CHAPTER II

STUDY AREA: A PROFILE OF TUTICORIN COAST
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2.1 INTRODUCTION

The present chapter describes a detailed profile of the study area, the Tuticorin Coastal Zone, with all of its physical, social and economic characteristics. These characteristics are described using derived information from both the primary and secondary sources of data.

2.2 LOCATION

Tuticorin Coast, the present study area is located in the south eastern part of coastal zone of Tamil Nadu State, India. It lies between 8°41’49” N and 9°22’20” N latitudes and 78°3’56” E and 79°26’6” E longitudes (Figure 2.1 and 2.1a), covering an area of about 1490 sq km. Apart from the mainland, the study area also includes Rameswaram Island and the twenty one other tiny reef islands. In the mainland, the study area is a curvilinear from Mandapam in the northeast to Madikettan Odai in the southwest (Odai-ephemeral stream in vernacular) with a width of 10 km, running parallel to the coastline. It is bounded on the east by the Gulf of Mannar and Palk Bay. In fact, the coastline of the study area forms a part of the Marine Biosphere Reserve. This is the first reserve area in India as declared by the UNESCO. The western part of the mainland is bounded by the villages of Tuticorin and Ramanathapuram Districts, while the southern part is bounded by Tirunelveli District. Rameswaram and other fringe Islands are located in the eastern part of the study area. Rameswaram, the largest Island stretching from Pamban in the west to Dhanuskodi in the east, separates the Palk Bay and the Gulf of Mannar. The other 21 islands are smaller in their areal extent, not more than 150 ha each, lying parallel to the coast line.

2.3 TUTICORIN COASTAL ZONE – AN OVERVIEW

The Tuticorin Coastal Zone has been demarcated by 10km, offset distance towards landward side from the coast line (above the high water line). To carry out the phase of spatialisation, the littoral environment is considered as an individual territory which comprises the coastal zone. Subsequently, it has been segmented by

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taking essentially the geomorphology of the coast into account. By dividing up the coastal zone, which has been possible to qualify units (sometimes also referred as littoral regions) which is the most comprehensive scale. In the present study area, the Tuticorin coast runs for 193 km, including Rameswaram Island. The littoral villages (facets of human habitants) have an average density of 136 persons per sq km.

The consequences of accelerated urbanisation are various pressures on the natural spaces and landscape, impermeabilisation of soil, multiplication of infrastructures, increase in water consumption, wastewater and reuse, atmospheric and noise pollution. In this perspective, the Tuticorin coast has launched a study in selecting and applying relevant criteria for dividing up and qualifying the littoral. This division has led to the definition of 27 homogeneous zones (coastal ecosystems) within which territorial land management may be implemented taking into account the range of coastal ecosystems.

The present study area is a part of the Gulf of Mannar Marine Biosphere Reserve. It is the first marine reserve not only in India but also in the entire south and south East Asia. It was established jointly by the Government of India and the Government of Tamil Nadu on 18th Feb, 1989. The Indian part of Gulf of Mannar lies between India and Sri Lanka and has an area of 10,500 sq km (approx.). There are 21 uninhabited islands lying off the coast in Ramanathapuram and Tuticorin districts. Most of the islands are of coral origin. The 21 islands altogether have an area of 623 ha. This area is the last refuge of any significance off Indian coast of the highly endangered sea-mammal, the Dugong. The reserve area is one of the richest areas for marine biodiversity in India. It encompasses diverse ecosystems like coral, mangrove, seagrass, and Island ecosystems and resources like sea-algal, ornamental reef fishes, shell and fin fish, marine mammals and marine turtles. More than 50, 000 fishermen living on the coast of the Gulf of Mannar depend on the fisheries for their livelihood (GoM, Marine National Park, 1999). The reserve area is comprised of 560 sq km core area of coral islands and shallow marine habitat, surrounded by 10 km, wide and 160 km, long buffer zone. The Gulf of Mannar Marine National Park comprises the core area of the Reserve land with 21 uninhabited islands, ranging in size from 0.25 ha to 130 ha. These lie between one and four km offshore, surrounded by shallow waters. The buffer zone is Gulf waters to the south and an inhabited coastline to the north.
Seventeen different mangrove species occur within the reserve and act as important nursery habitats. Here a number of marine species namely, Pemphis acidula, seagrass and Enhalus acoroides, a monospecific genus of seagrass are endemic and are found nowhere else in India. The shallow water of the Marine National Park has the highest concentration of seagrass species along the Indian coastline for about 7500km. All six genera and 11 species of seagrass recorded in India occur in this biosphere. Six of the world’s twelve seagrass genera and eleven of the world’s fifty species occur here. The same shallow water is also known to have at least 147 species of marine algae (seaweed). These seagrass and algal beds support complex ecological communities and provide feeding grounds for many animals, (globally endangered) including the marine mammal sea cow (Dugong dugong).

Productive fringing and patchy coral reef surrounding the Park’s islands are composed of at least 91 species of coral belonging to 37 genera. These islands are habitation for 168 migratory bird species. The sandy shores of most of the islands provide nesting habitat for sea turtles. This Gulf has 450 species (20 per cent) out of 2200 fish species in Indian water. It is the single richest coastal area in terms of fish diversity in the Indian sub-continent. Over 79 species of crustaceans, 108 species of sponges, 260 species of molluscs, and 100 species of echinoderms occur in the Gulf.

According to the experts (M.S. Swaminathan Research Foundation MSSRF; 1999), the threat of irreversible damage to some components of the marine ecosystem, e.g., dugongs, coral reefs and seagrasses, is very real. An international authority on coral reefs recorded that the current effort at strengthening the management of Gulf of Mannar Biosphere Reserve (BR) “is almost certainly the last hope that such species will survive in the Gulf” (Kelleher, 1998).

The Marine-based livelihood of people in the coastal buffer zone partly depends on coastal and marine resources. However, agriculture and allied activities still play a major role in providing livelihoods for the poor. The activities of coastal-based people including fishing, salt making, seaweed collection or other marine-based activities are gaining importance. Ninety percent of these fisher folk are artisanal (using wind or small engine powered craft) and 10 per cent are mechanized trawler fishermen. (Source: Paragraph 8 of GEF project in brief).

Agriculture also plays an important role in the life of the people. The major part of agriculture thrives is based on the irrigation available through the village tanks. These tanks have traditional water harvesting structures. There are 71 tanks (1994) in
this coastal zone irrigating 3,750 ha, which accounts for only 2.9 per cent of the total study area. As the region is devoid of any other form of agriculture, tanks irrigate around 80 per cent of the land under cultivation. Almost all the tanks in the reserve area are in need of rehabilitation.

Financial services for the poor in the existing livelihood related programmes in the buffer zone continue to ignore the development of sustainable alternatives. In majority of the cases, people are forced to seek credit from the moneylenders at prohibitively high rate of interest, resulting in more pressure on the resource to repay the interest.

Few (Non-Governmental Organisations) NGOs and Research Institutions are working for the development of the socio-economic condition of this area. There are also community-based organizations working on banking programmes in the region.

