soil. In general, the ground water is available in unconfined condition in the weathered geological formation in entire study area.

3.5 LAND USE PATTERN

The total geographical area of the study region is being used for non-agricultural activities. Consequent to urbanization and industrialization, the land put to non-agricultural purposes. This is increasing with time. As a result the net areas irrigated are steadily decreases in the study area. The brief particulars of the land use in Harapanahalli taluk for agricultural and non-agricultural purposes as well as barren lands are presented in pie diagram (Fig-3.3).
The existing type of soil in the taluk is suitable for growing crops like ragi, groundnut, jowar, cotton, maize, and wheat. The common fertilizers used in the study area are NPK complex, urea, ammonium sulphate, 20-20, 16-20 and DAP. Insecticides and pesticides such as Monophas, Confidal, Carbon dizine. About 7% of the total area is being used for non activities consequent to urbanization and industrialization.

**Table-3.1 Land use Pattern (in Hectares)**

<table>
<thead>
<tr>
<th>Total Geographical Area</th>
<th>1,43,024 hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cultivable Land</td>
<td>88,332 hectares</td>
</tr>
<tr>
<td>Total Forest Area</td>
<td>22,230 hectares</td>
</tr>
<tr>
<td>Barren Land</td>
<td>6,258 hectares</td>
</tr>
<tr>
<td>Non Agriculture</td>
<td>11,245 hectares</td>
</tr>
<tr>
<td>Permanent Pasture</td>
<td>1,603 hectares</td>
</tr>
<tr>
<td>Trees and Groves</td>
<td>812 hectares</td>
</tr>
<tr>
<td>Cultivable Waste</td>
<td>3,174 hectares</td>
</tr>
<tr>
<td>Fallow Land</td>
<td>8,320 hectares</td>
</tr>
<tr>
<td>Others</td>
<td>1,050 hectares</td>
</tr>
</tbody>
</table>

**3.5 METEOROLOGY**

The Harapanahalli taluk have highest temperature is 38°C during April and May. The lowest temperature recorded is 18°C during the months of November and December.

**Climate:**

The climate of this taluk is semiarid and enjoys three well defined seasons.

- Summer season: February to May and the hottest months being April and May.
- Rainy season: June to September.
- Winter season: October to January.
Temperature:

Temperature varies from the temperature range from $27^0\text{C}$ to $37^0\text{C}$. The maximum temperature recorded so far is $37^0\text{C}$ during the month of April. The lowest minimum Temperature was recorded in this taluk is $27^0\text{C}$ during the month of December. The relative humidity varies between 55 to 86%.

Rainfall:

The average rainfall of the area is the average rainfall of the Taluk is about 656mm/annum. The region receives rainfall mainly from South West monsoon and slightly from North East monsoon with an annual rainfall season spreading over a period of Five to Six months .The South West monsoon occurs from June to September amounting to about 70% and North East monsoon during October to November contributing about 30% of the annual rain fall.
Table-3.2 Rain fall data (2003-2008)

<table>
<thead>
<tr>
<th>Years</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td></td>
<td>2.3</td>
<td>1.1</td>
<td>26.0</td>
<td>---</td>
<td>24</td>
<td>27</td>
<td>73.2</td>
<td>25</td>
<td>171</td>
<td>---</td>
<td>---</td>
<td>320.2</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td>43.4</td>
<td>93.6</td>
<td>44.4</td>
<td>64.1</td>
<td>80.2</td>
<td>174</td>
<td>19.4</td>
<td>---</td>
<td>---</td>
<td>519.1</td>
</tr>
<tr>
<td>2005</td>
<td>1.6</td>
<td></td>
<td></td>
<td>26.7</td>
<td>39.2</td>
<td>53.7</td>
<td>203.9</td>
<td>106.9</td>
<td>76.5</td>
<td>136.9</td>
<td>16.6</td>
<td>---</td>
<td>662</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td>4.5</td>
<td>51.5</td>
<td>88.3</td>
<td>65.4</td>
<td>62.6</td>
<td>44.1</td>
<td>81.5</td>
<td>30</td>
<td>69.8</td>
<td>---</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td>1.9</td>
<td>17.5</td>
<td>78.4</td>
<td>138.2</td>
<td>102.6</td>
<td>70</td>
<td>240</td>
<td>184.6</td>
<td>23.3</td>
<td>---</td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td>93.5</td>
<td>14</td>
<td>63</td>
<td>53.2</td>
<td>33.2</td>
<td>80</td>
<td>92.9</td>
<td>---</td>
<td>---</td>
<td>429.8</td>
</tr>
</tbody>
</table>

Table-3.3 Statistics of Irrigation Water Systems

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Taluk</th>
<th>Ponds</th>
<th>Open wells</th>
<th>Bore wells</th>
<th>Streams/Rivers</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Harapanahalli</td>
<td>295</td>
<td>390</td>
<td>7,832</td>
<td>3,400</td>
<td>2,700</td>
<td>14,617</td>
</tr>
</tbody>
</table>

*(Source :AEE Office Harapanahalli)*
Fig 3.1 Physiographic Map Of Harapanahalli taluk
Fig 3.2: Geological map of Harapanahalli taluk

Fig 3.3 Land utilization (2006-2008)