CHAPTER 2

PROFILE OF THE STUDY AREA

2.1 SITE AND SITUATION

Today the city of Madras is a flourishing metropolis of India and the capital of the state of Tamil Nadu. It is also an important port along the eastern coast of India. But the history of Madras goes back to antiquity to the beginning of the Christian era. Historically the port had a flourishing trade with the Roman empire in the second century AD. A number of Arab merchants visited this area during the 9th and 10th century AD. The foundation of the present settlement was laid in 1639 when the site on which Fort St. George stands was acquired by the British East India Company (C.S. Srinivasachari, 1939). This site was located in a tiny fishing village called Madraspatnam, which gave the city its name. Within a few years of the founding of the British settlement and the construction of the fort, the new town which had grown up around it came to be known as Chennaipatnam, after the father of a local chieftain. The surroundings of this area covering nearly 67 square kilometres and containing within it 16 hamlets were constituted in 1798 as the city of Madras (M.M.D.A. Report, 1985). The area was subsequently enlarged from time to time. With British supremacy over the area firmly established by the latter part of the 19th century, the development of the city progressed faster. To facilitate trade a harbour was built in 1896 to
the east of George Town, which had emerged as the main business centre. The
principle road and railway lines connected the harbour to the north, west, and
southern parts of the presidency and they still constitute the main transport

Madras city and its hinterland together constitute the Madras Metropolitan Area (M.M.A.) (Fig. 2.1). M.M.A. extends over an area of 1,1668
square kilometres, and consists of the city of Madras, four municipalities of
Alandur, Pallavaram, Tambaram, and Tiruvottiyur, five townships of
Kathivakkam, Madhavaram, Ambattur, Tiruverkadu, and Feddi, and 23 town
panchayats, 10 panchayat unions and 217 villages (Fig.2.2 & 2.3) (Appendix I)
(A.Ramesh 1992). Madras city is the centre of all commercial and
administrative activities as well as being the living area for over 75% of the
total population.

Three distinct areas may be identified within the metropolitan area. First is the core, which is Madras city, demarcated by the limits of the Madras
Corporation covering an area of 172 square kilometres (1991). Then there are
the urban centres and extensions contiguous to the city area which along with
the city have an area of 530 sq. km. and are referred to as the Madras Urban
Agglomeration (M.U.A.). Finally, there are the rural areas with a number of

At the beginning of the century the city had a population of about
5,50,000 which by 1941 had grown to 8,80,000. Since independence the city has
grown rapidly. In 1971 Madras city had an area of 129 sq.km. and a population
of 2.5 million. In 1981 the city limits grew to cover an area of 170 sq. km. and a population of over 3.2 million. M.M.A. then had a population of over 4.5 million. As per the 1991 census Madras city had a population of 3.7 million, and the M.M.A. a population of 5.7 million. M.M.A. accounts for about 10% of the total population of the state of Tamil Nadu. This works out to be 30% of the total urban population of Tamil Nadu state (1991).

2.2 PHYSIOGRAPHY

2.2.1 Physical features

In general, M.M.A. is a typical example of flat land topography. The average elevation of M.M.A. decreases from west to east. The maximum height of 100 meters is found in the Vandalur Reserved Forest in the south western boundary of M.M.A. The average elevation in Madras city is around 7 meters, with the area along the west having an elevation of less than 4 meters. In the western part of M.M.A. the average elevation is around 20 meters with few pockets of elevation going until 40 meters. These areas are found in the south of Meenambakkam, between Meenambakkam and Pallavaram, and also to the north of the Chemberambakkam tank. The surface of the plains is varied also by the shallow valleys of the, Kotralaiyar, Cooum and Adyar rivers. In the north-west part the inclined plain is broken by two groups of hills near Avadi and the south-western part of the plain is dotted by a number of low ridge hills south of the Chemberambakkam tank (A.Ramesh,1992).

Along the sea coast, immediately behind the ridges of the blown sand, are the backwaters connected together by the Buckingham Canal running
along the entire length of the sea coast and through Madras city. The main
back waters on the coast are the Pulicat Lake and Ennore Creek in the north
of M.M.A. and at Covelong to the south (M.M.D.A., 1985). M.M.A. is also
dotted with numerous tanks and lakes, important sources of water in this area.
These tanks vary in size with the Chamberambakkam tank which is about 14
square kilometres, and the Red Hills lake which is about 11 square kilometres,
to the much smaller ones like those in the Vyasarpadi group of tanks which
are a few square kilometres or even less in area. All these are rain fed and
depend on the north-east monsoons for their water (Fig. 2.4 and 2.5).

2.2.2 Geology and Soils

Geomorphic evolution and morpho-structural analysis of the area
suggests neotectonic activity during the quaternary period resulting in marine
regression and large scale changes and shifting in the courses of major rivers.
Buried river channels and the hydrological characteristics of the sediments
have also been identified. The noted buried channel is seen as a large stretch
north of Kottralaiyar river extending from Minjur to Penjetty, moves to it's
south towards Tamarapakkam and merges with the Poondi reservoir (located
just outside the M.M.A. boundary to the west) near Kesavaram anicut
(UNDP Report, 1983).

The residual hills found in the western parts of M.M.A., to the east of
Tiruvallur are the remnants of four cycles of erosion and are composed mostly
of granite, gneiss, Cudappah conglomerate and quartzite (Fig. 2.6). There are
a few unidentified valleys along fracture or fault zones. The hills have no
MADRAS METROPOLITAN AREA

PHYSICAL ENVIRONMENT

IRS - December - 1990 (Post-monsoon period)

LEGEND

- Water bodies
- Agriculture
- Built-up area
- Sparsely Built-up with Vegetation
- Industrial area
- Swamp
- Sand
- Vegetation
- Airports

IRS - Image Date Possitive Scale - 1:500,000

Enlarge Scale - 1:1,000,000 (Using Varigraph)

SOURCE: IRS - ANNA UNIVERSITY, MADRAS.

Fig.2.5
Fig. 2.6

Source: An Environmental Profile of 'Madras Metropolitan Area', UNCHS Project Report, 1992. (A. Ramesh, A. Genasahram, and Vasudha)
weathered mantle and the ground water potential in the west and south-western parts of M.M.A. over an area of 300 sq.km. is very poor.

The rock formation in the region are archean to recent age. Crystalline rocks are found mostly in the southern parts of M.M.A., near Vandallur, Pallavaram, and Chrompet. Sedimentary formations occur in the eastern parts of Sriperambubur taluk. In the south of M.M.A. there is an area of crystalline rock which in the future could be a constraint on development, since it has very limited ground water potential. In the west and north-west of M.M.A., clay, sandstone, and shale are found. Alluvial deposits occur in the flood plains stretching for distances of 30 to 50 kms, along the course of Kottralayar, Cooum, Adyar, and Palar rivers. The soils of M.M.A. can be classified as alluvial and laterite red soils, along with sandy coastal alluvium found on the beaches along the coast. River alluvium is found in the Kottralayar, Cooum, and Adyar river basins and tank beds. Laterite red soils are found in the north of Madras city beyond Perambur and extends westwards along the Avadi-Ambattur axis (UNDP Report, 1983).

