CHAPTER 8

SUMMARY AND CONCLUSION

The urban environment of metropolitan cities has been deteriorating due to an influx of population, inadequate infrastructure and services, and weak local administration that have been unable to regulate and control urban development. Thus problems such as inadequate sewerage and drainage facilities, poor quality and quantity of drinking water, high levels of air pollution, and inadequate facilities for solid waste disposal arise. Along with this are problems of overcrowding, congested and substandard living conditions, especially in slums, indiscriminate use of land for residential purposes leading to development of housing in environmental risk prone areas and in areas that need to be protected such as lake beds fragile ecosystems and agricultural lands.

It is obvious that the quality of the environment has to be maintained if man has to perform his activities and lead a healthy life. However it was observed that man himself was polluting and harming the very environment essential for his sustenance. The extent of harm brought on the environment had a direct bearing on the health and quality of life of those living there.

Thus we could say that with growing urbanisation and intensive use of all available resources innumerable environmental problems were being experienced. The reasons for the deterioration of environmental conditions in
metropolitan cities include, a continuously widening gap between demand and supply of infrastructural facilities, and an escalating per capita cost of providing urban services. The accumulated backlog in urban housing along with a rapid increase in the number of urban poor had resulted in the proliferation of slums and squatter settlements. Weak urban local bodies could not monitor and control haphazard residential growth. The lack of effective control of changes in landuse has encouraged unplanned urban sprawl, while inadequate control of pollution has led to contamination of urban environment.

Madras city, the fourth largest metropolis in India and its environs which constitute the Madras Metropolitan Area (M.M.A.), was no exception to all the problems associated with unchecked growth of population and haphazard spread of residential areas. The rapid growth of population in the last few decades gave rise to various environmental problems. The city was found to be suffering from the over exploitation of basic infrastructure facilities, with demand far outstripping supply. The city also suffered from high levels of congestion and poor living conditions, and the proliferation of slums. In the rest of M.M.A. the problems of development were mainly due to the non-availability of basic infrastructure facilities such as protected water supply and underground drainage facilities. Another problem seen here and also in Madras city was the absence of proper landuse zoning, because of which housing came up in hazardous and unsuitable areas, such as close to polluting industries, and along river and canal banks.
A study of the various research work done in the field of urban environmental problems revealed that the main issues studied were in relation to impact of specific environmental conditions on health and living conditions, study of pollution, and environmental perceptions. Studies on the environment included study of environmental policy, environmental conditions in squatters, economic development and environmental protection. Environmental regulations, effect of environmental regulation on planning practices, and need for urban development to be environmentally sound was emphasised. Issues with regard to residential areas and landuse focused study of landuse plans to identify areas of conflict between plans, ethnicity, economic status and neighbourhood, public dissatisfaction with their area of residence, and capacity and willingness of people to pay for urban improvement. Studies carried out by researchers in the areas of pollution, environment and health showed methods of obtaining a health hazard index and its applications in regional health planning, relationship between air pollution intensity and property values, influence of area on behaviour, risks to health from environmental factors, spatial approach to risk assessment, and epidemiological research on urbanisation and health in developing countries. The emphasis of research work done in India was mainly on study of specific health hazard and environmental conditions, and crowding and human responses to various levels of crowding.

Madras city and its hinterland together constituted the Madras Metropolitan Area (M.M.A.). Madras city was the centre of all commercial and administrative activities as well as being the living area for over 75% of the
total population of M.M.A. The post independence era saw a tremendous
growth of population. This was the result of industrial development and
economic growth resulting from developmental activities.

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 showed few distinct pockets
of high densities in Madras city, with densities of over one lakh persons per
square kilometre. The areas were the divisions of Tondiarpet, Purusawalkam,
Triplicane and Saidapet. The average densities were 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. Other high density areas included
Tiruvottiyur, and Avadi townships, and Pammal and Velsarvakkam Town
Panchayat.

The break up of the pattern of landuse for the city revealed that in 1974
residential areas covered 45% of the total area while in 1991 it covered 48% of
the area. 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 revealed the fact that there had been a more dense use of the land area
already under residential use, this was reflected in the large scale proliferation
of multi-storeyed apartment complexes. 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. The percentage of area under industries fell from 6.6% to
5.3% indicative of the movement of industries 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, this was reduced to occupy 20 sq.km. in 1991, the fall reflects the continuous growth of built up areas at the cost of open spaces.

In the rest of M.M.A. though agriculture continued to remain the predominant landuse, from 1974 to 1991 there was a marked reduction in the area under agriculture. 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.

A study of the physical environment of M.M.A. revealed that M.M.A. was a typical example of flat land topography. The average elevation decreased from west to east. The maximum height of 100 meters was found in the Vandalur Reserved Forest in the south western boundary of M.M.A. The average elevation in Madras city was around 7 meters. In the western part of M.M.A. the average elevation was around 20 meters with few pockets of elevation going until 40 meters. Tanks were found well distributed over large parts of northern and western M.M.A. The main large tanks were the Red Hills lake and Cholavaram tank in the north, and the Chamberambakkam tank in the western parts of M.M.A., which were the only ones that had water throughout the year. Apart from these there were numerous small tanks dotting the entire M.M.A. region.

A comparative study of the residential landuse patterns in Madras city showed that in 1974 residential areas occupied 45% of the total area, and in
1991 this had increased to 48% of the total area of the city. There was a more intensive utilisation of all available land in the residential areas of the city. This resulted in the shift from independent single unit houses to multi-storeyed structures accommodating numerous small flats. A plot of land which used to house about 5 to 10 people at the most now accommodated 80 to 100 people. This type of change was prominently visible in the well-developed areas of the city such as Nungambakkam, Thyagaraya Nagar, Alwarpet, Adyar and Kodambakkam. The vacant lands that were seen in Villivakkam, Kolathur, and Velachery in 1974 had nearly altogether disappeared.

