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GEOGRAPHICAL PROFILE OF THE STUDY AREA

2.1 Introduction

The earth’s surface has great physical and cultural diversity. Geography is a dynamic subject as the geographical phenomena change in space and time. Geography is a correlative science, drawing together and combining the many facets of earth and man into complete mosaics to be viewed in their totality. It helps to a proper understanding of an area’s position in the world. It gives an insight into the lives of people outside our own area by appraising the resources available to them and analyzing their manner of living, thereby giving us an understanding and appreciation of their problems and potentialities. The inter relationships between man and earth differ from place to place. Hence it becomes a pre-requisite to assess the specific nature of physical and demographic set up if a person wants to analyze a research parameter for an area. For the present study, the road transport dimension is considered for the Madurai metropolitan area. Therefore an attempt has been made here to describe the geographical profile of the study area.

2.2 Location

Madurai Metropolitan area is located between 9° 50' and 10° 10' North Latitudes and 77° 55' and 78° 15' East Longitudes. As a Million city, Madurai which is located along the banks of River Vaigai has attracted large number of migrants from other regions in the past. Madurai metropolitan area extends over an area of 797.9 sq.km. (Fig. 2.1). Total population of the area is 1972776 persons as per 2011 census. Next to Chennai and Coimbatore, Madurai ranks third in the size of population in Tamil Nadu. The city provides a rich cultural heritage mixed with elements of modern infrastructure. It is known as the cultural capital of Tamil Nadu as it has been a historical, cultural and administrative centre from time immemorial. Madurai city has been acting as a central place serving a
vast region with varied economic functions. Therefore, a brief note on the historical evolution of Madurai city will enhance the understanding of the ground situation better.

2.3 Administrative Setup

Madurai metropolitan area consists of 195 administrative units including Madurai Corporation, 4 Class II towns, 7 Class III towns, 7 Class IV towns, 8 Class V towns, 1 Class VI town and 167 revenue villages. As noted earlier, the study area consists of both urban centers and villages. Other than Madurai city corporation area, the metropolitan region includes parts of Vadipatti, Alanganallur, Madurai west, Madurai east, Thiruparankundram, Thirumangalam blocks. In addition, Panniyan village of Chellampatti block also comes under study area. Other than these parts of Madurai District, the study area also includes Mangulam village of Kariapatti block in Virudhunagar District as well as 8 villages from Thirupuvanam block of Sivagangai District (Fig. 2.2). For the present study, the study area has to be further subdivided into micro units so as to bring out the spatial differentiation and change better. Existing block boundaries can be considered as micro units. However, it may be seen that a few villages of one block are lying as an island in the other block. For example, Alanganallur Block occurs as two separate pieces of areas. Similarly, two villages of Thiruparankundram Block lies within Thirupuvanam block area. Further only one village of Chellampatti block and 1 village in Kariapatti block are included. Considering all these aspects and to have some contiguous micro unit area, the present study area has been divided into 7 zones by including/excluding some villages. The zones and constituent villages are given in Table 2.1.

Alanganallur, Kallanai, Kumaram, Manianji, Parali and Thandalai are the 6 villages of Alanganallur block that are included in Madurai west zone. Mangulam is the village in Kariapatti block included in Thiruparankundram zone. Viradhanur and Kusavapatti are the two villages of Thiruparankundram block included in Thirupuvanam zone. Panniyan village of Chellampatti block is included in Thirumangalam zone. Finally Thanichiyam and Sambakulam are the 2 villages of Alanganallur block that are included in Vadipatti zone. The zonal map is given in Fig 2.3.
Table 2.1
Madurai Metropolitan Area – Zones and Constituent villages