2.2.3 Climate

Madras has a tropical maritime monsoon climate. On the basis of seasonal variation the year can be divided as, cool weather in the months of January and February, hot weather from March to May, south-west monsoon from June to September, and north-east monsoon from October to December. The mean annual maximum and minimum temperatures are around 33 dergee Celsius and 24 dergee Celsius respectively. May is the hottest monthn with a
mean minimum of 27.5 degrees and maximum of 37.4 degrees Celsius. January is the coldest month with a mean temperature of 24 degrees Celsius. The isotherms run parallel to the coast line. Temperatures decrease towards the interior of M.M.A., whereas the humidity increases. A cross-over effect with inversion of temperature is witnessed especially in the rural areas of M.M.A. Relative humidity is high throughout the year, and varies between 65% between May and June, and 80% during October and November. The mean annual rainfall is 127 cm. with 57 rainy days. The north-east monsoon accounts for two-thirds of the annual rainfall (about 70 cm.). Two noteworthy features of the climate here are thunderstorms from April to November and pronounced sea breeze which provides uniformly warm and moist climate (K.Gunasekaran, 1987).

Three distinct heat islands are observed over Madras city at Mambalam, Vepery, and Ennore. This is probably due to concentration of buildings, absence of vegetation, and industries in these areas. The first two are thickly populated commercial areas and the latter an industrial area. In contrast a cool pool is observed over the well vegetated Guindy Park.

2.2.4 Watersheds and Aquifers

The surface waterways in M.M.A. include three rivers, Kottralayar, Cooum, and Adyar. All these rivers are seasonal and have flowing water only during the monsoon, though the Cooum and Adyar are never completely dry. Sand bars get formed at the mouths of these rivers impeding the flow of water and requiring dredging. Sand bars are caused due to the action of surf driven
sand, a characteristic feature of the Coromandal coast. The Kottralayar joins
the sea at Ennore back waters, and the Adyar forms an estuary at its mouth.

The other two water courses flowing through the city are the
Buckingham Canal and the Otteri Nullah. The Otteri Nullah starts from a
tank in the Villivakkam group of tanks 26 kms. to the west of Madras city and
joins the Buckingham canal at Basin Bridge. The Buckingham Canal
originates in Andhra Pradesh, and flows south running parallel to the
Coromandal coast. It traverses M.M.A. from north to south linking the
Kottralayar, Cooum, and Adyar rivers.

All the surface waterways in M.M.A. are extremely polluted, as they
receive untreated sewage water and other pollutants from households and
industries located along their banks. As a result of this very often their water
resembles raw sewage.

Tanks are found well distributed over large parts of northern and
western M.M.A. The main large tanks are the Red Hills lake and Cholavaram
tank in the north, and the Chemberambakkam tank in the western parts of
M.M.A., which are the only ones that have water throughout the year. Apart
from these there are numerous small tanks dotting the entire M.M.A. region,
the Cooum basin has 65 tanks and the Adyar basin 450 tanks. The sizes of
these vary from about 14 sq. km. which is the size of the Chemberambakkam
tank and the Red Hills lake which is 11 sq.km., to less than 1 sq.km. which is
the size of the tanks in the Adyar basin area (Structure Plan for Madras
Metropolitan Area, Vol.1 and 2, 1980). The Red Hills lake, the Cholavaram
tank, and the Poondi reservoir are the main sources of drinking water to the city. The Chemberambakkam tank and the other smaller tanks located in its watershed area are used to irrigate the agricultural area around it, the largest agricultural area in M.M.A. The other important tanks in M.M.A. include Korattur tank, Ambattur tank, Velachery tank, Saidapet tank, Kodungaiyur tank and the Vyasarpadi group of tanks.

Within the city most of the tanks have been filled up or are perennially dry. Often they are partially or fully silted, or even used as the dumping grounds for the city's garbage. In places where they are surrounded by dwellings, especially hutments as in Vyasarpadi, and West Mambalam, they are used as public toilets and for dumping refuse and waste water. They become sources of health hazards to the people living close to them.

Another important source of drinking water in M.M.A. is ground water. Alluvial deposits are a major source of ground water. These deposits are highly permeable and underlain by a bed of stiff clay conducive for artesian wells. Water bearing aquifers have been located in Minjur, Panjetty, and Tamarapakkam in the north and western parts of M.M.A. and in Tiruvanmiyur in the southern part of Madras city. These aquifers are estimated to have a dependable potential yield of 155 million liters of water per day (UNDP Report, 1983).

There is a buried channel in the area between the Poondi reservoir and the Tamaraiyakkam well field. The thickness of the alluvium ranges from 15m. in the middle of the area to 30m. in the eastern part. In the area surrounding the Poondi reservoir, the reservoir itself acts as a recharge source. Ground
water occurs in the alluvial formations in the basins of the Kottralayar, Cooum, and Adyar rivers. These aquifers are mainly recharged by the waters from these water bodies, especially during the monsoon periods (UNDP Report, 1983).

Though the aquifers are an important source of water for the region, they are under continuous threat of pollution resulting mainly from over exploitation. Sea water intrusion has rendered the water in the Minjur well field unusable. Ground water studies have found that the interface between sea water and fresh water has been moving westward in the area (UNDP Report, 1983). Also the alluvial soil in the area allows for seepage of pollutants discharged on the surface into the soil, leaving the ground water highly susceptible to contamination by various pollutants, especially industrial pollutants.

2.3 DEMOGRAPHIC PROFILE

As has already been stated the foundation for what is today the metropolis of Madras was laid in 1639 when the site on which Fort St. George stands was acquired by the British East India Company. At that time Madras consisted of several scattered settlements. The most important of these being Mylapore, Santhome, and Triplicane. The other smaller settlements inside what constitutes the city today included Purusawalkam, Egmore, Nungambakkam, and Saidapet. The villages in the suburbs included Tiruvottiyur, St. Thomas Mount, Pallavaram, Tambaram, Poonamallee, and Ambattur to name a few (Structure Plan for Madras Metropolitan Area, Vol. 1, 1980).
Within a few years of the founding of the British settlement and the construction of the Fort, the New Town which had grown up around it came to be known as Chennapatnam. The population which was 19,000 in 1646 grew to 40,000 in 1669 (Structure Plan for Madras Metropolitan Area, Vol. 1, 1980).

Congestion within the Fort led people to move out and populate areas outside. Even areas outside the Fort started getting crowded and people started to move further out. The areas that started to get populated after the 1730's included Chintadripet, Kusapet, Triplicane and later Royapuram. At the turn of the century in 1901 the city had a population of 5.62 lakhs. Despite congestion in a few pockets, large tracts of land were vacant and available for future growth. The city nearly doubled its population in the sixty years from 1871 to 1931, when it grew from 3.23 lakhs to 6.47 lakhs. But areas of concentration remained around the Fort. The population of the city increased to 8.81 lakhs by 1941 (Table 2.1). The decades 1921 to 1931 and 1931 to 1941 saw an unprecedented growth of population with the decadal growth rate being 24% and 23% respectively. There was considerable infilling into the already developed and suburban growth along the electrified rail route to Tambaram (Structure Plan for Madras Metropolitan Area, Vol.1, 1980).