2.4 ADMINISTRATIVE UNITS

The administrative units are drawn and compiled based upon the Survey of India maps (1996). From the administration divisions, Tuticorin coastal zone covers parts of two districts viz. Ramanathapuram in the north and Tuticorin in the south (Figure 2.2 and Table 2.1). About 61.5 per cent of the study area falls under Rameswaram, part of Ramanathapuram and Kadaladi Taluks of Ramanathapuram District and altogether covers 70 villages. The Tuticorin District covers the rest of the 38.5 per cent of the study area comprising 50 villages belonging to Vilathikulam, Ottapidaram and Tuticorin Taluks. There are 21 islands in the study area of which 14 islands (Shingle Tivu, Kurasad Tivu, Kovi Tivu, Pumarichan Tivu, Manalipatti Tivu, Manali Tivu, Musal Tivu, Mulli Tivu, Valai Tivu, Talari Tivu, Appa Tivu, Puvarasampatti Tivu, Palliyarumma Tivu and Anaipari Tivu) belong to Ramanathapuram Taluk, 3 islands (NallaTanni Tivu Shalli Tivu and Uppu Tanni Tivu) to Kadaladi Taluk and the rest of the four islands belong to Kovilpatti Taluk (Kariya Shuli Tivu, Vilangu shuli Tivu, Kosuvaritivu and Van Tivu). The mainland of Kovilpatti Taluk locates away from the study area.

2.5 RELIEF

The relief (Figure 2.3) of the study area was deduced from the Survey of India topographic sheets of 1:50,000 scale and the field survey by using GPS (GARMIAN
### Tuticorin District

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Revenue Village</th>
<th>Sl. No.</th>
<th>Name of Revenue Village</th>
</tr>
</thead>
<tbody>
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<td>Mullakkadu</td>
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<tr>
<td>3</td>
<td>Ayanadaippu</td>
<td>4</td>
<td>Maravanmatam</td>
</tr>
<tr>
<td>5</td>
<td>Korampallam</td>
<td>6</td>
<td>Sakkarapperi</td>
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<tr>
<td>7</td>
<td>Mappilairani</td>
<td>8</td>
<td>Pulipanjankulam</td>
</tr>
<tr>
<td>9</td>
<td>Attimarappatti</td>
<td>10</td>
<td>Vellapandiispuram</td>
</tr>
<tr>
<td>11</td>
<td>Milavittin</td>
<td>12</td>
<td>Tuticorin VII</td>
</tr>
<tr>
<td>13</td>
<td>Tuticorin VI</td>
<td>14</td>
<td>Thathaneri</td>
</tr>
<tr>
<td>15</td>
<td>Nedungulam</td>
<td>16</td>
<td>Kallurani</td>
</tr>
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<td>Periyasamypuram</td>
<td>18</td>
<td>Vembaram</td>
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<tr>
<td>19</td>
<td>Kuathur (North)</td>
<td>20</td>
<td>Vaippar Part-1</td>
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<td>21</td>
<td>Melhandai</td>
<td>22</td>
<td>M. Shanmugapuram</td>
</tr>
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<td>23</td>
<td>Thangamalpuram, K.</td>
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<td>Soorangudi</td>
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### Ramanathapuram District

<table>
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<th>Name of Revenue Village</th>
<th>Sl. No.</th>
<th>Name of Revenue Village</th>
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<tbody>
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<td>Kila Arasadi</td>
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<td>Sillanattam</td>
<td>4</td>
<td>Mela Marudur</td>
</tr>
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<td>5</td>
<td>Valasamudram</td>
<td>6</td>
<td>Mela Arasadi</td>
</tr>
<tr>
<td>7</td>
<td>Tanvaikkulam</td>
<td>8</td>
<td>Mela Arasadi</td>
</tr>
<tr>
<td>9</td>
<td>Mural Murukumarapuram</td>
<td>10</td>
<td>D. Duraiwampusuram</td>
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<tr>
<td>11</td>
<td>Veypalodai</td>
<td>12</td>
<td>Kollanparambufu</td>
</tr>
<tr>
<td>13</td>
<td>Vadanattam</td>
<td>14</td>
<td>Peikulam</td>
</tr>
<tr>
<td>15</td>
<td>Terku Kalamedu</td>
<td>16</td>
<td>Mariyur</td>
</tr>
<tr>
<td>17</td>
<td>Idampadal</td>
<td>18</td>
<td>Thaniyam</td>
</tr>
<tr>
<td>19</td>
<td>Siraikulam</td>
<td>20</td>
<td>Meenangudi</td>
</tr>
<tr>
<td>21</td>
<td>Kadugusandai</td>
<td>22</td>
<td>Melaselvanur</td>
</tr>
<tr>
<td>23</td>
<td>Keelasevanur</td>
<td>24</td>
<td>Keelakidaram</td>
</tr>
<tr>
<td>25</td>
<td>Alvangulam</td>
<td>26</td>
<td>Melakidaram</td>
</tr>
<tr>
<td>27</td>
<td>Ertvadi</td>
<td>28</td>
<td>Valinokam</td>
</tr>
<tr>
<td>29</td>
<td>Sippilakulam</td>
<td>30</td>
<td>Brahmankulam</td>
</tr>
</tbody>
</table>

**Compiled by Author based on Census of India, 2001,**

Table 2.1: Revenue Villages comes under Tuticorin Coastal Zone
Palm tap). The contours at two metres interval were generated to understand the topography. Accordingly, two small packets of elevated lands are found near K.Shanmugapuram village of Ottapidaram Taluk and Thathaneri Village of Vilathikulam Taluk. The rest of the study area is relatively plain. The maximum elevation of 28.7m, above MSL is found near K.Shanmukapuram. The Rameswaram Island is a plain with the highest elevation of 21.5 m, above mean sea level found near Gadhamanaparvatham. In general, the slope gradually decreases towards the east from highlands. No island has perceptible relief variation except the central part which is having a slight elevation.

2.6 GEOLOGY

The study area comprises the rocks and unconsolidated sediments of Archaean to Recent age, deposited during Recent to late Pleistocene epochs occurring over most part of the study area which constitutes about 83.5 per cent in the study area. They have been classified as fluvial, fluvio-marine and marine, having the areal extent of 275 sq km (19.3 per cent), 763sq km (53.5 per cent) and 153sq km (10.7 per cent) respectively (Figure 2.4). Marine sediments occupy the entire Rameswaram Island and the area from Mandapam to Killakara. The width of these marine sediments narrows down in the southern part (8 km, in the south, near Tuticorin and less than a kilometer near Killakara). The fluvio-marine sediments are confined to the southern and central part of the study area. They lie along a narrow stretch between Kuliyankarimal of Tuticorin Taluk and Gundar River and parallel to the marine sediments on the island side. Fluvial sediments lie along the western margin, adjacent to the fluvio-marine sediment on the island side continuously from the area near Kottagudi Ar in the northeast up to the area just north of K.Thangamalpuram in the south. They have been deposited by the rivers such as Gundar, Palar and Kottgudiar. Apart from these unconsolidated sediments, laterites of Quaternary period are also found along a narrow stretch between the Kottagudi Ar in the northeast and Palar in the southwest and the northeast of Kadugusandai and further down southwest between the villages of S.Tharaikudi and Narippaiyur of Kadaladi Taluk. Calcareous gritty sand stone and clay are (5.34 sq km, 0.31 per cent) found in the northern rim of Rameswaram Island. Hornblende-biotite gneiss is (136 sq km, 9.54 per cent) restricted to the southwestern part towards the west, lying on either side of the Vaippar River.
GEOLOGY, LINEAMENTS & MINERALS

TUTICORIN COAST

F i g. 2.4

LEGEND

Recent to Late Pleistocene
- Qf: Fluvial Sediments
- Qfm: Fluvio - Marine Sediments
- Qm: Marine Sediments
- Cal: Limestone

Early to Middle Pleistocene
- Czc: Carbonaceous Grity Sandstone and Clay

Migmatite Complex - Archaean Period
- Amh: Hornblende - Biotite Geniss

Minerals
- Clay
- Gypsum
- Illmenite
- Limestone
- Salt
- Shell Limestone

Source: Compiled by author based on SOI Topographic sheets and Geological Survey of India Map
The important minerals of the study area are Clay, Gypsum, Limestone, Shell limestone, Salt, Illumite and Garnet. Most of the Garnet and Illumite deposits are confined to the eastern part of the study area, especially near Mandapam, Periyapattinam and Kanjirangudi of Ramanathapuram Taluk. Garnet deposits are predominant near Taruvaikulam and Terku Kalamedu villages of the Ottapidaram Taluk. Gypsum occurs near Tuticorin, Kalamedu and mouth of Pal Ar River. Large deposits of salts are found near Tuticorin and Valinokkam (Kadaladi Taluk). Limestone deposits are found near Valinokkam and Shell limestone are restricted to the areas near the northern tip of Rameswaram Island and the Vaippar river mouth.