<table>
<thead>
<tr>
<th>Zone</th>
<th>Name</th>
<th>Constituent villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Madurai city</td>
<td>City corporation area.</td>
</tr>
<tr>
<td>2</td>
<td>Madurai West</td>
<td>42 villages and 6 urban centers of Madurai west block and 5 villages and 1 urban center of Alanganallur block.</td>
</tr>
<tr>
<td>3</td>
<td>Madurai East</td>
<td>32 villages and 5 urban centers of Madurai east block.</td>
</tr>
<tr>
<td>4</td>
<td>Thiruparankundram</td>
<td>45 villages and 13 urban centers in Thiruparankundram block and 1 village in Kariapatti block.</td>
</tr>
<tr>
<td>5</td>
<td>Thirupuvanam</td>
<td>8 villages in Thirupuvanam block and 2 villages of Thiruparankundram block.</td>
</tr>
<tr>
<td>6</td>
<td>Thirumangalam</td>
<td>17 villages and 1 urban center in Thirumangalam block and 1 village from Chellampatti block.</td>
</tr>
<tr>
<td>7</td>
<td>Vadipatti</td>
<td>12 villages and 1 urban center from Vadipatti block and 2 villages from Alanganallur block.</td>
</tr>
</tbody>
</table>

2.4 Historical Background

The study area is one of the oldest inhabited areas in the Indian peninsula. It is the cultural capital of Tamil Nadu. From all the available evidences Madurai appears to have been ruled by the Pandyas from the time immemorial. The Pandyas and their capital Madurai are mentioned in many early Indian works and Puranas thus pointing to the antiquity of Madurai and the Pandyan dynasty. Madurai was originally a forest known as “Kadambavanam”. One day a farmer named Dhananjaya who was passing through the forest, saw Indra (The King of the gods), worshipping a swayambhu (self created Lingam) under a Kadamba tree. The farmer immediately reported this to King Kulasekara Pandya, who cleared the forest and built a temple around the Lingam and a city was soon built with the temple at its centre. On the day the city was to be named, Lord Shiva is said to have appeared and drops of nectar from his hair fell on the town. So, the place was named Madurai from the word Mathuram meaning “sweet” in Tamil. Further it is stated that
Goddess Meenakshi as the Pandya Princess had ruled over Madurai. Madurai City, as a religious centre, is famous due to Meenakshi Sundareswarar temple. The temple is dedicated to both Meenakshi, the lovely consort of Lord Siva and Sri Sundareswarar. There are 12 temple towers (Gopura). The outer towers are the landmarks of Madurai. In this temple city Lord Siva enacted his 64 Thiruvilaiyadals. The last of three Tamil Sangams flourished here 2000 years ago. Madurai is also called as “the Athens of the East” and “Cradle of Tamil Culture”. Madurai is nicknamed "Thoonga Nagaram", roughly translated as, "city that never sleeps". Madurai is also called as Temple city. Madurai is one of the few cities to have enjoyed a continuous history. Thirumalai Nayak, the popular king of Nayak rulers, renovated Meenakshi temple, built Nayak Palace in 1636 with the help of an Italian Architect and expanded Madurai city. Thirumalai Nayak is not only a great ruler and builder but also very popular among his subjects. He built many magnificent structures in and around Madurai. The Rajagopuram of the Meenakshi Amman temple, the Pudu Mandapam, the Mariamman teppakulam and the Thirumalai Nayak’s palace are living monuments that bear testimony to his artistic fervor. Nayak ruled over Madurai and became weak after the death of Thirumalai Nayak. Then Queen Mangamma, a brave lady ruled Madurai for 17 years. Few years later Madurai rulers tried to rule Madurai and they were ineffective because British and French people laid their foot strongly in the region. In 1781, the British rulers appointed their representatives to look after Madurai. In 1804, Mr.George Parish, the first Collector of Madurai was appointed by the East India Company, after the Nawab of Arcot gave Madurai in 1801. Madurai District and surrounding areas remained under the rule of the British for about 150 years. After independence it became the second most important city in Tamil Nadu after Chennai. However, rapid industrial growth of Coimbatore helped that city to overtake Madurai in its importance and ranking. Currently Madurai is the third largest city. Madurai acts as a major commercial and recreational and most important nodal centre for entire Southern Tamil Nadu which comprises of nearly 10 districts.
This brief historical background of the study area proves that Madurai city and its surrounding rural areas are strongly interwoven in terms of socio-economic, political and cultural points of view.