The post independence era saw a tremendous growth of population (Fig.2.7). This was the result of industrial development and economic growth resulting from developmental activities. The 1951 census showed a population of 14.6 lakhs, the decadal growth rate touching a record figure of 65%.
TABLE 2.1
HISTORICAL GROWTH OF POPULATION IN MMA

<table>
<thead>
<tr>
<th>Year</th>
<th>Madras City</th>
<th>Decadal Growth (%)</th>
<th>MMA</th>
<th>Decadal Growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>553000</td>
<td>-</td>
<td>808000</td>
<td>-</td>
</tr>
<tr>
<td>1911</td>
<td>575000</td>
<td>3.98</td>
<td>830000</td>
<td>2.73</td>
</tr>
<tr>
<td>1921</td>
<td>592000</td>
<td>2.96</td>
<td>876000</td>
<td>5.54</td>
</tr>
<tr>
<td>1931</td>
<td>734000</td>
<td>23.99</td>
<td>1056000</td>
<td>20.55</td>
</tr>
<tr>
<td>1941</td>
<td>881000</td>
<td>20.23</td>
<td>1250000</td>
<td>18.37</td>
</tr>
<tr>
<td>1951</td>
<td>1459000</td>
<td>65.61</td>
<td>1901000</td>
<td>52.10</td>
</tr>
<tr>
<td>1961</td>
<td>1815000</td>
<td>24.40</td>
<td>2358000</td>
<td>24.04</td>
</tr>
<tr>
<td>1971</td>
<td>2593000</td>
<td>42.87</td>
<td>3476000</td>
<td>47.41</td>
</tr>
<tr>
<td>1981</td>
<td>3276220</td>
<td>26.36</td>
<td>4567758</td>
<td>31.41</td>
</tr>
<tr>
<td>1991</td>
<td>3795000</td>
<td>19.00</td>
<td>5760542</td>
<td>25.00</td>
</tr>
</tbody>
</table>

Source: Census of India

A similar growth rate was recorded in the rest of M.M.A. which registered a population of 19 lakhs, with a decadal growth rate of 52%. The population distribution in the city showed that high density areas were George Town, Purusawalkam, Chintadripet, and Triplicane, having densities of over 50,000 persons per sq.km., and between 40,000 to 50,000 persons per sq.km. Medium density areas with densities between 20,000 to 40,000 persons per sq.km. included Mylapore, parts of Purusawalkam, and Egmore (Structure Plan for Madras Metropolitan Area, Vol.1, 1980).
The decade 1951 to 1961 saw a fall in the decadal growth rate for the city which was 24% for both the city as well as the rest of M.M.A. In 1961 the city had a population of 18.15 lakhs and M.M.A. 23.58 lakhs. Madras city with a density of 14,404 persons per sq.km. saw the further densification of areas already having high densities and also the movement of population towards the periphery of the city. Areas that became more densely populated were George Town, Purusawalkam, Tondiarpet, Triplicane, and Mylapore. The new areas that were developed included Sembium, Ayanawaram, Nungambakkam, and Kodambakkam. In 1961 the average population density in the rest of M.M.A. was 1837 persons per sq.km. Though it was very sparse in comparison to the city, its distribution showed distinct patches of concentration of population. Areas with higher densities of over 2000 persons per sq.km. were Alandur, parts of St. Thomas Mount, Pallavaram, and Nandambakkam, all along the south-western boundary of the city and Tambaram further south along the electrified rail route, and also in parts of Madhavaram and Ambattur along the northern and western boundaries of the city. Moderate densities of 500 to 2000 persons per sq. km. were seen in the remaining parts of Pallavaram, Tambaram, St. Thomas Mount, Ambattur, and Madhavaram, and in parts of Avadi, Kunnrathur, and Sholinganallur.

The 1971 census recorded a population of 25.93 lakhs for the city and 34.76 lakhs for M.M.A. The decade 1961 to 1971 recorded a decadal growth of 43% for the city and 47% for the rest of M.M.A., nearly double the growth rate of the previous decade. Population densities grew to 20,1000 persons per sq.km. in the city and 3359 persons per sq.km. in the rest of M.M.A.
This large growth in population in Madras city led to an increase in the densities of population in the already developed areas. A belt of high density areas developed along the coast from Tondiarpet in the north spreading down south until Mylapore. These areas had population densities of 40,000 to 50,000 and more persons per sq.km. Pockets with medium densities ranging from 20,000 to 40,000 persons per sq.km. developed in areas in and around Thyagaraya Nagar, Kodambakkam, Nungambakkam, Mylapore, and parts of Ayanavaram.

Areas in the rest of M.M.A. where population growth was observed were in and around Kottivakkam, Alandur, Pallavaram, Tambaram, Valsaravakkam, Ambattur, Avadi, Tiruvottiyur, and Kathivakkam. Except for Kottivakkam and Valsaravakkam all the other places were either municipalities or townships. Proximity to the city, availability of transport facilities, and nearness to industries were the main reasons for concentration of population in these areas.

The 1981 census recorded a city population of 32.76 lakhs and a population of 57,000 for M.M.A. The city had a decadal growth rate of 26% and M.M.A. a growth rate of 31% (Table 2.2) (Census Records, 1981).
TABLE 2.2

POPULATION GROWTH IN MMA AND ITS CONSTITUENT UNITS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Madras City</td>
<td>32.78</td>
<td>37.95</td>
<td>7.05</td>
<td>5.17</td>
</tr>
<tr>
<td>Madras Urban</td>
<td>10.11</td>
<td>15.60</td>
<td>4.14</td>
<td>5.55</td>
</tr>
<tr>
<td>Area (excluding city)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MUA (total)</td>
<td>42.89</td>
<td>53.61</td>
<td>11.19</td>
<td>10.72</td>
</tr>
<tr>
<td>MMA</td>
<td>45.67</td>
<td>57.60</td>
<td>12.10</td>
<td>13.00</td>
</tr>
</tbody>
</table>

Source: MMDA Records

The average density of population for the city was about 19,000 persons per sq.km. The distribution of population showed a continuation of the past trend with higher densities in the central parts of the city having densities of 20,000 or more persons per sq.km., the western parts had densities of 10,000 to 20,000 persons per sq.km., and the southern parts had densities less the 10,000 persons per sq.km. (Fig.2.8) (M.M.D.A. Report, 1985).