2.7 GEOMORPHOLOGY

The geomorphic units were drawn from remotely sensed data (Figure 2.5) and the doubtful areas are checked in the field and tabulated (Table 2.2). The Tuticorin coastal zone has been classified into major landforms such as fluvial, fluvio-marine, marine origins. **Fluvial Origin** is formed due to the action of running water. The running water develops certain landforms in the study area such as river, alluvial plain, flood plain, natural levee, delta, deltaic plain and deep buried pediment. Alluvial plain occupies more areas than any other landforms in fluvial origin that has an extent of area 24, 335 ha (16.3 per cent). Natural levee occupies a small area of 915 ha (0.62 per cent). The landforms of **Fluvio-Marine Origin** in the study area are estuary and shoal which cover an area of 874 ha (0.58 per cent) and 265 ha (0.18 per cent) respectively. **Marine Origin** landforms of the study area formed due to the action of sea waves, are coastal plain, beach ridge-swale complex, dune, stabilized dune, salt flat, mud flat, beach, spit, bar, tombolo, marine terrace, cliff, creek, tidal flat/tidal inlet, island, lagoon/paleo lagoon, and coral reefs. The detailed geomorphic descriptions of the landforms are dealt in chapter four.

The major landforms of the present coastal zone are swale and ridge complex. They are marine origin which covers a larger area of 27,453 ha (18.42 per cent). Tombolo occupies a smaller portion and covers an area of 68.96 ha (0.05 per cent).

2.8 DRAINAGE

The Tuticorin coastal zone is drained (Figure 2.) by the Vaigai Ar, Pal Ar, Gundar and Vaippar Kottagudi Ar, Korrampallam Odai and Madikettan Odai. Apart
Table 2.2. Tuticorin Coastal Zone: Geomorphology and their areal extent

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Geomorphology</th>
<th>Area in hectare</th>
<th>percentage</th>
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<td><strong>Fluvial Origin</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Deep Buried Pediment</td>
<td>16717.33</td>
<td>10.91</td>
</tr>
<tr>
<td>2</td>
<td>River</td>
<td>1210.61</td>
<td>0.81</td>
</tr>
<tr>
<td>3</td>
<td>Natural Levee</td>
<td>915.17</td>
<td>0.61</td>
</tr>
<tr>
<td>4</td>
<td>Alluvial Plain</td>
<td>24334.86</td>
<td>16.32</td>
</tr>
<tr>
<td>5</td>
<td>Flood Plain</td>
<td>2930.57</td>
<td>2.35</td>
</tr>
<tr>
<td>6</td>
<td>Deltaic Plain</td>
<td>7866.73</td>
<td>5.28</td>
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<tr>
<td>7</td>
<td>Delta</td>
<td>2401.78</td>
<td>1.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>56377.05</td>
<td>37.89</td>
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<tr>
<td><strong>Fluvio marine Origin</strong></td>
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<td></td>
<td></td>
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<td>8</td>
<td>Estuary</td>
<td>874.20</td>
<td>0.58</td>
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<td>9</td>
<td>Shoal</td>
<td>264.80</td>
<td>0.18</td>
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<td></td>
<td></td>
<td>1139</td>
<td>0.76</td>
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<tr>
<td><strong>Marine Origin</strong></td>
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<tr>
<td>10</td>
<td>Sandy Plain</td>
<td>17832.30</td>
<td>11.88</td>
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<td>11</td>
<td>Coastal Plain</td>
<td>14614.12</td>
<td>9.81</td>
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<td>12</td>
<td>Swale &amp; Ridge complex</td>
<td>27453.22</td>
<td>18.42</td>
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<tr>
<td>13</td>
<td>Stabilised Dune</td>
<td>4679.96</td>
<td>3.23</td>
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<td>14</td>
<td>Coastal Sand Dune</td>
<td>681.06</td>
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<tr>
<td>15</td>
<td>Sandy Beach</td>
<td>726.17</td>
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<tr>
<td>16</td>
<td>Marine Terrace</td>
<td>6717.70</td>
<td>4.65</td>
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<tr>
<td>17</td>
<td>Spit</td>
<td>1919.31</td>
<td>1.29</td>
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<tr>
<td>18</td>
<td>Cliff</td>
<td>110.91</td>
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<td>19</td>
<td>Sand Bar</td>
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<td>20</td>
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<td>Salt Flat</td>
<td>6902.23</td>
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<td>22</td>
<td>Mud Flat</td>
<td>439.47</td>
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<td>23</td>
<td>Tidal flat/Tidal Inlet</td>
<td>1792.73</td>
<td>1.21</td>
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<td>24</td>
<td>Tombolo</td>
<td>68.96</td>
<td>0.05</td>
</tr>
<tr>
<td>25</td>
<td>Islands</td>
<td>767.31</td>
<td>0.52</td>
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<tr>
<td>26</td>
<td>Lagoon/ Paleo lagoon</td>
<td>4133.92</td>
<td>2.78</td>
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<tr>
<td>27</td>
<td>Coral Reef</td>
<td>934.77</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>91346.25</td>
<td>61.35</td>
</tr>
</tbody>
</table>

Total area 148862.03ha or 1488.62 sqkm

Source: Compiled by Author based on IRS 1D LISS 3 2003
from these, a number of minor rivers draining the study area debouch into the tanks and they form the major source for irrigation. The major rivers of the study area have their catchment at the Western Ghats and they flow from the west to the east and empty their surplus water into Gulf of Mannar, during the monsoon seasons. In general, streams and rivers of the study area are ephemeral.

2.9 CLIMATE

The climate in Tuticorin coast is hot and dry except the coastal areas, where the sea breeze mitigates the heat to some extent. The maximum temperature rarely exceeds 34º C and the minimum temperature drops below 20º C. April to June is the hottest months. During this season, coastal region enjoys cool sea breeze. The mean temperature varies from 25.9º C to 30.6º C and the average humidity is 79%. The lowest temperature is recorded during the period of December to January.