2.5 Physiography

2.5.1 Relief

The study area is a part of Southern lowlands of Tamil Nadu and is generally a plain region dotted with few ridges and inselbergs. The average elevation of the study area is around 120m above mean sea level. The Metropolitan Area as a whole lies in a gently sloping plain area. The general direction of slope is from northwest to southeast indicated by the flow of River Vaigai. Most of the area has an elevation between 100 and 200 metres. The highest elevation occurs at Nagamalai ridge which is the prominent relief feature in the study area and it amounts to 388 metres. To the south of Nagamalai ridge there is a parallel line of isolated small hillocks with lesser elevation (Fig. 2.4). Samanarmalai, Pasumalai and Thirupparankunram are notable hills. Of these Thirupparankunram has an elevation of 319 metres. Topography in the northern part is gently sloping plain and the only notable relief feature is a granitic ridge called Yanaimalai which has a maximum elevation of 300 metres. One of the notable aspects of the study area is its undulating topography.

2.5.2 Geology

The study area forms a part of the Southern Granite Terrain in Peninsular India, which is among the very few areas in the world where the oldest rocks of the earth are exposed on the surface. Hence, more than 95% of the study area is underlined by hard crystalline rocks of Precambrian age (Fig. 2.5). Among the various crystalline rocks, Granite gneiss covers a major portion and is contiguously exposed in all over the study area, whereas Charnockites are predominantly observed only in the southern parts of the study area. Quartzites occur in linear narrow patches in the northern and southern parts of the study area. A very small exposure of limestone is also observed in the southern part of the study area. The recent deposits like sand, silt, clay etc, are represented by river
alluvium deposited by the Vaigai river and is noticed in the central part of the study area along the course of the Vaigai river.

2.5.3 Geomorphology

Geomorphologically, the study area seems to have attained an advanced state of pediplanation. Since the study area lies on either side of River Vaigai, it covers part of the flood plain of the river. In fact all along the central part there is a wide strip of flood plain along the course of the river. On either side of this flood plain one can find pediments which are at different stages. Deeply buried pediments occur in the northern and northeastern parts while shallow pediments are more common in the northeast, northwest and southwestern parts (Fig. 2.6). Nagamalai ridge forms the major structural hill in the west central part while a granitic structural hill named Yanaimalai is found in the northeast. In the eastern side remnants of old deltaic plain is noticed and this indicates that in the geological past River Vaigai had built a delta in this region. Another notable geomorphological feature is the presence of large areas of Duricrust, particularly in areas to the south of River Vaigai indicating the comparatively dry condition of the region.

2.5.4 Drainage

The major drainage feature of the study area is River Vaigai. It is a non-perennial river flowing from northwest to southeast. Only during the months of October to December water flow is comparatively more in the course of the river. Other than River Vaigai, there is a small stream called Kirudhumal nadhi flowing within the city limits. This has become almost non-existent due to large scale encroachment. The general undulating terrain is responsible for the presence of a large number of tanks (Fig. 2.7). These tanks, generally known as “Kanmai”, “Kulam” or “Oorani” in local context. Bigger tanks like Nilaiyur Kanmai in the southern part and Vandiyur Kanmai in the northern part are prominent drainage features in the study area.

2.5.5 Soil

Soil is one of the natural resources which have the most direct impact on agricultural development. In agrarian country like India, it becomes necessary to take
steps for its proper conservation and management. Hence, knowledge about the types of soil, its extent and occurrence are of primary importance for agricultural planning to maximize production. Predominant types of soil include red soil, sandy clay and black cotton soil. Almost the entire southern part of the study area is covered with red soils and sandy clay except a small part in the southwest where black cotton soil occurs (Fig. 2.8). Along the river course, sand with silt is predominant. Even in the northern part red soil is widespread except the northeastern parts where sandy clay is dominant.