The rest of M.M.A. registered a higher growth rate than the city, indicating an outward movement of population. The average density was about 3900 persons per sq.km. Densities of over 4000 persons per sq.km. were seen in Alandur, Pallavaram, and Avadi municipalities (Fig.2.9). Moderate densities between 1500 to 4000 persons per sq. km. were in Ambattur, and Kathivakkam townships, Tiruvottiyur municipality, and in Poonamallee and Mangadu towns (M.M D.A. Report, 1985).
The 1991 census showed a population of 38,42,000 for the city and 57,60,000 for M.M.A. The decadal growth rate was 19% for the city and 25% for the rest of M.M.A. The population distribution shows few distinct pockets of high densities in Madras city, with densities of over one lakh persons per square kilometre. The areas are the divisions of Tondiarpet, Purasawalkam, Triplicane and Saidapet (Fig 2.10). The average densities are comparatively much lower in the rest of M.M.A. Densities of over 9000 persons per sq km were found in Alandur and Pallavaram municipalities (Fig.2.11). Other high density areas included Tiruvottiyur, and Avadi townships, and Pammal and Valsaravakkam town panchayat.

2.4 LANDUSE PATTERNS

When the British East India Company came to Madras in 1600 and established their base as Fort St. George, Madras consisted of scattered settlements long distances away from one another. Each settlement had at its centre a temple and was self contained with its own agriculture and household industries (Structure Plan for Madras Metropolitan Area, Vol. 1, 1980).

The British settlements grew, creating employment opportunities and bringing in people of various professions. These people began to settle down around the Fort area, and with this evolved distinct areas for the British, the locals, and for people of different professions. Thus there were the weavers near Tiruvottiyur, potters at Kosapet, and the Britishers along the Cooum river. The surroundings of the Fort area covering nearly 70-90 km. and
containing within it 16 hamlets were constituted as the city of Madras in 1798 (Structure Plan for Madras Metropolitan Area, Vol.1, 1980).

In the 19th century the laying of the railway line helped the city to grow in the north towards Royapuram and Perambur. Later in 1931 the electrified rail route from beach to Tambaram allowed for development along that line. In 1941 the city occupied an area of 80 sq.km., it was a provincial metropolis, being an administrative and commercial centre (Structure Plan for Madras Metropolitan Area, Vol. 1, 1980).

The post independence era saw further economic development in the area. Industrial development started with the establishment of industrial units in both the private and public sectors. Industrial development in and around Ennore and Manali in the north, Ambattur and Avadi in the west and in Guindy in the south-western parts of the city. Pre-independence industries were located mainly in the northern parts of the city. The commercial hub of the city George Town grew and spread into today’s Anna Salai. Apart from this, shopping facilities began to spread and locate themselves along the main arterial roads. Government and public offices which were earlier located around the Fort area started to get dispersed, being located on the Marina at Chepauk, and at Egmore, Nungambakkam and Anna Salai.

Residential development picked up momentum along with economic development, and is still growing until today. Within the city outward development towards the periphery saw the development of areas such as
Anna Nagar in the west, and Adyar, Besant Nagar, and Tiruvanmiyur in the South into major residential areas of the city.

A similar pattern of development occurred in the rest of M.M.A. with the growth of residential areas in and around Alandur, Pallavaram, and Tambaram in the south-west, along the electrified rail route, and in Mugapair and Padi to the west of the city.

As such development took place the city boundary also expanded. In 1950 the city occupied an area of 129 sq.km., in 1978 it was increased to 170 sq.km. which is what it is today, with the rest of M.M.A. occupying 993 sq.km. (Structure Plan for Madras Metropolitan Area, Vol.1, 1980).

The M.M.D.A. conducted a detailed landuse survey of Madras city and the rest of M.M.A., first in 1974 and then in 1991 to prepare their Master Plans 1 and 2 respectively. The break up of the pattern of landuse for the city reveals that in 1974 residential areas covered 45% of the total area while in 1991 it covered 48% of the area (Table 2.3, and Fig. 2.12, 2.13). Not a very substantial increase in area covered when we consider the fact that there was a 19% increase in population for the decade 1981-1991. This reveals the fact that there has been a more dense use of the land area already under residential use. This is reflected in the large scale proliferation of multi-storeyed apartment complexes. This has been taking place in the well developed residential areas of Nungambakkam, Thyagaraya Nagar, Alwarpet, and Adyar. Commercial areas which occupied 7.6 sq.km. in 1974, grew to occupy 12 sq.km. in 1991, an increase from 6% to 7% of the total area.
MADRAS CITY
LAND USE - 1974

LEGEND

- Residential
- Commercial
- Institutional
- Industrial
- Non-urban
- Agricultural
- Water bodies
- Open space & Recreational

Source: Structure plan - 1970

Kms

Fig.2.12
### TABLE 2.3

**LANDUSE PATTERN IN MADRAS CITY**

<table>
<thead>
<tr>
<th>Landuse</th>
<th>1974</th>
<th></th>
<th>1991</th>
<th></th>
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</thead>
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<tr>
<td></td>
<td>Extent</td>
<td>%</td>
<td>Extent (in</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>(in hectares)</td>
<td></td>
<td>hectares)</td>
<td></td>
</tr>
<tr>
<td>Primary Residential</td>
<td>5780</td>
<td>44.9</td>
<td>8138.40</td>
<td>47.74</td>
</tr>
<tr>
<td>Commercial</td>
<td>760</td>
<td>5.9</td>
<td>1183.91</td>
<td>6.97</td>
</tr>
<tr>
<td>Institutional</td>
<td>2160</td>
<td>16.8</td>
<td>4769.60</td>
<td>27.98</td>
</tr>
<tr>
<td>Industrial</td>
<td>860</td>
<td>6.6</td>
<td>918.14</td>
<td>5.38</td>
</tr>
<tr>
<td>Open space</td>
<td></td>
<td></td>
<td>1080.29</td>
<td>6.34</td>
</tr>
<tr>
<td>Agricultural</td>
<td>3320</td>
<td>25.8</td>
<td>248.38</td>
<td>1.46</td>
</tr>
<tr>
<td>Non urban</td>
<td></td>
<td></td>
<td>104.82</td>
<td>0.62</td>
</tr>
<tr>
<td>Vacant</td>
<td></td>
<td></td>
<td>603.85</td>
<td>3.54</td>
</tr>
<tr>
<td>Total</td>
<td>12880</td>
<td>100.0</td>
<td>17047.39</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Source**: MMDA Report, 1995.

The percentage of area under industries fell from 6.6% to 5.3%, indicative of the movement industries to areas outside the city boundary. Institutional areas grew from occupying 17% to 28% of the total area from 1974 to 1991. Open spaces that covered 33 sq.km. in 1974, were reduced to occupying 20 sq.km. in 1991, (Fig.2.14). The fall reflects the continuous growth of built up areas at the cost of open spaces.
LAND USE PATTERNS IN MADRAS CITY

1974

1991

LEGEND

RESIDENTIAL
COMMERCIAL
INDUSTRIAL

INSTITUTIONAL
OPEN SPACES
AGRICULTURAL

LAND USE PATTERNS IN THE REST OF M.M.A.