2.9.1 Rainfall

The rainfall characteristic of the Tuticorin Coast has been studied by using 40 (1965-2004) years of monthly rainfall data collected from 7 rain gauge stations namely, Mandapam, Pamban, Vilathikulam, Mudukulathur, Balamorekulam, Ottapidaram and Tuticorin, located in and around the study area. Accordingly, the spatial distributions of the mean annual, seasonal and monthly rainfall of the study area are dealt in the following paragraphs:

2.9.1.1 Mean Annual: The long term mean annual rainfall of the study area is 691.6 mm (Table 2.3). It is less than 60 per cent, while compared with the state average mean annual rainfall of 983.3 mm. However, the study area is characterised by significant variations in the quantum of mean annual rainfall. It is observed that the mean annual rainfall varies spatially from 541.8 mm (Tuticorin) to 825.6 mm (Pamban) in the study area. Based on the mean annual rainfall amounts, the study area has been divided into: zones of high rainfall (>775 mm); moderate (700-775 mm); normal (625-700 mm); low (550-625 mm) and very low (<550 mm) (Figure 2.7). The high rainfall zone covers the areas of the Rameswaram Island and most of the villages of the Ramanathapuram Taluk that fall within the study area. It extends all along the coast upto the area just west of Kottagudi Ar. The zone with moderate rainfall lies further the west and southwest, extending upto the south west of Pal Ar
Table: 2.3. Tuticorin Coast: Long term mean monthly (1965 – 2003) rainfall (in mm)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Rain Gauge Station Name</th>
<th>January (mm) (%)</th>
<th>February (mm) (%)</th>
<th>March (mm) (%)</th>
<th>April (mm) (%)</th>
<th>May (mm) (%)</th>
<th>June (mm) (%)</th>
<th>July (mm) (%)</th>
<th>August (mm) (%)</th>
<th>September (mm) (%)</th>
<th>Southwest (mm) (%)</th>
<th>October (mm) (%)</th>
<th>November (mm) (%)</th>
<th>December (mm) (%)</th>
<th>Northeast (mm) (%)</th>
<th>Mean annual (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pamban</td>
<td>39.3 (4.76)</td>
<td>24.0 (2.91)</td>
<td>63.4 (7.68)</td>
<td>8.1 (0.98)</td>
<td>48.4 (5.86)</td>
<td>43.9 (5.31)</td>
<td>100.3 (12.15)</td>
<td>6.2 (0.75)</td>
<td>13.4 (1.62)</td>
<td>8.8 (1.07)</td>
<td>28.3 (3.43)</td>
<td>56.7 (6.87)</td>
<td>185.4 (22.45)</td>
<td>241.3 (29.22)</td>
<td>178.6 (21.63)</td>
</tr>
<tr>
<td>2</td>
<td>Mandapam</td>
<td>35.5 (4.35)</td>
<td>24.0 (2.94)</td>
<td>59.5 (7.29)</td>
<td>11.0 (1.35)</td>
<td>45.0 (5.52)</td>
<td>38.0 (4.65)</td>
<td>94.0 (11.52)</td>
<td>7.0 (0.86)</td>
<td>10.2 (1.25)</td>
<td>11.8 (1.45)</td>
<td>28.3 (3.47)</td>
<td>57.3 (7.03)</td>
<td>181.8 (22.30)</td>
<td>247.1 (30.29)</td>
<td>175.9 (21.56)</td>
</tr>
<tr>
<td>3</td>
<td>Balamorekulam</td>
<td>25.8 (3.27)</td>
<td>27.3 (3.47)</td>
<td>53.1 (6.74)</td>
<td>23.4 (2.96)</td>
<td>43.5 (5.52)</td>
<td>30.6 (4.88)</td>
<td>97.5 (12.37)</td>
<td>3.5 (0.44)</td>
<td>15.9 (2.02)</td>
<td>34.9 (5.14)</td>
<td>72.3 (10.6)</td>
<td>144.1 (13.22)</td>
<td>158.6 (22.35)</td>
<td>155.2 (22.84)</td>
<td>91.6 (13.48)</td>
</tr>
<tr>
<td>4</td>
<td>Mudukulathur</td>
<td>17.6 (2.59)</td>
<td>23.5 (3.46)</td>
<td>41.1 (6.05)</td>
<td>18.5 (2.72)</td>
<td>36.5 (5.38)</td>
<td>33.7 (4.96)</td>
<td>88.7 (13.06)</td>
<td>14.7 (2.17)</td>
<td>22.2 (3.26)</td>
<td>34.9 (5.14)</td>
<td>72.3 (10.6)</td>
<td>144.1 (13.22)</td>
<td>158.6 (22.35)</td>
<td>155.2 (22.84)</td>
<td>91.6 (13.48)</td>
</tr>
<tr>
<td>5</td>
<td>Vilathikulam</td>
<td>11.33 (1.97)</td>
<td>18.41 (3.19)</td>
<td>29.74 (5.16)</td>
<td>11.70 (2.03)</td>
<td>39.48 (6.85)</td>
<td>26.81 (4.65)</td>
<td>77.99 (13.53)</td>
<td>5.23 (0.91)</td>
<td>18.11 (3.14)</td>
<td>20.19 (3.50)</td>
<td>56.65 (9.83)</td>
<td>100.17 (17.38)</td>
<td>162.81 (28.24)</td>
<td>138.12 (23.96)</td>
<td>67.65 (11.73)</td>
</tr>
<tr>
<td>6</td>
<td>Ottapidaram</td>
<td>16.4 (2.66)</td>
<td>20.4 (3.33)</td>
<td>36.8 (5.99)</td>
<td>24.3 (3.96)</td>
<td>39.9 (6.50)</td>
<td>35.5 (5.78)</td>
<td>99.7 (16.23)</td>
<td>5.4 (0.88)</td>
<td>10.8 (1.76)</td>
<td>16.4 (2.67)</td>
<td>49.0 (7.97)</td>
<td>81.6 (13.28)</td>
<td>175.4 (28.55)</td>
<td>158.1 (25.73)</td>
<td>62.7 (10.20)</td>
</tr>
<tr>
<td>7</td>
<td>Tuticorin</td>
<td>17.9 (3.30)</td>
<td>26.7 (4.93)</td>
<td>44.6 (8.23)</td>
<td>25.1 (4.63)</td>
<td>34.6 (6.39)</td>
<td>20.7 (3.81)</td>
<td>80.4 (14.83)</td>
<td>2.6 (0.47)</td>
<td>4.1 (0.76)</td>
<td>4.8 (0.88)</td>
<td>18.0 (3.33)</td>
<td>29.5 (5.44)</td>
<td>130.7 (24.11)</td>
<td>166.9 (30.80)</td>
<td>89.8 (16.58)</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>23.4 (3.27)</strong></td>
<td><strong>23.5 (3.46)</strong></td>
<td><strong>46.9 (6.73)</strong></td>
<td><strong>17.4 (2.66)</strong></td>
<td><strong>41.1 (6.00)</strong></td>
<td><strong>32.7 (4.72)</strong></td>
<td><strong>91.2 (13.39)</strong></td>
<td><strong>6.4 (0.93)</strong></td>
<td><strong>13.5 (1.97)</strong></td>
<td><strong>15.2 (2.28)</strong></td>
<td><strong>40.4 (6.08)</strong></td>
<td><strong>75.6 (11.25)</strong></td>
<td><strong>160.7 (24.44)</strong></td>
<td><strong>191.8 (27.54)</strong></td>
<td><strong>119.2 (16.64)</strong></td>
<td><strong>477.9 (68.63)</strong></td>
</tr>
</tbody>
</table>

Note: The figures given in parentheses are percentage of rainfall for respective figures.
and Valinokkam, followed by the normal rainfall zone (625-700 mm) which lies further south west, extending upto the area just east of Vembar. Most of the villages of the Kadaladi Taluk fall under the normal rainfall zone. Further towards south, all along the coast, the low rainfall zone occurs, which extends in an accurate shape upto the area just north of Tuticorin. The villages which come under Ottapidaram and Villathikulam Taluks of Tuticorin District covers this low rainfall zone. Further, south, the areas of very low rainfall occurs and most of the villages belonging to the study area that lie in Tuticorin Taluk fall within this zone.

In general, the mean annual rainfall receives maximum in the northeastern part of the study area (Figure 2.7) of Rameswaram Island and it gradually decreases all along the coast towards the west and southwest.

