CHAPTER-II
The study area comprises of Tirupati urban and Tirupati rural mandals of Chittoor district of Andhra Pradesh. Tirupati is the major pilgrimage city located in the Chittoor district. It is located at the foothills of Seshachalam hill range at a distance 550 km south of Hyderabad and 100 km north of Chennai. The study area falls in between 13° 45' N and 13° 34' N latitude and 79° 15' E and 79° 29' E longitude. The Tirupati urban and Tirupati rural mandals are bounded by Renigunta mandal in the east, Chandragiri mandal in the West, Ramachandrapuram and Vadamapaleta mandals in the South, and Obulavari palli mandal of Kadapa district in the north. It has an average elevation of 161 m (528 ft). The Tirumala hill has an average elevation of 980 m (3,200 ft) above sea level. The study area is covered in Survey of India (SOI) Toposheet No. 570/6 and 57 0/5 on 1: 50,000 scale. The location map of the study area is shown in Fig. 2.1.
Fig.2.1: Location Map of the Study Area
Transport Network and Settlement Locations

The study area is very well connected with other cities and towns as it is an important pilgrim centre. In the study area, the transport network has a defined pattern, which very much confirms to the terrain pattern. The transport network and settlement location map was prepared with SOI toposheets (1975-76) as base information and updated with the help of IRS P6 LISS-IV satellite data of 27th February, 2008. (Fig.2.2) The area has very good transport network and it is well connected by rail, road and air. The national highway (N.H. 205) connecting Anantapur and Chennai and Chennai-Renigunta-Putalapattu State highway passes through the study area. In addition, there is a good network of district and village roads connecting all the settlements. Only major roads are depicted in the map for clarity. The broad gauge railway line connecting Renigunta-Katpadi junctions passes through Tirupati. The nearest airport is Tirupati which is about 15 km from the study area.
Geology

Chittoor district forms part of the Indian peninsula which is a stable shield composed of geologically ancient rocks. Tirumala hills form the southern most part of the Cuddapah Basin. The imposing Southern escapement of the hills was probably developed due to vertical displacement along the Karakambadi fault, which runs along the foot of the Tirumala hills in an East-West direction. The vertical face of the escarpment is made up of Bairenkonda Quartzite. The slopes of the hills are composed of granite and gneiss with intrusion of dolerite dykes. The Bairenkonda quartzite rests in conformity on the Aschean granites and gneisses forming a non-conformity, which is called the Eparchaean unconformity in Indian Geology.

Interesting geological features on the Tirumala hills have been declared by the Geological Survey of India (GSI) as National Geological Monuments have been marked by appropriate sign boards for the benefit of visitors and pilgrims.

1. Eparchaean Unconformity

2. Natural bridge / wind gap (Shilathoranam)

Standing at the GSI Eparchaean unconformity monument (at the last ‘U’ bend of the road on the way to Tirumala). One can see a panoramic view of the Bairekonda Quartzite resting gracefully on the uneven surface of the underlying granites and gneisses. Natural bridge is 1,20,00,000 years old and one among four natural bridges of the world plate. The terrain in the study area shows diversity in attitude, slope and general configuration. The study area has undulating terrain with very steep to gentle slope.

Drainage Network

The drainage and surface water bodies map prepared using SOI toposheets (1975-76) as a base on 1:50,000 scale and updated using IRS-P6 LISS IV Satellite data of 27th February, 2008 is shown in the Fig.2.3.
In addition, drains, seasonal streams, river island, sandy area in rivers were also mapped. The major tanks are Peruru tank and Kuntrapakam tank. Apart from this number of water bodies are located in the entire area. Most of the minor tanks have limited spatial extent and are seen as small polygons in the map.

Climate

Tirupati urban and Tirupati mandals have an extreme type of climate and observed topical type of climate throughout the year. Summer experiences temperature ranging from 42 to 45°Celsius (107.6°F to 113°F). In the winter the minimum temperatures will be in between 10°C and 18°Celsius (150°F to 64.4°F). Usually the summer lasts from March to June, with the advent of rainy season in July, followed by winter which lasts till the end of February.

During South-West monsoon season, relative humidity is high. The remaining period of the year, the air is generally dry and the summer season is the driest part of the year.

Rainfall Distribution

The rainy season starts with the advent of South-West monsoon in July and ends with the receding of North-East monsoon by November. The rainfall received from North-West monsoon is comparatively more. This is due to the depressions formed in Bay of Bengal. The rainfall in this area is precarious, un-even and erratic.

The average annual rainfall and monthly rainfall data of Tirupati urban and rural mandals is collected from Directorate of Economics and Statistics, Govt. of A.P, Hyderabad. The data for average annual rainfall is collected for a period of about 20 years i.e., from 1987 to 2009 for Tirupati urban mandal. The average annual rainfall for Tirupati urban mandal is collected from the years 1991 to 2009. The rainfall data collected is graphically shown in Figs.2.4 and 2.5 for Tirupati urban and rural mandals.
AVERAGE ANNUAL RAINFALL IN mm OF TIRUPATI URBAN MANDAL FROM 1987-2009

Rainfall in mm

Year

Fig. 2.4.
AVERAGE ANNUAL RAINFALL IN mm OF TIRUPATI RURAL MANDAL FROM 1991-2009
The Tirupati urban and rural mandals receive a normal annual rainfall of 1088 mm and 979 mm respectively. Tirupati urban mandal received more than average rainfall (1088 mm) for about ten years. It experienced less than 1000 mm rainfall for eleven years. The station received more than 1000 mm rainfall for twelve years. The lowest (663.6 mm) and the highest (1724 mm) rainfall recorded at this station is during 2006 and 1991 respectively.