1974

1991
In the rest of M.M.A. though agriculture continued to remain the predominant landuse, from 1974 to 1991 there has been a marked reduction in the area under agriculture (Table 2.4, Fig. 2.15, 2.16). In 1974 it occupied 791 sq.km. which was 76% of the total area, while in 1991 the total area under agriculture fell to 410 sq.km., 41% of the total area. In comparison to this area under residential landuse increased from 84 sq.km. to 207 sq.km.

**TABLE NO.2.4**

LANDUSE PATTERN IN M.M.A. (Excluding Madras City)

<table>
<thead>
<tr>
<th>Landuse</th>
<th>1974</th>
<th>%</th>
<th>1991</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extent (in hectares)</td>
<td></td>
<td>Extent (in hectares)</td>
<td></td>
</tr>
<tr>
<td>Primary Residential</td>
<td>8460</td>
<td>8.2</td>
<td>15094</td>
<td>15.20</td>
</tr>
<tr>
<td>Mixed Residential (Village Nathan)</td>
<td>100</td>
<td>0.1</td>
<td>5653</td>
<td>5.69</td>
</tr>
<tr>
<td>Commercial</td>
<td>2540</td>
<td>2.4</td>
<td>428.64</td>
<td>0.45</td>
</tr>
<tr>
<td>Institutional</td>
<td>2860</td>
<td>2.8</td>
<td>5062.32</td>
<td>5.08</td>
</tr>
<tr>
<td>Industrial</td>
<td>79120</td>
<td>76.2</td>
<td>4704.69</td>
<td>4.75</td>
</tr>
<tr>
<td>Agricultural</td>
<td></td>
<td></td>
<td>40991.21</td>
<td>41.25</td>
</tr>
<tr>
<td>Open Spaces</td>
<td>10720</td>
<td>10.3</td>
<td>12982.92</td>
<td>13.07</td>
</tr>
<tr>
<td>Non urban</td>
<td></td>
<td></td>
<td>3104.23</td>
<td>3.12</td>
</tr>
<tr>
<td>Vacant</td>
<td></td>
<td></td>
<td>11316.19</td>
<td>11.39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>103790</td>
<td>100.0</td>
<td>99337.97</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Source:** MMDA Report, 1995.
Source: MMDA Structure plan for MMA - 1978
MADRAS METROPOLITAN AREA

LAND USE - 1991

LEGEND

- RESIDENTIAL
- COMMERCIAL
- INSTITUTIONAL
- INDUSTRIAL
- RECREATIONAL
- NON-URBAN
- AGRICULTURAL
- WATER BODY
- VACANT LAND

Source: M.M.D.A Master plan - 1991
A more than three fold increase is indicative of the fact that M.M.A. is increasingly catering to the requirements of the city, and is providing housing facilities to a growing section of the population. Similarly all other landuses too have seen a large scale growth in M.M.A. Commercial areas grew from occupying 1 sq.km. in 1974 to 4 sq. km.in 1991. Industrial areas grew from 28 sq.km. in 1974 to occupy an area of 47 sq.km. in 1991. Institutional areas covered an area of 25 sq.km. in 1974 and grew in area to 50 sq.km. in 1991. All these trends are indicative of the growing urban nature of M.M.A., where the influence of Madras city is very strongly felt, with M.M.A. becoming an extention of Madras city. Another significant change is the increase from 107 sq.km. to 274 sq.km., in the area under open spaces and vacant lands. This is because large tracts of agricultural lands are being bought over by private land developers, and being left open for speculative purposes, to be sold at high profits when the land value escalates.

2.5 INFRASTRUCTURAL FACILITIES

The continuously growing population of Madras city and M.M.A. puts a great demand on infrastructure facilities, making it necessary for these facilities to grow and get updated to keep pace with the growing population. Some of the basic requirements of the people are housing, water supply and sewage, transportation lines, communication network, health services, education facilities, and recreation and marketing services.
2.5.1 Housing

Providing affordable and environmentally sound housing facilities should be the final objective of any urban planning process. But achieving this objective is extremely difficult. Owing to a constant gap between the available housing stock and the ever-growing demand for housing. This is even more acutely seen amongst the economically weaker sections, where rural migrants come into the urban area in search of job opportunities. These people are poor, cannot afford housing in the urban set up and are ill equipped to meet the challenges of city life. These people usually end up living in slums and as pavement dwellers, with minimal or no access to basic facilities such as water and sanitation.

As per the 1991 census one finds that the gap between the existing housing stock and the required housing stock shows a requirement of 7.6 lakh houses in Madras city and 11.4 lakh houses in the rest of M M A. (Table. 2.5).

<table>
<thead>
<tr>
<th></th>
<th>Madras City</th>
<th>MMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>3.8</td>
<td>5.7</td>
</tr>
<tr>
<td>Existing housing</td>
<td>0.56</td>
<td>0.70</td>
</tr>
<tr>
<td>Demand for housing</td>
<td>0.20</td>
<td>0.44</td>
</tr>
<tr>
<td>Required housing units</td>
<td>0.76</td>
<td>1.14</td>
</tr>
</tbody>
</table>

**Source**: MMDA Report, 1995.
While the scope for increasing the housing stock within the city is very limited, most of the development now is taking place in the other urban centres of M.M.A. outside the city. Sections of the upper middle class and high income group desire to acquire property within the city. In the absence of sufficient vacant land and the prohibitive cost of land real estate developers are developing multi-storeyed flats within the city. In the rest of M.M.A. development of low density single storeyed buildings, though flats are also being developed in some of the other urban centres such as Valsaravakkam, Padi, Mugaper, and Tambaram.

In 1990 M.U.A. had 10.57 lakh households, of these 7.47 lakh of the households consisted of bungalows, small housing, flats, and portions of a house. 3.10 lakh households were in the informal sector. Madras city had 70% of households living in pucca houses, the rest which accounted for about 1.8 lakh households lived in semi-pucca and kutchta houses.

Households in the rest of M.M.A., excluding Madras city and M.U.A., had 71% of the total as kutchta houses, 6% semi-pucca houses, and 23% as pucca houses.

Though this is the situation of the available housing stock, the requirement is much higher. At the present rate of growth the requirement would be of 32,000 housing units in M.U.A. annually, of these 13,000 in Madras city and 19,000 in other urban centres of M.M.A. Apart from this 18,000 housing units would have to be annually generated in the rest of M.M.A. Of the annual requirements 55% comes from the economically weaker
sections of the society, 33% from the lower income groups, 9% from the middle income group, and 3% from the higher income groups (M.M.D.A. Report, 1995).

In order to serve these requirements the agencies involved can be classified as public and private agencies. The public housing agencies are as follows (Madras 2011, 1993):

i) Tamil Nadu Housing Board,

ii) Tamil Nadu Slum Clearance board,

iii) Tamil Nadu Adi Dravidar Housing and Development Corporation,

iv) Tamil Nadu Co-operative Housing Federation,

v) Madras Metropolitan Development Authority, and

vi) Tamil Nadu Handloom Weavers Housing Co-operative Society.