### 2.9.1.2 Winter Season:
Rainfall during winter season is relatively meager (46.9 mm) and is very less among all seasons. The season contributes an average of only 6.7 per cent of the annual rainfall. Among the rainfall stations of the study area, the winter rainfall varies from 29.7 mm in Villathikulam to 63.4 mm in Pamban. Further, the rainfall is relatively high in the Rameswaram Island (Figure 2.8) which records 60 mm rainfall. Moderate rainfall is ranging from 50 mm to 60 mm occurs in the areas of Ramanathapuram Taluk. The normal rainfall which ranges between 40 mm and 50 mm is found in the areas of Kadaladi Taluk and along the narrow coastal stretch, extending upto the southern margin of the study area. Most part of the area that falls within the Ottapidaram Taluk and western part of Villathikulam Taluk receives low winter rainfall. Thus it is evident that the winter season rainfall in the study area gradually decreases towards the south along the coast and the west of the southern portion of the study area.

### 2.9.1.3 Summer Season:
The mean summer rainfall of the study area is 91.2 mm which accounts for 13.4 per cent of the mean annual rainfall. Though the rainfall during this season is less, it contributes significantly to the annual rainfall, unlike the winter season. In the study area, the summer rainfall is the maximum in Pamban which records 100.3 mm, closely followed by Ottapidaram 99.7 mm (16.2 per cent), Balamorekulam 97.5 mm (12.4 per cent) and Mandapam 94 mm (11.5 per cent) respectively. The summer rainfall is very less at Villathikulam which records 78 mm. The rainfall during this season is relatively high (>100 mm) in the entire Rameswaram island (Figure 2.9) whereas it is moderate (90-100 mm) in the mainland,
SUMMER SEASON RAINFALL (1965-2004)

LEGEND
Rainfall in Millimeters

- Above 100 (High)
- 90 - 100 (Moderate)
- 80 - 90 (Normal)
- Below 80 (Low)

Revenue Village: Location & Name

- Sayalgudi
- Veppalodai
- Nedungulam
- Pallakulam
- Thathaneri
- Puliangulam
- Mela Marudur
- Kadugusandai
- Melaselvanur
- Pattanamarudur
- Kannimarkuttam
- Sivaperunguntram
- M.Kumarasakkanapuram
- Jamin Karisalkulam
- Van Tivu
- Koswari Tivu
- Vilangu shuli Tivu
- Karia shuli Tivu
- Uppu Tanni Tivu
- Shali Tivu
- Nalla Tanni Tivu
- Anaipari Tivu Palliyarmunai Tivu
- Puvarasanputti Tivu Appa Tivu
- Talairi Tivu
- Valai Tivu
- Muli Tivu
- Musal Tivu
- Manaliputti Tivu
- Kovi Tivu
- Pumurichan Tivu
- Shingle Tivu
- Kurusad Tivu
- Talairi Tivu
- Van Tivu
- Palikal Bay
- Gulf of Mannar
- Pal K Bay
- M.Kamarasaharan
- Shingalai Vanni
- Pipparamalan
- Kottagudi Ar.
- Vaigai R.
- Pall Ar.
- Channal Palk
- Madikettan Odai
- Vaippar R.
i.e. the entire coastal stretch except the western portion of the southern part of the study area. This zone includes the entire area of Tuticorin Taluk. Areas with normal rainfall of 80-90 mm during this season are confined to the western part of Ottapidaram and Villathikulam Taluks. The areas of low rainfall of below 80mm during this period, is restricted to a small portion on the western part of Villathikulam Taluk. In general, the eastern parts of the study area receive relatively more rainfall and it gradually decreases towards the western portion in the southern part of the study area. It is very low, compared with the State mean summer rainfall (132.4 mm or 13 per cent).

2.9.1.4 Southwest Monsoon Season: During this season, the study area receives only 75.6 mm of rainfall which is less than the rainfall of the summer season. In several parts of the State, though the southwest monsoon is the predominant rainy season, its contribution to the mean annual rainfall is very less (11.2 mm) for the study area. It is below the State average of 393.9 mm (40 per cent) rainfall. Among the rain gauge stations of the study area, the amount of rainfall during the season varies considerably (Figure 2.10). It ranges from 29.5 mm in Tuticorin to 144.1 mm in Kadaladi. The rainfall during the winter and summer seasons is relatively higher than the southwest monsoon in the western, interior parts, especially in the western parts of Kadaladi and Villathikulam Taluks.

2.9.1.5 Northeast Monsoon Season: The rainfall of the northeast monsoon season is 477.9 mm, much higher than even the total rainfall of the other three seasons and hence, it is the predominant and the most important rainy season of the study area. This season contributes about 68.6 per cent of the total annual rainfall which is above the State average northeast monsoon rainfall of 41 per cent (404.7 mm).

Among the rain gauge stations, the distribution of the rainfall varies from 368.6 mm in Villathikulam to 605.2 mm in Pamban. However, the percentages of the season’s rainfall to the annual rainfall give a different picture; the percentage of rainfall during this season ranges from 59.7 per cent for Kadaladi to 74.1 per cent for Mandapam. In general, the rainfall gradually decreases from the northeast towards the west, south west and southern parts of the study area (Figure 2.11). A trend is much similar to the mean annual rainfall and hence the northeast monsoon season is important for all agricultural activities.

"Integrated Coastal Zone Management for Tuticorin Coast, Tamil Nadu, India: Using Geo-spatial Technology", Department of Geography, Bharathidasan University, Tiruchirappalli: geomks16@gmail.com (2010)
NORTHEAST MONSOON SEASON (1965-2004)

TUTICORIN COAST

Fig. 2.11

Revenue Village: Location & Name

LEgend
Rainfall in Millimeters
- Above 600 (High)
- 500 - 600 (Moderate)
- 400 - 500 (Normal)
- 400 (Low)
- Below 400 (Low)

Sayalkudi
SOUTHWEST MONSOON SEASON (1965-2004)

LEGEND
Rainfall in Millimeters
- Above 125 (High)
- 100 - 125 (Moderate)
- 75 - 100 (Normal)
- 50 - 75 (Low)
- Below 50 (Very Low)

Revenue Village: Location & Name
As far as the spatial distribution of northeast monsoon rainfall is concerned, the Rameswaram Island and a small pocket in the mainland near Mandapam is relatively high rainfall zone which recorded 600 mm of rainfall. This is followed by the moderate rainfall of 500-600 mm zone, which includes the entire part of the study area under Ramanathapuram Taluk, and it stretches up to Valinokkam. The mid portion of the study area adjacent to the Gundar River falls under the normal rainfall zone and it receives 400-500 mm of rainfall. In the rest of the areas of the west and further towards south, the rainfall during this season is relatively less than 400 mm.

2.9.2 Temperature

The study area falls under the hot tropical climate. The months of April to July are the hottest. The temperature declines to some extent on the outbreak of the northeast monsoon. The study areas mean minimum temperature varies from 18.0°C in January to 26.5°C in June, and mean maximum temperature varies from 38°C in May to 30.5°C in December. The relative humidity is high at 79% on an average and it ranges between 80% and 90% in coastal area owing to the coastal nature.