2.5.6 Climate

The climate conditions of an area are expressed with reference to temperature, precipitation, humidity, pressure and wind which vary from place to place and from season to season. Climate generally signifies the combined effects of the sun, the atmosphere, and the earth on the biotic phenomena including human life. In fact no other factor controls human activity so much as that of climate. Though the elements of climate include temperature, atmospheric pressure, winds, humidity and precipitation, only two, namely temperature and rainfall are considered more important and have a direct bearing on human life. Because of this, sometimes atmospheric pressure and winds are called climatic controls. Hence in this account more emphasis is given to the distribution of temperature, humidity and rainfall than the other two elements.

On the whole Madurai metropolitan area enjoys a tropical sub humid climate since the average temperatures are high throughout the year while the annual rainfall is nearly 950 mm. Like all other southern parts of Tamil Nadu, the study area also has four seasons. They are:

a) Dry season – January to March

b) Hot season - April to May

c) Southwest monsoon season – June to September

d) Northeast monsoon season – October to December
Madurai Metropolitan Area

CLIMATE

Fig: 2.9
Table 2.2 shows the monthly distribution of the mean temperature, relative humidity and rainfall for the study area.

Table – 2.2
Madurai Metropolitan Area —
Mean Monthly Temperature, Rainfall and Relative Humidity

<table>
<thead>
<tr>
<th>Months</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature in ºC</td>
<td>29.9</td>
<td>32.2</td>
<td>35.3</td>
<td>36.9</td>
<td>37.5</td>
<td>36.8</td>
<td>36</td>
<td>35.1</td>
<td>34.5</td>
<td>32.5</td>
<td>30.5</td>
<td>29.5</td>
</tr>
<tr>
<td>Relative Humidity in %</td>
<td>75</td>
<td>76</td>
<td>69</td>
<td>67</td>
<td>64</td>
<td>58</td>
<td>54</td>
<td>62</td>
<td>65</td>
<td>65</td>
<td>81</td>
<td>78</td>
</tr>
<tr>
<td>Rainfall in mm</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>57</td>
<td>75</td>
<td>37</td>
<td>63</td>
<td>88</td>
<td>139</td>
<td>185</td>
<td>175</td>
<td>175</td>
</tr>
</tbody>
</table>

Source: Statistical office, Madurai.

2.5.6.1 Temperature and Relative Humidity

Temperature is a major element in climate. For the Madurai Metropolitan Area the average temperature varies from 29.5ºC to 37.5ºC. In general higher temperatures are recorded in the months of April, May and June while December and January have minimum temperatures. The temperature curve shows a unimodal form with one peak. The highest temperature of 37.5ºC is recorded during May. From then temperature gradually decreases to reach the minimum temperature of 29.5ºC during December (Fig. 2.9). Relative humidity also varies from 54% to 81% in the year. The highest relative humidity of 81% is recorded in the month of November. The occurrence of northeast season may be reason for this. July had the lowest percentage of 54% relative humidity (Table 2.2).

2.5.6.2 Rainfall

The average annual rainfall for the study area is around 950 mm. However the actual amount of rainfall received varies from one year to the other. In general average
monthly rainfall varies from a minimum of 12 mm to a maximum of 185 mm. The highest amount of rainfall is recorded in the month of October. The area receives more rainfall during Northeast monsoon season. The lowest amount of rainfall of 12 mm is recorded in February (Table 2.2).

The account given so far provides an outline about the physical base of the study area. In such a physical setup, man has undertaken a variety of economic activities. Hence a brief outline about the demographic profile is attempted here.

### 2.6 Demographic Profile

Population characteristics also vary from one region to the other. The different aspects of the demographic profile include growth, density, sex ratio, literacy, occupational structure and other dimensions. These are explained separately in the following paragraphs.