While the public housing agencies cater to the requirements mainly of the lower income group and the economically weaker sections, housing requirements of the other sections of the society are taken care of largely by the private sector. Under this category there are private individuals, co-operative societies, and private property developers. The housing supply by the private sector in Madras is more than double the quantity of supply made by the public sector (Madras 2011, 1993).

Apart from providing just houses for the people, availability of basic infrastructural facilities is an important factor to be considered. Within Madras city the Madras Metropolitan Water Supply and Sewerage Board (M.M.W.S.S.B.) covers most of the city for the supply of protected water supply
and under ground sewage system. But this is yet to be extended to cover the rest of M.M.A.

Thus we can say that from the infrastructural facilities point of view Madras city is still much more attractive for the development of housing. Due to the non-availability of land the trend now is the construction of multi-storeyed flats, which are coming up in areas within the heart of the city. The main areas include Nungambakkam, Egmore, Alwarpet, Mambalam, Thyagaraya Nagar, Adyar, and Besant Nagar. Old single unit houses are being replaced by multi-storeyed flats. But these cater to very limited requirements and the prohibitive costs restricts the number of people who can afford houses in the city (Table 2.6).

**TABLE 2.6**

**COST OF FLATS DEVELOPED BY A PRIVATE DEVELOPER IN PROMINENT LOCATIONS IN MADRAS CITY**

<table>
<thead>
<tr>
<th>Location</th>
<th>Area (sq.ft)</th>
<th>Price (Rs. lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyagaraya Nagar</td>
<td>2146</td>
<td>49.79</td>
</tr>
<tr>
<td></td>
<td>1946</td>
<td>45.15</td>
</tr>
<tr>
<td></td>
<td>1073</td>
<td>24.89</td>
</tr>
<tr>
<td></td>
<td>972</td>
<td>22.55</td>
</tr>
<tr>
<td></td>
<td>842</td>
<td>18.95</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>18.00</td>
</tr>
<tr>
<td>Chamiers Road</td>
<td>1474</td>
<td>43.85</td>
</tr>
<tr>
<td></td>
<td>1307</td>
<td>38.88</td>
</tr>
<tr>
<td>Mylapore</td>
<td>1400</td>
<td>29.75</td>
</tr>
<tr>
<td></td>
<td>1070</td>
<td>26.64</td>
</tr>
<tr>
<td>Kilpauk</td>
<td>1235</td>
<td>29.02</td>
</tr>
<tr>
<td></td>
<td>1054</td>
<td>26.88</td>
</tr>
<tr>
<td></td>
<td>997</td>
<td>25.42</td>
</tr>
<tr>
<td></td>
<td>860</td>
<td>20.21</td>
</tr>
<tr>
<td></td>
<td>1298</td>
<td>25.83</td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>1046</td>
<td>20.82</td>
</tr>
<tr>
<td></td>
<td>1044</td>
<td>20.78</td>
</tr>
<tr>
<td><strong>Srinagar Colony, Saidapet</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1167</td>
<td>24.80</td>
</tr>
<tr>
<td></td>
<td>1134</td>
<td>24.10</td>
</tr>
<tr>
<td></td>
<td>1017</td>
<td>20.59</td>
</tr>
<tr>
<td></td>
<td>983</td>
<td>19.91</td>
</tr>
<tr>
<td></td>
<td>866</td>
<td>18.40</td>
</tr>
<tr>
<td></td>
<td>832</td>
<td>17.68</td>
</tr>
<tr>
<td><strong>Anna Nagar</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>980</td>
<td>23.03</td>
</tr>
<tr>
<td></td>
<td>901</td>
<td>21.17</td>
</tr>
<tr>
<td></td>
<td>870</td>
<td>20.45</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>18.80</td>
</tr>
<tr>
<td><strong>Royapuram</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1473</td>
<td>22.69</td>
</tr>
<tr>
<td></td>
<td>1290</td>
<td>19.77</td>
</tr>
<tr>
<td></td>
<td>873</td>
<td>13.92</td>
</tr>
<tr>
<td><strong>Postal Colony West Mambalam</strong></td>
<td>1059</td>
<td>22.13</td>
</tr>
<tr>
<td><strong>Velachery</strong></td>
<td>1086</td>
<td>11.49</td>
</tr>
<tr>
<td></td>
<td>1055</td>
<td>11.08</td>
</tr>
<tr>
<td></td>
<td>1037</td>
<td>10.89</td>
</tr>
<tr>
<td></td>
<td>1001</td>
<td>10.51</td>
</tr>
</tbody>
</table>

**Source**: The Hindu

For the middle and lower income groups housing is affordable only outside the city. Availability of land and lower costs make these areas more attractive. Even here it is the urban centres such as Ambattur, Avadi, Padi, Nanganallur, Tambaram, Pallavaram, and Madhavaram that attract more people as they are better served areas especially with regard to public transport facilities.
2.5.2 Water supply and sewerage

Organised supply of water to Madras began in 1870 when unfiltered water was brought to Kilpauk by an open channel by gravity and distributed through pipes to nearby areas. Now raw water is brought from Red Hills by covered masonry conduits to the Kilpauk water works, where it is chemically treated, filtered and chlorinated. There are two subsidiary head works at Anna Poonga in North Madras and near Valluvar Kottam in South Madras which receive treated water from the Kilpauk water works and boost the pressure by pumping it to elevated reservoirs. The distribution mains branch off from these head works. Madras city is divided into 12 distribution zones. The distribution system is spread over a length of about 1600 km. (Krishna Water Supply Project, 1992).

Though most of the city is covered by piped water supply system the quantity of water supplied is highly variable. The average water supplied during normal rainfall years is estimated at 78 liters per capita day (lpcd) and only 32 lpcd during drought years. According to WHO standards the average metropolitan supply of water should be 150 lpcd (P.N.Reddy, 1993).

A large part of the system in the city is more than 100 years old and about 40% has served a life span of 50 years, and hence there is need for replacement and repairs. About 12% of the water supplied is wasted due to leakage in the system. Old leaking pipe lines also increase the chances of contamination due to the mixing of sewage and waste water with the drinking water (P.N.Reddy, 1993). These conditions are found to prevail in the old
developed areas of the city and includes Purusawalkkam, George Town, Triplicane, Mylapore, and Egmore.

The rest of M.M.A. is not covered by the piped water supply of the M.M.W.S.S.B. The residents of these areas have to have their own supply which is the usage of ground water from shallow wells or bore wells. Some of the local panchayats sink bore wells for the residents belonging to the economically weaker sections. For example in town panchayats like Nandambakkam, Porur, Manali, Minjur and Poonamallee.

Similar to the water supply system, open drains were connected to pumping stations for the disposal of waste water away from habitation. The sewage system is even now based on a system of pumping. Sewage flows by gravity to pumping stations from where it is pumped to the treatment facility. The final effluents from the treatment plants are discharged into the nearest water course (Krishna Water Supply Project, 1992).