2.10 SOIL AND THEIR DISTRIBUTION

Information regarding the soils of the study area was obtained from the Soil Survey and Land Use Organisation, Department of Agriculture, Government of Tamil Nadu State. There are four soil orders (viz, Entisol, Vertisol, Inceptisol, and Alfisol) based on USDA Classification with 16 soil series found in the study area (Figure 2.12). The characteristics of these soil series and their distribution in the Tuticorin Coast are described as follows:

2.10.1 Entisol (Recent soil)

Entisols are those soils which are developed recently. Soils belonging to this order are found on steep actively eroding slopes or on flood plains that receive new deposits of alluvium at frequent intervals. Alluvial flood plains, deltas, shorelines bordering, lagoons and estuaries usually have these soils. In the study area, these soils have been drained mainly from the depositional process by the rivers. Within this soil order, three soil types are found and they include recent soils, recent sandy soil, and red sandy soil. Each of this soil types can be further subdivided into a number of soil
**SOILS**

**LEGEND**

**Soil classification**

*Based on U.S. Department of Agriculture*

- **Entisol (Recent soil)**
  - **Aquic Ustipsamments (Kovalam (Kvm))**
  - **Typic Ustipsamments (Mandapam (Mmp), Tiruchendur (Tcr))**
  - **Typic Chromusterts (Kovilpatti (Kvp))**

- **Inceptisol (Immature soil)**
  - **Aquic Ustipsamments (Kovalam (Kvm))**
  - **Typic Ustipsamments (Mandapam (Mmp), Tiruchendur (Tcr))**
  - **Typic Chromusterts (Kovilpatti (Kvp))**

- **Vertisol (Black soil)**
  - **Vertic Haplustalfs (Kadaladi (Kdl))**
  - **Vertic Haplustalfs+Entic Chromusterts (Kadaladi (Kdl))**
  - **Vertic Haplustalfs+Vertic Ustrocherept (Vannankundu (Vnk))**
  - **Vertic Haplustalfs+Fluventic Ustropepts (Pannerkulam (Pnk))**

- **Alfisol (Reddish Brown soil)**
  - **Fluventic Ustropepts (Sayalkudi (Syk))**
  - **Typic Ustropepts (Paramakudi (Pmk))**

- **Other**
  - **Inceptisol (Immature soil)**
  - **Vertic Ustrochrepts (Vedalai (Vdl))**
  - **Vertic Fragiochrepts+Aquic Ustipsamments (Tirupullani (Tpl))**
  - **Calcio Ustrochrepts (Vedalai (Vdl))**

**Source:** NBSS & Soil Survey and Landuse Organisation, Coimbatore and compiled by author.

**Fig. 2.12**

- **Tuticorin Sector**
- **Ottapidaram Sector**
- **Vilathikulam Sector**
- **Kadaladi Sector**
- **Madikettan Odai**
- **Palk Bay**
- **Chennel Pal Cs**
- **Kottagudi Ar**
- **Vaippar R.**
- **Vai.R**
- **Kara mopallam**
- **G Kul fo of M annar**
series. The important characteristics of these subdivisions and their distribution in the study area are given in the following section.

3.10.1.1 Aquic Ustorthents-Auot (Keelapavalam): The Keelapalavam soil series is characterised by dark brown colour, very deep, coarse, loamy, slightly calcareous and neutral. Areas with these soils possess gentle slope and are prone for water stagnation. In general, this soil series supports vegetation such as Palm, Poovarasu and Tamarind. It is mainly found in the Ramanathapuram Taluk, between Nochiyurani and Kalimankundu. It covers an area of 25.25 sq.km or 1.63 per cent of the study area.

3.10.1.2 Typic Ustipsamments - Tupt (Mandapam and Tiruchendur): The Mandapam and Tiruchendur soil series are characterised by deep to moderately deep, wind transported shingle grain, and calcareous as well as non calcareous, red and grayish brown and well drained soil. In general, this soil series largely supports vegetation such as Palmyrah in the study area. It occurs in the Ramanathapuram Taluk, along the shore line with a width of 1-2 km and distributed for about 788 sq.km. It is a predominant feature in the study area and occupies 50.8 per cent.

3.10.1.3 Calcio Ustipsamments - Caupt (Rameswaram): The Rameswaram soil series are similar to Typic Ustipsamments (Mandapam and Tiruchendur) except that they are deep and have unweathered sea shells in the profile. In this soil series the major vegetations are Palmyrah and Coconut. About 21 sq.km or 1.34 per cent of the study area comes under this soil series. They mainly occur in the Rameswaram Taluk, far larger extenting between Pamban and Rameswaram.

2.10.2 Vertisol (Black soil)

Vertisols are commonly referred to as black soils. They are subjected to cracking during summer season, mostly montmorillenite that shrink and swell over the rainy seasons. They have wide deep cracks during moisture deficient periods. Alkaline reaction is common to the various parent materials like calcareous sedimentary rocks, basic igneous rocks and alluvial deposits. They are usually formed over gentle slopes. The important soil series of this group found in the coastal zone are detailed as follows.

2.10.2.1 Typic Chromusterts - Tcsv (Mudukulathur): It is locally known as Mudukulathur soil. It is characterized by black, deep, imperfectly drained, cracking
dry soils on nearly level land. In general, this soil series supports to raise cotton, chillies, ground nuts and small millets. It is found in the Idampadal and Siraikulam area of Ramanathapuram Taluk and covers an area of 18.20sq km that accounts for 0.69 per cent of the total study area.

2.10.2.2 Entic Chromusterts - Ecsv (Kovilpatti): It is called Kovilpatti soil series. It is black, very deep, calcareous, moderately well drained, heavy textured, with well developed crumb structure and well defined horizon soils derived from gneiss. The profile invariably consists of gypsum in various stage of development. This soil supports to cultivate cotton, chillies and pulses. It covers an area of about 240 sq km and is mainly distributed along the western margin, a little south of Vaippar River. It occupies 15.4 per cent of the total area of the Tuticorin coastal zone.

2.10.3 Inceptisol (Immature soil)

Inceptisols are imperfectly or very poorly developed soils with indistinct profile features that retain close resemblance to the parent material. The five major great-groups soils found in the study area are:

2.10.3.1 Calcio-Ustochropts - Cauop (Vedalai): This soil series is characterised by light brownish, very deep, coarse to fine loamy, occurring in low lying swampy lands. They are calcareous and have calcic horizon. They have ochric epipedon (surface layer has organic matter less than 1 per cent) and Ustic moisture regime (the soil moisture control section is dry in some parts or all parts for 90 days or more cumulative days). In general, this soil series supports vegetation such as Prosopis, Acacia and Palmyra. It is found in the northeastern part of Rameswaram Island, west and south of Vaigai River that altogether cover an area of 25 sq km or 1.63 per cent of the study area.

2.10.3.2 Typic Fragiochrepts - Tjop (Tiruppullani): The Tiruppullani soil series is yellowish brown, very deep, coarse loamy, noncalcareous and mildly alkaline soil. Areas with these soils possess gentle slope and slight erosion and moisture land. Prosopis and palm are the major vegetations in the soil group. This soil is distributed for about 14.8 sq km or 0.96 per cent of the total study area. A linear stretch of this soil is found in Nochiyurani and Kalimankundu of the Ramanathapuram Taluk.
2.10.3.3 Typic Fragiochrepts+Aquic Ustipsamments – Tfop+Aupt (Tiruppullani): This soil series is an extended and mixed soil of Typic Fragiochrepts.

2.10.3.4 Fluventic Ustropepts - Futp (Sayalkudi): This soil series is dark yellowish brown, very deep, calcareous, moderately well drained, medium textured, with well developed structure and moderately well defined horizon soil and developed from old flood plains of river alluvium. In this soil, Cotton, Groundnut, Pulses and small millets are being cultivated. It occurs in the Sayalkudi, Panaydiyendal, Melakidaram and Melaselvanur areas of Kadaladi Taluk. It covers an extent of 42.36 sq km, which is about 2.73 per cent of the study area.

2.10.3.5 Typic Ustropepts - Tutp (Paramakudi): It is moderately deep light to medium textured, non calcareous, brown soils with weak structural development. It is found in the villages such as Panaydiyendal and Utrakosamangai of the Ramanathapuram Taluk and covers about 0.89 per cent or 10.12 sq km of the study area. Small millets are generally being grown in this soil.