#### 2.6.1 Growth of population

Table 2.3 explains the decadal growth of population of the study area from 1951 to 2011. In 1951 Madurai metropolitan area had 555621 persons. For 1951-1961 decade, the growth rate was 32.8%. Since Madurai was the major city serving the entire southern parts of Tamil Nadu, decadal growth rate increased to 35.5% during 1961-1971. However, there was a sharp decline of decadal growth 1971 to 2001. Madurai was also serving as District headquarters for the erstwhile Ramanathapuram District. In 1985 Ramanathapuram district was trifurcated and the headquarters was shifted from Madurai district to respective districts. In 1985 Dindigul district was bifurcated from Madurai district. Similarly in 1997 Theni district was carved out of Madurai. Added together, these may be responsible for such a declining decadal growth rate. Between 2001 and 2011, again the decadal growth rate increased to earlier levels of around 30%.
Table – 2.3

Madurai Metropolitan Area - Growth of Population (1951-2011)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Year</th>
<th>Total Population</th>
<th>Decadal Growth in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1951</td>
<td>5,55,621</td>
<td>--</td>
</tr>
<tr>
<td>2.</td>
<td>1961</td>
<td>7,38,344</td>
<td>32.8</td>
</tr>
<tr>
<td>3.</td>
<td>1971</td>
<td>10,01,822</td>
<td>35.5</td>
</tr>
<tr>
<td>4.</td>
<td>1981</td>
<td>12,30,841</td>
<td>22.8</td>
</tr>
<tr>
<td>5.</td>
<td>1991</td>
<td>13,98,108</td>
<td>13.5</td>
</tr>
<tr>
<td>6.</td>
<td>2001</td>
<td>15,24,027</td>
<td>9.0</td>
</tr>
<tr>
<td>7.</td>
<td>2011</td>
<td>19,72,776</td>
<td>29.4</td>
</tr>
</tbody>
</table>

Source: Census Records.

2.6.2 Distribution of Population

In order to study the population distribution total population of the each zone has been converted into percentage to total population of the metropolitan area. Such percentage share can be grouped into 3 categories, namely less than 10%, 10% to 20% and more than 20% (Fig. 2.10). It should be noted that Madurai city has the highest concentration of population where about more than fifty percent of population of the study area is noticed (Table 2.4). Another group of population range is 10% to 20%, Thiruparkundram and Madurai west falls under this category. The lowest distribution of population of less than 10% is observed in the northwestern and eastern parts of the study area. It consists of Thirupuvanam, Vadipatti, Madurai east and Thirumangalam zones.
2.6.3 Density of Population.

Population density is the number of persons inhabited per sq.km. of the area. The density of population is mainly studied to understand about one of the demographic aspects of the study area. The average density of population of the metropolitan area is 2647 persons per sq.km. Madurai city has a population density (19574 per sq.km.). Which is higher than the average for the study area as a whole. The highest density of population is found in the central part of the metropolitan area (Fig. 2.11). Madurai west, Madurai east and Thiruparankundram zones have moderate population density (Table 2.4). Lowest density is seen in Thirumangalam, Vadipatti and Thirupuvanam zones.

2.6.4 Sex Ratio

Sex ratio stands for number of females per 1000 males in a population. The sex ratio gives the valuable information of the index of gender disparities of an area. The study area has an average sex ratio of 993 females per thousand males (Fig. 2.12). Northern part of the study area has a comparatively higher sex ratio with Vadipatti zone registering the highest sex ratio of 1010 females per thousand males. Madurai city and Madurai west zones also have a higher sex ratio than the average for the study area (Table 2.4). Thiruparankundram and Madurai east zones have medium sex ratio. The lowest share of this category is seen in the southwest and eastern parts of the metropolitan area covering Thirumangalam and Thirupuvanam zones.
**Table – 2.4**