The sewage system covers an area of 129 sq.km., about 85% of Madras city, but the entire population is not covered. In the areas without underground sewage facilities, individual households have septic tanks which are cleaned and maintained by the owners. But low income and slum households, which house about one million people have very little access to any form of sewage system. They have to use the existing 750 public toilets scattered around the city or the waterways of the city (P.N.Reddy, 1993).
In the rest of M.M.A. underground sewage system is completely non-existent. Individual households have septic tanks, but for the hutment dwellers and economically weaker sections who cannot afford septic tanks, the situation is very unhygienic. Waste water gets let out into open drains or open grounds, and open grounds are used as toilets. In the rapidly growing urban centres of M.U.A. the prevalence of such conditions is extremely hazardous to health as open lands are shrinking. The areas where such conditions prevail are urban centres such as Ambattur, Avadi, Pallavaram, Tambaram, Alandur, and Tiruvottiyur.

As has already been highlighted from the point of view of availability of facilities Madras city is much more attractive. With regard to the availability of water the rest of M.M.A. has ground water potential and meets an essential requirement. Thus it is not a very limiting factor in the growth of housing there, especially since even though piped water is supplied within the city in very many cases it is inadequate. The southern parts of M.M.A. have a good ground water potential, and areas such as Injambakkam, Kottivakkam, Nilangarai, and Perunugdi along the Mahabalipuram road, and in the south-west at Alandur, Nandambakkam, and Porur, are attractive from this angle. But with regard to the drainage and sewerage facilities all areas outside the city are very unattractive.

2.5.3 Transportation

An integral part of urban development is the growth of transport networks. M.M.A. and Madras city are connected to the rest of the country by
road and railways. So also within the region areas are connected by railway lines and network of roads.

There are three railway lines criss-crossing the M.M.A. region. These are the Madras Beach-Tambaram line a meter gauge line, the Madras Central-Thiruvalluvar line abroad gauge line, and the Madras Central-Gummudipundi line also a broad gauge line.

The road network covers the entire M.M.A. providing for the movement of a variety of vehicles. Public buses are the most common mode of transportation. There are two transport corporations that serve Madras city and M.M.A., they are the Pallavan Transport Corporation, and Dr. Ambedkar Transport Corporation. Together they ply 2239 buses operating on 439 different routes. They cover a distance of 5.2 lakh kms. a day with a passenger load of 31.69 lakhs (M.M.D.A. Report, 1995). Being a major industrial and commercial centre in the region, M.M.A. attracts large number of goods transport vehicles like trucks and tempos. In 1992 there were 21,128 goods vehicles in M.M.A. and Madras city, as compared to 6,671 in 1980. The terminal points for these vehicles are George Town, Kurukupet, Salt Cotaurs, Madras Harbour, Guindy, Ambattur, Chrompet, and Tambaram (M.M.D.A. Report, 1995).

Similarly there has been a marked increase in the number of passenger vehicles (Table 2.7). The population of two wheeler vehicles has seen an increase of 50% per annum, with other vehicles too experiencing marked increase in their numbers. But this quantum increase in the number of vehicles has not been accompanied by an appropriate growth of road surfaces.
TABLE 2.7

MOTOR VEHICLES IN MADRAS CITY

<table>
<thead>
<tr>
<th>Type</th>
<th>1984</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car, Van and Jeeps</td>
<td>34,500</td>
<td>127,159</td>
</tr>
<tr>
<td>Two Wheelers</td>
<td>87,000</td>
<td>433,046</td>
</tr>
<tr>
<td>Auto rikshaws</td>
<td>5,900</td>
<td>16,407</td>
</tr>
<tr>
<td>Buses</td>
<td>2,100</td>
<td>2,748</td>
</tr>
<tr>
<td>Trucks</td>
<td>14,782</td>
<td>21,128</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>3,176</td>
</tr>
<tr>
<td>Total</td>
<td>144,282</td>
<td>603,664</td>
</tr>
</tbody>
</table>


Over usage has led to increased wear and tear with the roads unable to handle the existing load. Hence, the capacity of almost all the roads is reduced due to poor quality of the surface, inadequate pedestrian foot paths, poor lighting conditions, and poorly designed intersections. The volume capacity ratio (V/C ratio) on many of the link roads especially during peak hours is more than one, indicating very high levels of congestion. In the CBD roads the V/C ratio is often more than 1.5. Such heavy congestion leads to frequent traffic jams and other traffic hazards. These areas also suffer from acute shortage of parking space. The roads in the CBD areas of Parry’s Corner, George Town, Anna Salai, Panagal Park, and their surrounding areas include, the Parry’s Corner intersection, Waltax Road, Mint Road, Wallajah Road, Anna Salai, Blackers Road, Sydnhams Road, Purusawalkam High Road, Nungambakkam High Road, Thyagaraya Road, and Usman Road (M.M.D.A. Report, 1995).
Absence of road connections and public transport facilities are a restricting factor to development of housing, but at the same time high levels of traffic congestion too are not conducive for housing. From this point of view Madras city is well connected with roads and public transport facilities, but at the same time CBD zones such as George Town, Parry’s Corner, and Anna Salai are too congested for any development. Main roads in other areas such as Nungambakkam High Road, T.T.K. Road and Eldams Road in Alwarpet, Usman Road, Bog Raod, and Thyagaraya Road in Mambalam are also extremely congested. Areas such as Anna Nagar, Besant Nagar, Tiruvanmiyur, Adyar, and inner areas of Alwarpet such as Raja Annamalai Puram, C.I.T. Colony, Nungambakkam, Kodambakkam, and Mambalam, are not as congested as the main roads and hence suited for housing purposes. Similarly in the rest of M.M.A. though road networks and public transport are not as well developed as in the city, the urban centres are better served. The areas here include, Tiruvottiyur, Kathivakkam, Ambattur, Padi, Valsaravakkam, Porur, Nanganallur, Pallavaram, Meenambakkam, Tambaram, Neelangarai, Injambakkam, and Perungudi. These areas lie along the major trunk roads, or along the suburban rail route and hence are well linked by transport network and thus suited for residential development.

2.5.4 Health Services

Provision of adequate medical services is an essential prerequisite for the maintenance of quality of life in a society. Madras is often referred to as the medical capital of the country owing to the presence of numerous hi-tech privately owned hospitals that provide state of the art medical treatment at
par with the best in the world. Apart from these services, the main stay of the medical services are provided by the government and quasi-government organisations that provide medical facilities that are affordable to all sections of the society, especially the poor and down trodden.

In Madras city at the grass root level are the medical centres catering to the economically weaker sections of the society, and the slum dwellers run by the Corporation of Madras. There are 22 such centres in the city, each catering to a population of 25,000. At the next higher level are Health Posts also run by the corporation. There are 68 such posts each catering to a population of 25,000 to 50,000. Of these 4 have post partum centres, 36 have maternity wards, and 2 have operation theatres. Additionally there are 16 more health posts attached to major government and private hospitals, and social welfare organisations. Thus there are a total of 84 health posts in Madras city (M.M.D.A. Report, 1995).