2.10.4 Alfisol (Reddish Brown soil)

Alfisol are associated with moisture less continental climatic zones than the mollisols. They are the most extensive soils found in the study area having mineral content and usually moist. They have either an argillic or a nitric horizon. The vase saturation is more than 50 per cent below top. The Alfisols soil orders are described in the following paragraphs:

2.10.4.1 Fluventic Haplustalfs - Fhsf (Mamallakkarai): The Mamallakkarai soil series is dark brown, deep, coarse loamy, calcareous and slightly alkaline soil. It is found in the Kanjirangudi and Palamorekulam areas of the Ramanathapuram Taluk and covers about 28 sq km or 1.8 per cent of the study area. The prosopis and thorny shrubs are the major vegetation growing in this soil.

2.10.4.2 Psammentic Paleustalfs - Psuf (Kudakottai): The Kudakottai soil series is characterized by very deep, loamy soils on flat areas, moderately eroded, associated with very deep and excessively drained, sandy clay soils. In this soil series groundnut, coconut, prosopis and acacia are being cultivated. It is mainly found in Kudakottai, Kumbaram, Karan and Rettaiyurani areas of the Ramanathapuram Taluk. It is distributed for an area of 22.67 sq.km, which accounts for 2.35 per cent of the total study area.
2.10.4.3 Rhodic Paleustalfs - Rupt (Kuthiraimozhi): The Kuthiraimozhi soil series is very deep, somewhat excessively drained, loamy soils on gentle sloping areas, moderately and severely eroded, associated with very deep and excessively drained sandy soils. Acacia, Prosopis and Palms are the common vegetation in this soil. The areas of Kuthiraimozhi, S.Taraikudi, Soorangudi, Thangammuupaluram.K., and Sivagnapuram in the Kadaladi Taluk and Kadugusandai, Keelakidaram, Melakidaram, Melaselvanur, and Thanichyam of the Ramanathapuram Taluk cover Kuthiraimozhi soils for an area of 44.7 sq.km or 10.2 per cent of the study area.

2.10.4.4 Vertic Haplustalfs - Vhsf (Kadaladi): It is a dark grayish brown, very fine loamy, calcareous, moderately alkaline soil. It is found in gentle sloping areas and subjected to slight erosion. Palm and Prosopis are the predominant vegetation found in this soil series. It occurs in the Sikkal, Kadaladi, Peikulam, Valanur in the Ramanathapuram Taluk and Meenangudi, Silliyanvagaikkulam, Iruveli and Archanipagam Usilangulam of the Kadaladi Taluk and altogether covers an area of 19.65 sq km, which is about 1.62 per cent of the study area. It is also mixed with Vertic Haplustalfs+Entic Chromusterts - Vhsf+Ecsv and Vertic Haplustalfs+Vertic Ustrocherept (Vhsf+Vuop) soils.

2.10.4.5 Vertic Haplustalfs+Fluventic Ustrocherept - Vhsf+Futp (Pannerkulam): The Pannerkulam soil series is deep to very deep non-calcareous, well drained, and medium to coarse textured, well developed structure and moderately well defined horizons and red soils developed from weathered gneiss. About 10.4 sq.km or 1.2 per cent of the study area is under this soil series. It supports for growth of Palmyrah, Acacia, Prosopis, Neem, Coconut, Ficus, Opunita, Erukku and Tamarind. The areas of Kulayankarisa l, Milavittan, Maravanmatam and Ramasamypuram of the Tuticorin Taluk are covered with this soil series.

2.10.4.6 Vertic Ustropepts+Typic Ustropepts+Vertic Haplustalfs - Vhsf+Tutp+Vutp (Villathikulam): This soil series is characterized by dark yellowish brown, very deep, calcareous, moderately well drained, medium textured, with well developed structure and moderately well defined horizon soils, developed from old flood plains of river alluvium. It is not subject to any serious erosion. In this soil series, crops like cotton, groundnut, pulses and small millets are being cultivated. It is found in Villathikulam Taluk by covering villages Vedapatti, Vaippar, Virusampatti, Poosanoor, Palakulam, Thathaneri, M. Kumarasakkanapuram, and Nedungulam. It is
distributed for an area of 42.36 sq.km, which accounts for 2.73 per cent of the study area.

2.11 GENERAL LAND USE/ LAND COVER

The spatial distribution of land use/land cover has been brought out (using Indian Remote Sensing satellite data IRS-1D, LISS-III FCC image) as it the result of permanent adjustment between constraining properties and socio-economic attributes of the study area (Figure 2.13). The total area of the coast zone is 14,8865 ha. It could be brought out under six major land use (Level I) categories. They are Built up lands covering an area of 6,824 ha or 4.6 per cent, Agricultural lands 72,436 ha or 48.7 per cent, Forests 9,601 ha or 6.4 per cent, Wastelands 45,611 ha or 30.6 per cent and water bodies 1,0054 ha or 6.8 per cent, and others 4,339 ha or 2.9 per cent of the total study area. The predominant class of agricultural lands is followed by the wastelands. These wastelands are in the central part and along the coast line of the eastern margins of the study area. However, the wastelands along the coastline can be utilized if proper conservation measures or alternatives are taken. They are suitable for scrub forest. A detailed description of the land use/land cover is discussed in the third chapter.

2.12 SOURCES OF IRRIGATION

The irrigation sources are Canals, Tanks, Wells and Tube wells. For the Kalvoi – Sadayaneri (Thoothukudi District), the Government has sanctioned an amount for the scheme of widening the existing Kalvoi – Sadayaneri Channel upto Kalvoi Tank and widening the existing Sadayaneri Channel, excavation of Sadayaneri Extension Channel, improvements to the existing Mudalur Odai from Karumeniyar to Vairavantharuvai and excavating a link canal from Vairavantharuvai to Puthanthurai. For Malattar Anicut Scheme (Ramanathapuram District) and Narayana Cauvery Channel (Ramanathapuram District), the Government has sanctioned the scheme for Rehabilitation of Narayana Cauvery Channel and its anicut (Mandalamanickam Anicut) to feed Sayalkudi tank and other 33 tanks in Ramanathapuram District. This scheme gives irrigation support to 1942.97 ha of lands including Mandalamanickam, Kamuthi, Mandalnadu, K.Nedungulam, Seemanendal, Kundukulam, K.Veppankulam, O.Karisalkulam, Kovilankulam, Koomboothi, M.Pudukulam and Villanendal villages of Kamuthi Taluk, Sayalkudi,
2.13 POPULATION DISTRIBUTION

The village wise population of the study area (2001 census, Appendix 2.1) was obtained from the Statistical Department, Government of Tamil Nadu. Accordingly, the total population of the study area is 5,49,956 persons of which 86,271 persons or about 15.7 per cent of the population are in the villages of Tuticorin Taluk, whereas the villages of Ramanathapuram Taluk have 1,90,995 persons which account for 34.7 per cent. The distribution of population (Figure 2.14) in the villages of Ottapidaram, Vilathikulam and Rameswaram Taluks is relatively less and altogether constitute only 24.4 per cent of the total population of the study area. The part of the study area which falls under the Vilathikulam Taluk possesses very less population among all taluks. It constitutes only 23,938 persons which is just 4.4 per cent of the total population of the study area. Accordingly, a large amount of population is concentrated in the southern part of the study area whereas the central and other parts have low population. The highest population is found in the Ramanathapuram taluk which alone constitute (1,90,995 persons) 34.7 per cent of the total population of the study area. It should be noted that Sippikulam, Alavangulam and Brahmankulam, villages of the Kadaladi Taluk are uninhabited. The villages with relatively higher population, that is, more than 10,000 persons are in Milavittan, Sankarapperi, Tuticorin and Muttayyapuram of Tuticorin Taluk, Ervadi and Sayalkudi of Kadaladi Taluk. The villages of Kilakkarai, Mandapam, Sakkarkottai and Alagankulam of Ramanathapuram Taluk, and the villages of Rameswaram and Pamban of Rameswaram Taluk, the villages of Ottapidaram and Villathikulam Taluks have not exceeded the population of 100,00 persons.