**Madurai Metropolitan Area-Demography**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Zones</th>
<th>Area in sq.km.</th>
<th>Total House holds</th>
<th>Total Population</th>
<th>Population in %</th>
<th>Population Density /sq.km</th>
<th>Sex Ratio</th>
<th>SC/ST in %</th>
<th>Literacy in %</th>
<th>Male Literacy in %</th>
<th>Female Literacy in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Madurai City</td>
<td>52.00</td>
<td>266449</td>
<td>1017865</td>
<td>52</td>
<td>19574</td>
<td>999</td>
<td>7</td>
<td>82</td>
<td>85</td>
<td>79</td>
</tr>
<tr>
<td>2</td>
<td>Madurai West</td>
<td>151.61</td>
<td>66292</td>
<td>260477</td>
<td>13</td>
<td>1718</td>
<td>994</td>
<td>17</td>
<td>79</td>
<td>83</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>Madurai East</td>
<td>99.60</td>
<td>40603</td>
<td>160400</td>
<td>8</td>
<td>1610</td>
<td>984</td>
<td>16</td>
<td>75</td>
<td>80</td>
<td>71</td>
</tr>
<tr>
<td>4</td>
<td>Thiruparankundram</td>
<td>246.87</td>
<td>91430</td>
<td>351203</td>
<td>18</td>
<td>1423</td>
<td>986</td>
<td>11</td>
<td>75</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>Thirupuvanam</td>
<td>57.40</td>
<td>5473</td>
<td>21888</td>
<td>1</td>
<td>381</td>
<td>937</td>
<td>39</td>
<td>65</td>
<td>73</td>
<td>56</td>
</tr>
<tr>
<td>6</td>
<td>Thirumangalam</td>
<td>115.53</td>
<td>28439</td>
<td>106529</td>
<td>5</td>
<td>922</td>
<td>979</td>
<td>13</td>
<td>75</td>
<td>81</td>
<td>70</td>
</tr>
<tr>
<td>7</td>
<td>Vadipatti</td>
<td>74.89</td>
<td>14262</td>
<td>54414</td>
<td>3</td>
<td>727</td>
<td>1010</td>
<td>22</td>
<td>72</td>
<td>78</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Metropolitan Total</td>
<td>797.90</td>
<td>512948</td>
<td>1972776</td>
<td>100</td>
<td>2472</td>
<td>993</td>
<td>11</td>
<td>79</td>
<td>83</td>
<td>75</td>
</tr>
</tbody>
</table>

*Source: Census,2011.*
2.6.5 Literacy

Literacy rate of the population is defined as the percentage of literates in the age-group seven years and above. For different age-groups the percentage of literates in that age-group gives the literacy rate. Literacy is one of the significant factors influencing the social, economic, demographic and political structure of any area. In accordance with 2011 census, the average literacy rate of the study area is 79 % as a whole. The highest literacy rate is noticed in Madurai city and Madurai west zones. It may noted that these two zones have a higher literacy rate of 82% and 79% respectively (Fig. 2.13). On the other hand Thirupuvanam zone has the lowest share of literacy. Moderate percentage share of literacy rate is found in the following zones they are Madurai east (75%), Thiruparankundram (75%), Thirumangalam (75%) and Vadipatti (72%). Table 2.3 explains that the male literacy (83%) is higher than the female literacy (75%) in the Madurai metropolitan area.

2.6.6 SC/ST Population

Only 11% of the total population of the Madurai metropolitan area belong to SC/ST category. However, Thirupuvanam and Vadipatti have a higher share of this category (Table 2.4). It may be noted that the lowest percentage of SC/ST population is found in Madurai city where it has a very low share of 7% to the total population (Fig. 2.14). Rest of the zones, namely Madurai west, Madurai east, Thiruparankundram and Thirupuvanam record a comparatively moderate percentage of SC/ST population.

2.7 Occupational Structure

Generally workers can be classified into three categories, namely Primary workers, Secondary workers, and Tertiary workers. People engaged in agriculture, livestock, forestry, fishing and mining are grouped as Primary workers. People engaged in household industry and other manufacturing activity is grouped as Secondary workers. People engaged in trade and commerce, transport and communication and other services are grouped as Tertiary workers and other workers. However, as per 2011 census there are four main categories, namely Cultivators, Agricultural labourers, Household industrial workers and “Other workers”. Hence for the present explanation only these four categories are considered. Being a Metropolitan Area, the share of “Other workers” category is
comparatively higher and it amounts to 86% of the total main workers. Cultivators and Agricultural labourers account for 10% share while the rest are engaged in various kinds of Household industrial activities.