At the top of the hierarchy are the General Hospitals, Speciality Hospitals, Referral Hospitals, and teaching institutions. Of these there are 6 General Hospitals, 10 Speciality Hospitals, 4 Referral Hospitals, 2 ESI hospitals, and a TB and Chest Disease Institute (M.M.D.A. Report, 1995), (Appendix II).

The rest of M.M.A. too is served by a hierarchy of medical services run by the government. At the grass root level are the Primary Health Centres (PHC), where every centre caters to a population of 30,000. Above these are the Community Health Centres (CHC), which are referral centres, with 1 for every
4 PHC. Every CHC caters to a population of 1,20,000. At the top of this are the General Hospitals and Speciality Hospitals. M.M.A. has 10 PHC, 3 Speciality Hospitals, and 1 General Hospital (M.M.D.A. Report, 1994).

Along with these hospitals run by the government there are 7 hospitals in M.M.A. run by other government establishments, they are the Perambur Railway Hospital, the Military Hospital, Port Trust Hospital, Police and Jail hospitals.

Apart from these as stated earlier, there are numerous privately run hospitals and nursing homes. Prominent among these to name a few are, Apollo Hospital, Vijaya Hospital, Tamilnad Hospital, Devaki Hospital, Ramachandra Hospital and Medical College, Malar Hospital, and V.H.S. As per the data collected in 1990, there were 257 privately run general hospitals, and 45 specialised hospitals (M.M.D.A. Report, 1995).

Besides these hospitals that provide treatment in the allopathic stream other streams of medicine are also followed here and run numerous medical centres, they include ayurveda, unani, sidha, and homeopathy. Of these ayurveda, unani, and sidha are indigenous, hence they have a wider acceptance, are closer to the people, use local resources, technology and labour, and have lower costs (A.Ramesh, and B.Hyma, 1986).

As in the case of all infrastructure facilities Madras city is much better equipped with the availability of medical services than the rest of M.M.A. Within the city both government run as well as private medical centres are
ubiquitously distributed. Poonamallee High Road has a high concentration of private nursing homes. Thus if proximity to medical facilities is considered Madras city is much more attractive for residential housing purposes.

2.5.5 Education Facilities

An important indicator of the extent of urban development is the availability of higher education facilities in an urban area. The education facilities available in Madras consist of schools, colleges and technical education institutes. In Madras city as per the 1991 census, there were 253 schools uptill the higher secondary level, 32 collegiate level institutions, and 50 technical level institutions. The non-technical colleges include arts and science colleges, training colleges, oriental education institutions, and physical education institutions. The technical education institutions include engineering colleges under Anna University, Indian Institute of Technology, polytechnics, medical colleges, para-medical training institutes, veterinary college and law college (M.M.D.A. Report, 1995).

The rest of M.M.A. has 150 schools uptill higher secondary level, 7 colleges, and 14 technical education institutions (M.M.D.A. Report, 1995).

Educational institutions uptill the high school level are found all over the city and rest of M.M.A. Technical institutions, polytechnics, and specialised research institutions of very high calibre such as I.I.T. Madras, Guindy Engineering College, and the Central Leather Research Institute are located in the Guindy area and extend outwards towards Taramani, along the
Taramani Road, which is now developing as an institutional area, where numerous polytechnics, and research institutes are located.

2.5.6 Telecommunication

An essential prerequisite for modern day living is a well connected telecommunication network. The telecom network in Madras city and the rest of M.M.A. is served by the Madras Telephone Department, covering almost the entire M.M.A., mainly the whole of Madras city and M.U.A. It caters to a population of about 6 million. The total area is served by about 36 telephone exchanges with a capacity of about 2.14 lakh lines, as on December 1992. About 58% of these consist of electronic exchanges and the rest are cross bar exchanges. Of these 23 exchanges with a capacity of 1.41 lakh lines serve Madras city and the remaining 14 exchanges with about 60,000 lines serve the rest of M.M.A. The density of telephones in Madras city varies from 100 per sq.km. in the outskirts to 2000 per sq.km. in the centre of the city. The number of working lines per 100 population in the city is 3.4 and in the rest of M.M.A. it is 2.8 (M.M.D.A., Report, 1955).

Thus we find that though it is the city that is better served with regard to availability of telephone lines the rest of M.M.A. is not far behind. In the congested parts of the city where demand is very high supply falls well short of the demand. Also congestion on the lines is more due to commercial usage. Centres of M.U.A. are served by the telephone network, covering areas such as Tiruvottiyur, Madavaram, Ambattur, Avadi, Pallavaram, Tambaram,
Alandur, St. Thomas Mount, Perungudi and Injambakkam. The rest of M.M.A. requires further development of telephone facilities.

2.5.7 Recreation and Marketing Facilities

Recreation facilities consist of parks and play grounds, cinema halls auditoriums, and stadia.

In Madras city there are 124 parks, 217 play fields, and 95 open grounds. This accounts for 1 park for every 30,000 persons and 1 play field for every 17,000 persons. The other open air recreation facilities include stadiums such as the Jawaharlal Nehru Stadium, University Stadium, Corporation Stadium, Chepauk Stadium, and Rajarathnam Stadium. There are also the Marina Beach, Elliot's Beach, Guindy Reserved Forest, Snake Park, Avingar Anna Zoological Park at Vandalur, Memorials to Gandhi, Kamaraj, and Rajaji, Anna Samadhi, M.G.R. Samadhi, and Golden Beach. (MMDH Report, 1995).

Indoor recreation facilities include cinema halls of which there are 108 in Madras city and 67 in the rest of M.M.A. There is the Birla Planetarium at the Periyar Science and Technology Centre at Guindy, Art museum and Natural History museum at the Museum Complex at Egmore. There are 12 other auditoriums in the city and numerous other clubs such as the Gymkhana Club, Cosmopolitan Club, Boat Club, Madras Cricket Club, and T'Nagar club. (MMDA Report, 1995).

Madras city has better facilities for indoor recreation in comparison to the rest of M.M.A. which is better endowed with open spaces. Indoor facilities
such as auditoriums and theatres are very limited outside the city and here too concentrated in the urban centres like Tambaram, Pallavaram, St. Thomas, Mount, and Ambattur.

Marketing and commercial activities are concentrated in the city in areas in and around George Town, Parry's Corner, along Anna Salai, Nungambakkam High Road, around Panagal Park and along Usman Road and Pondy Bazar in Mambalam, along Kodambakkam High Road and along Lattice Bridge Road in Adyar. In the rest of M.M.A. marketing and commercial activities are very limited and restricted to meet the local shopping requirements, and here too they are mainly concentrated in the urban centres such as Ambattur, Avadi, Tambaram, Pallavaram, and Tiruvottiyur.

Thus we find that Madras city and its environs have grown from a small scattering of settlements as it existed over three hundred years ago has today grown into a major metropolitan city of India. The past decade or so has seen a large scale growth in population as well as spatial extent. Numerous infrastructure facilities exist to cater to the requirements of the people, but the recent spurt in population and spatial extent have made the further development of these facilities to cater to a larger population essential.