2.14 POPULATION DENSITY

The population density of Tuticorin coast is 338 persons per sq km. However, there exists a wide variation in the population density among the taluks of the study area. The population density is high in the Rameswaram Taluk (Figure 2.15) where the density is 772 persons per sq km, followed by Tuticorin Taluk, 529 persons per sq km and Ramanathapuram, 444 persons per sq km. It is lesser in Ottapidaram and
POPULATION DENSITY - 2001

TUTICORIN COAST

Legend:
- Persons per Sqkm
- Below 250
- 250 - 500
- 500 - 5000
- 5000 - 10000
- Above 10000

Fig. 2.15

Map showing population density with various regions indicated by different color codes.
Vilathikulam Taluks where the density is 174 and 134 persons per sq km respectively. The least population density is found in Ottapidaram Taluk which has only 174 persons per sq km.

Among the urban centres, the population density is maximum (45,703 persons per sq km) in the Tuticorin. The other urban centres such as Killakarai (4,458 persons per sq km) and Mandapam (1,726 persons) also possess higher population density. Among the villages, the population density is relatively higher (>1000 persons/ sq km) in Tuticorin of Tuticorin Taluk, Veerapandipuram, Melmandai, Poosanoor, T. Subbiahpuram, Vedapatti, Kulathur (North), Kulathur (South), Kulathur (East), M. Kumarasakkanapuram, Vembar, E. Velayudhapuram, Periyasampuram, Virusampatti, Nedungulam and Vaippar of Villathikulam Taluk, and Enmanamkondan of Ramanathapuram Taluk. The remaining rural villages depicted lower population density in the study area.

2.15 SEX RATIO

Sex Ratio is expressed as 'number of females per thousands males in the population'. Sex ratio of the study area is 969 (Figure 2.16). Therefore the female population is marginally less than the male population. Similar trend is observed for the Taluks of Kadaladi (989), Ramanathapuram (905) and Rameswaram (936). In Tuticorin and Ottapidaram Taluks, the case is reverse and the sex ratios are 1043 and 1010 respectively.

Among the villages of the study area, the sex ratio is maximum occurs in Balamorekulam village of Ramanathapuram Taluk where the sex ratio is more than 1000 in most villages of Tuticorin Taluk. In majority of the villages of Ottapidaram and Kadaladi Taluks, the sex ratio is less than 1000.

2.16 LITERACY

Literacy rate of population is defined as the percentage of literates to the total population aged 7 years and above. In the study area, about 72.52 per cent of the population is literates. However, the percentage of literates varies from 76 per cent to 58.4 per cent among the taluks of the study area (Figure 2.17). The maximum literacy rate of 75.97 per cent is found in the Tuticorin Taluk followed by Ramanathapuram Taluk 70.23 per cent, Rameswaram Taluk 68.42 per cent, Ottapidaram Taluk 65.82
Fig. 2.17
SEX RATIO - 2001

LEGEND

Female per 1000 Males

- Below 925
- 925 - 950
- 950 - 975
- 975 - 1000
- 1000 Above
per cent, and Vilathikulam Taluk 65.80 per cent respectively. The literacy level is very less in the Kadaladi Taluk which has only 58.43 per cent.

2.17 OCCUPATION

Main workers have worked for the major part of the reference period of 6 months or more and marginal workers have not worked for the major part of the reference period, less than 6 months constituting about 31.94 and 4.18 per cent respectively. The non-workers constitute about 56.60 per cent of the total population. Among the taluks of the study area, the proportion of main workers is more than 40 per cent in Vilathikulam and Ottapidaram taluks whereas its proportion is low (< 25 per cent) in Kadaladi Taluk. Among the villages of the study area, the proportion of the main workers is high in Tuticorin whereas it is found to be the least (7.7 per cent) in Thangammalpuram.K., village of Kadaladi Taluk. The villages where the main workers population is low are 87 per cent (Figure 2.18). The marginal workers constitute just 4.18 per cent of the total population. Among the villages, the proportion of marginal workers is maximum (56 per cent) in Thangammalpuram.K., village of Vilathikulam Taluk and the least (0.11 per cent) in the Mulur Muthukumarapuram village of Ottapidaram Taluk. The non-workers population is high (> 40 per cent of the population) in the Vilathikulam and Ottapidaram Taluks whereas it is low (< 25 per cent) in Kadaladi Taluk.

Note: All workers that is who have been engaged in some economic activity during the last one year, but are not cultivators or agricultural labourers or in Household Industry, are 'Other Workers (OW)'. The workers that come under this category of 'OW' include all government servants, municipal employees, teachers, factory workers, plantation workers, those engaged in trade, commerce, business, transport banking, mining, construction, political or social work, priests, entertainment artists, etc.

2.18 TRANSPORT NETWORK

The study area is connected by the road and railway network (Figure 2.19). The National Highways (NH) No.49 which connects Madurai and Rameswaram passes through the northern part of the study area. The NH (No. 7A), which passes through the southern part of the study area connects Tuticorin with other parts of the State. Apart from this, the East Coast Road which connects Chennai and
Fig. 2.18

LEGEND
- Workers in Per cent
- Main Workers
- Marginal Workers
- Non Workers

TUTICORIN COAST
OCCUPATIONS - 2001
Kaniyakumari passes through the study area that runs almost parallel to the coastline. A number of State Highways (SH) criss-cross the various parts of the study area. Tuticorin and Rameswaram, the two important urban centres of the study area are well connected by rail while the Chennai-Tiruchirappalli-Rameswaram broad gauge line passes thorough the northern part of the study area. Tuticorin being an important Port town is well connected by sea with other parts of the country and world. The much narrated Sethu Samundram Canal which is under construction, envisaging facilitates the movement of larger vessels across the water of the Gulf of Mannar and Palk Bay, lies closer to the study area.

2.19 TOURISM

The study area is a place of legend because Rameswaram is sacred for both the Shaivite and Vaishnavite sects of Hinduism. The Ramanathaswami Temple is located about a hundred meters from the shore. The Kurusadai Islands, west of the Pamban Bridge are of great interest to marine biologists. The Gulf has been declared a Biosphere Reserve. The coral reefs are beautiful and provide home to lots of sea-creatures. Boat rides in the islands can be arranged from Mandapam. The district headquarters at Ramanathapuram (55 km) is to be visited for the Ramvilas Palace of Sethupati kings where the walls are very entertaining, with oil portraits of the kings and murals of such sundry occasions as battles with Marathas and business meetings with the British. Ervadi (21 km) is a place of pilgrimage for Muslims. It has the tomb of Ibrahim Syed Aulia. An annual festival in memory of the Saint is held every December. Uthirakosamangai has a statue of Shiva carved out of emerald and attracts lots of pilgrims. Kanchirankullam (35 km) is a water Bird Sanctuary and is home to many species throughout the year and the season is from November to February. The spot Valinokkam (90 km) is a seaside village largely untouched by consumerism and tourism. The water is clear and clean and ideal for swimming. The seaside is peppered with little stalls selling wares of seashell art, corals, conches and palm leaf drawings. It is hot and humid all through the year as the summer and winter temperatures do not vary much. However, the months of Jan/ Feb are more comfortable than May/ June.