### 2.7.1 Work Participation Ratio

Among the total population, only a section of it is engaged in various kinds of occupations. The total main workers are converted to the percentage share to total population of the area is known as Work Participation ratio. In general work participation ratio is comparatively higher in the case of rural areas. Since the study area is predominantly rural here also the work participation ratio is comparatively higher.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Zones</th>
<th>Total Main Workers in %</th>
<th>Cultivators in %</th>
<th>Agricultural Labourers in %</th>
<th>Household Industrial Workers in %</th>
<th>Other Workers in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Madurai City</td>
<td>35.7</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>96</td>
</tr>
<tr>
<td>2</td>
<td>Madurai West</td>
<td>35.3</td>
<td>3</td>
<td>14</td>
<td>2</td>
<td>81</td>
</tr>
<tr>
<td>3</td>
<td>Madurai East</td>
<td>36.3</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>84</td>
</tr>
<tr>
<td>4</td>
<td>Thiruparankundram</td>
<td>38.2</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>79</td>
</tr>
<tr>
<td>5</td>
<td>Thirupuvanam</td>
<td>39</td>
<td>8</td>
<td>38</td>
<td>2</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>Thirumangalam</td>
<td>39.5</td>
<td>8</td>
<td>21</td>
<td>2</td>
<td>69</td>
</tr>
<tr>
<td>7</td>
<td>Vadipatti</td>
<td>38.6</td>
<td>6</td>
<td>50</td>
<td>2</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Metropolitan Total</td>
<td>36.5</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>86</td>
</tr>
</tbody>
</table>

*Source: Census, 2011.*
As per 2011 census the average main workers of the Madurai metropolitan area is 36%. Among the zones higher work participation ratio is noticed in Thirupuvanam, Thirumangalam, Vadipatti and Thiruparankundram zones (Fig. 2.15). Lowest percentage (35%) of this category is found in Madurai west (Table 2.5).

2.7.2 Cultivators

As per Census of India, a person is classified as cultivator if he or she is engaged in cultivation on land owned or held from government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation. On the whole, only 2% of the total main workers are Cultivators (Table 2.5). Southwestern and southeastern parts of the area have the highest percentage of Cultivators Thirumangalam and Thirupuvanam zones each have 8% of their total main workers in this category. As Madurai city is totally urban, there are no Cultivators in this zone (Fig. 2.16).

2.7.3 Agricultural Labourers

A person who works on another person’s land for wages in money or kind or share is regarded as an agricultural labourer. She/he has no risk in the cultivation, but merely works on another person’s land for wages. An agricultural labourer has no right of lease or contract on land on which she/he works. The study area has 8% of total workers as agricultural labourers. Highest concentration of this workers are noticed in western, northern and southeastern parts. Vadipatti is notable with 50% of its workers, further 38% of this total workers under this group. Similarly Thirupuvanam zone also has 38% of the total workers in this category (Fig. 2.17). Medium percentage of this sector is noticed in Thiruparankundram and Madurai east. Madurai city has only 1% of agricultural labourers (Table 2.5).

2.7.4 Household Industrial Workers

Household industry is defined as an industry conducted by the head of the household herself/himself and or by the members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives
in urban areas. Average household industrial workers of the study area is only 4% (Table 2.5). Higher than metropolitan average of this workers category is seen in two zones they are Thiruparankundram (9%), and Madurai east zones (5%). Vadipatti, Madurai west, Thirumangalam, Thirupuvanam and Madurai city zones have comparatively a lower concentration of household industrial workers (Fig. 2.18).

### 2.7.5 Other Workers

A person, who has been engaged in some economic activity during the reference period but not as a cultivator or agricultural labourer or in Household Industry, is termed as a ‘Other Worker (OW)’. Average other workers of the Madurai metropolitan area is 86%. Madurai city (96%) has the highest share of this group (Table 2.5). It is higher than the average for study area Madurai being the third largest city may be a reason for this. Southern and western parts of the study area are having the lowest share of Other workers. Vadipatti (42%) and Thiruparankundram (51%) have the lowest share of this category. Other zones have moderate share (Fig. 2.19).