Similarly, Tirupati rural mandal received more than average rainfall (979 mm) for nine years. It experienced less than 1000 mm rainfall for thirteen years. The station received more than 1000 mm rainfall for seven years. The lowest (571.3 mm) and the highest (1566 mm) rainfall recorded at this station is during 1999 and 1996 respectively.

The mandal wise monthly normal and actual rainfall of the Tirupati urban and rural mandals for the years 1999-2000, 2005-2006 and 2008-2009 are shown graphically in the Figs.2.6, 2.7 and 2.8 respectively.

Wind Speeds

With the onset of North-West Monsoon, the eastern winds commence to blow right up to the end of the March followed by a full fort might in April, then the Western winds commence to flow followed by south-west monsoon up to the middle of September. There will be general gap of 15 to 20 days before the North-Eastern period commences to blow accompanied by showers.

It is interesting to note that there is a power plant run by wind in Tirumala. It generates 0.984 Mega Watts of power. The windmills in Tirumala are shown in Fig.2.9.
Mandal wise monthly normal and actual rainfall of the Tirupati urban and Rural mandal for the year 2005-2006
Mandal wise monthly normal and actual rainfall of the Tirupati urban and rural mandal for the year 2008-2009

Fig. 28
Fig. 2.9: Windmills generating power at Tirumala
Conventional source of energy
Flora and Fauna

The study area includes S.V. Sanctuary and the holy, sacred seven hills where the world famous Hindu Diety Lord Venkateswara abodes. The reserved forest of the sanctuary consists of unique Flora and Fauna. The highly endangered Flora like Cycas beddomei and highly priced endemic species like Pterocarpus santalinus grows luxuriantly. The entire sanctuary is an uninhabited large chunk of dry deciduous Red Sanders bearing forest forming catchment to Swarnamukhi river. The Kalyani and Papavinasanam dams which are the prime drinking water resources of Tirupati and Tirumala are situated within S.V. Sanctuary and are also source of drinking water to wild animals during pinch period.

The core area of the sanctuary, with high hillocks and deep valleys and with natural springs consists of thick forest, with vivid Flora and Fauna. The area also consists of natural grass lands.

The following rare, endemic and endangered Flora and Fauna occurs in the sanctuary.

Flora

The area is a heaven for Botanists with lot of diversity. The area is having as many as fifteen hundred species belonging to 176 families of vascular plants. The following are the important endemic species available in the sanctuary.

1. Cycas beddomei (The Peacock feathered Gymnosperm)

This is an endemic, rare and highly endangered species in to S.V. Sanctuary, and is highly prone for smuggling for medicinal purpose. This is one of the species listed in Schedule VI of the wild life (protect) Act, 1972 Fig.2.10.
Fig. 2.10: Cycas beddomei, endemic, rare and endangered species
2. Pterocarpus Santalinaus

“Red Sanders” locally called as “Raktha Chandanam, Yerrachandanam and Bomma Koyya” is endemic and found in abundant in S.V. Sanctuary Fig.2.11. The red sanders wood is highly priced internationally and highly prone for smuggling. The quality wood occurs in high elevation when compared to plains. Each part of the tree is very useful as follows:

<table>
<thead>
<tr>
<th>Part</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>Fodder</td>
</tr>
<tr>
<td>Chips</td>
<td>Paints and Colors</td>
</tr>
<tr>
<td>Timber</td>
<td></td>
</tr>
<tr>
<td>a. Local</td>
<td>(i) Agricultural implements</td>
</tr>
<tr>
<td></td>
<td>(ii) Building Material</td>
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<td></td>
<td>(iii) Tags</td>
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<td></td>
<td>(iv) Idols of God</td>
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<td></td>
<td>(v) Utensils</td>
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<td></td>
<td>(vi) Medicinal Purpose</td>
</tr>
<tr>
<td>b. International</td>
<td>Used as music instrument in Japan</td>
</tr>
<tr>
<td></td>
<td>Red Sanders wood earn Foreign exchange because of its demand in foreign countries especially in Japan.</td>
</tr>
</tbody>
</table>

3. Shorea Talaria (Jalari)

4. Shorea Tambuggia (Tamba Jalari)

5. Syzygium Alternifolium (Mogli)

6. Terminalia Pellida (Tella Karaka)

Fauna

The forests in the study area harbour certain rare animals like Slender Loris (Fig.12). Indian Giant Squirrel, Mouse Deer, Golden Gecko, Yellow Browed Bulbul etc., The Golden Gecko was discovered after 100 years Tiger, leopard, Indian Wolf, Wild Dog, Sloth Bear, Porcupine, Wild Boar, Chinkara, Four-pored Antelope, Chital and Sambar are some of the common animals found in the forests of study area. More than 150 species of birds are reported in the National Park area.
Fig. 2.11: Pterocarpus Santalinus (Red Sanders) most predominant and endemic species in Sheshachalam Hills
Fig. 2.12: Slender loris endangered animal found in S.V. Sanctuary Tirumala