### 2.8 Land use

Land use map has been prepared from Ikonos imagery 2007 for the Madurai metropolitan area. There are eight types of land uses identified in the study area. Agriculture is the predominant land use and it accounted for nearly 50% of the total area. This is mainly because the surrounding areas of Madurai city are rural and these areas avail the irrigation from Periyar main canal. Next to agriculture, Settlements ranked second and covered about 15% of the area. Concentration of settlements is noticed in a southwest - northeast axis in the study area with Madurai city as the centre (Fig. 2.20). Though there are many National and State Highways, the southward extension of NH-7 from Madurai city has a higher concentration of major settlements than the other parts along the Highways. Followed by this water bodies had a share of around 10.95% of the area. About 8% of the land was brought under the fallow during the period. Scrubland and Wasteland have a share of about 6.25% and 4.09% respectively (Table 2.6). An interesting aspect is that both these types of land use occur only in the southern part of the Metropolitan Area. This is particularly true in the case of Wasteland. Low rainfall, lack of irrigation facility,
poor soil and presence of Duricrust may be the major reasons for such concentration of Wasteland and Scrubland.

Table – 2.6

<table>
<thead>
<tr>
<th>S.No</th>
<th>Land use Types</th>
<th>Area in sq.km.</th>
<th>Area in Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Settlements</td>
<td>117.7</td>
<td>14.75</td>
</tr>
<tr>
<td>2</td>
<td>Agriculture</td>
<td>391.4</td>
<td>49.05</td>
</tr>
<tr>
<td>3</td>
<td>Fallow land</td>
<td>63.4</td>
<td>7.95</td>
</tr>
<tr>
<td>4</td>
<td>Plantation</td>
<td>33.2</td>
<td>4.16</td>
</tr>
<tr>
<td>5</td>
<td>Scrub</td>
<td>49.8</td>
<td>6.25</td>
</tr>
<tr>
<td>6</td>
<td>Water bodies</td>
<td>87.3</td>
<td>10.95</td>
</tr>
<tr>
<td>7</td>
<td>Rock outcrop</td>
<td>22.4</td>
<td>2.81</td>
</tr>
<tr>
<td>8</td>
<td>Waste land</td>
<td>32.6</td>
<td>4.09</td>
</tr>
<tr>
<td></td>
<td><strong>Metropolitan Total</strong></td>
<td><strong>797.9</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

*Source: Compiled by the Investigator.*

Plantations occur mostly along River Vaigai and in some parts in the northern Metropolitan Area. Nagamalai, Yanaimalai, Sikkanthamalai and other residual hills constitute the Rock outcrops in the study area. Among the various types of land use Rock outcrop had the lowest share.

2.9 Transport and Settlements

Since Madurai is the third largest city in Tamil Nadu it is well connected by all the major means of transportation. Three National Highways cross the study area. Further there are State Highways and Major District roads which provide connectivity to the settlements with Madurai city. The major roads are:
1. National Highway 7 connecting Bangalore with Kanniyakumari
2. National Highway 49 connecting Rameswaram with Kochi
3. National Highway 45B connecting Chennai with Thoothukudi
4. State Highway 33 connecting Madurai with Tondi
5. State Highway 72 connecting Madurai with Natham
6. State Highway 73 connecting Thirumangalam with Pallapatti

In addition to the National and State Highways, a number of Major District roads and other roads provide connectivity to almost all the villages in the study area. Fig. 2.21 shows the dense network of roads in the study area. Madurai is also well connected with all major cities in Tamil Nadu and other States by Broad gauge Rail transport. Major rail routes include Madurai – Chennai, Madurai – Coimbatore, Madurai – Kanniyakumari, Madurai – Rameswaram and Madurai – Shenkottah. Currently gauge conversion work is in progress in the Madurai – Bodinayakkanur stretch.

Madurai has also got air connectivity. It has a domestic airport which handles flights to Chennai, Bangalore, Mumbai, Delhi and Hyderabad. Recently international connectivity was also established with flights to Colombo. Being a historical, cultural, religious and trade centre, Madurai attracts a large number of tourists throughout the year. Hence floating population is very high here. Further, Madurai is the major city providing specialized services in health, education and other spheres to the population living in the entire southern districts. The good connectivity helps easy movement of people and goods in the region.