In comparison to the landuse changes that had taken place for the time period 1974 to 1991 in Madras city, the rest of M.M.A. saw definite changes in the landuse patterns with a marked increase in area under residential landuse. In 1974 there was only 8.2% of the land under residential landuse, and this increased to 21% of the total area in the rest of M.M.A. Residential areas over-flowed out of the city and spread out into the rest of M.M.A. This spread took place mainly towards the south, south-west, and west of the city. Residential development in the rest of M.M.A. took place all along the boundary of the city as well as in a linear pattern along the rail routes and roads that traverse the area in a radial pattern. Thus the spatial development of residential areas was along the G.S.T. Road in the south-west, the coastal highway in the south, and the railway lines running from the city to the west and the north. From 1974 to 1991 area under residential landuse increased by 13% to accommodate a 25% increase in population.
Madras city and its surrounding areas which constitute the M.M.A. faced numerous environmental hazards associated with indiscriminate use of land and its resources.

As regards natural hazards, cyclones especially during the north east monsoon posed a threat to the residents of the city and its environs. Cyclones were associated with rains that hit the Tamil Nadu coast during the period of the north-eastern monsoons during the months of October to January, and during the summer months of May to July. The flat terrain of the city made the natural draining away very difficult, and water logging took place in low lying areas such as Mambalam, Santhome, Saidapet, and Tiruvottiyur. Another natural hazard faced here was from sea erosion. As a result of which large chunks of land along the coast in the Thiruvottiyur-Ennore area had been eroded by the action of sea waves.

With regard to man-made hazards it was observed that the environment had been greatly degraded and posed innumerable threats to the residents of M.M.A.

The waters of all the waterways flowing through the city were extremely polluted and often resembled sewers. The main reason for this was the discharge of untreated effluents, in the form of overflows from the treatment plants, direct sewage lines and from the hutments along the water courses.

A major problem faced by Madras was the extreme shortage of water supply especially during the summer months. As a result of which people had
to rely on ground water and water brought in by tankers from outside the area, and there were no checks on the quality of these waters. Piped water supply was mainly confined to the residents of the city alone. But here too the water was susceptible to contamination because of corrosion of the water pipes. In the rest of M.M.A. ground water was the main source of water supply and this was threatened by pollution from industrial effluents and sea water intrusion.

High levels of air pollution were also recorded in the industrial belts of M.M.A. in areas such as Kathivakkam, and Thiruvottiyur, and in the congested commercial areas of Parry's Corner, George Town and Central Station. High levels of noise were also recorded in the commercial areas in the northern parts of the city and along Ann Salai.

Another major environmental hazard in Madras arose from the improper handling, clearing and disposal of solid wastes. All wastes were dumped in open grounds, exposing the environment and the people there to various toxic wastes from industries and hospitals.

The industries located in the rest of M.M.A. were the main causes of pollution outside the city. Non-adherence to effluent treatment rules resulted in the indiscriminate disposal of industrial wastes into the soil and waterways, and into the air.

Environmentally sensitive areas were those areas where the various risks so far identified occurred. These areas because of the presence of a single
hazard or a combination of them put the residents of these areas at risk. The residents of these sensitive areas faced various environmental hazard to their health and well being.

In M.M.A. the environmentally sensitive areas were identified on the basis of occurrence of high levels of air pollution, the presence of polluting industries, absence of piped water supply and sewerage facilities, occurrences of cholera and malaria with endemicity index of over 1 per 1000, and ground water pollution areas identified as having high TDS and chloride levels. The environmentally sensitive areas identified included, the industrial area in the northern part where in arc located Tiruvottiyur, Kathivakkam, Ennore, and Manali. To the west of Madras city Ambattur is a risk prone area, and to the south-west along the GST Road at Pammal, and Pallavaram, closer to Madras city at Adambakkam and further westward at Poonamallee.

The criteria used to identify environmentally sensitive areas in Madras city were, high levels of air and noise pollution, ground water pollution, proximity to polluted waterways, high population densities, and high levels of occurrences of cholera and malaria. The areas where these were located included the northern part of the city comprising the areas of, Kurukupet, Mottai Thottam, Cheriyar Nagar, Jeeva Nagar, Kumaraswamy Nagar, Royapuram, Washermanpet, Sowcarpet, Seven Wells, Pulianthope, Park Town, and Elephant Gate. This entire zone had a combination of risks including, high population densities, occurrences of cholera and malaria, a polluted waterway, and high levels of air and noise pollution. Other sensitive areas in the city were Triplicane which had high population densities, and high level of
occurrence of malaria and Saidapet which also had high population densities, and polluted ground water. Also all the residential areas located along side the waterways have been considered as risk prone areas.

In order to understand the living conditions in specific risk prone areas a primary questionnaire survey was conducted in selected sample locations. The areas surveyed were Pulianthope, Triplicane, Kumaran Nagar, Chintadripet, Jafferkhanpet, Thiruvottiyur, Ambattur, and Pammal.

Pulianthope is an old residential area identified as a sensitive area because of high levels of air pollution, reported occurrences of cholera, population density of over one lakh per square kilometre, and located close to the Otteri Nullah. The main problems faced by the residents were due to contamination of drinking water because of outdated water pipes, and poor drainage facilities resulting in blocked drains and stagnant rain water.

Triplicane is another old residential area in Madras city. This area was considered as environmentally sensitive area as it had a population density of over one lakh per square kilometre, and an annual parasite index for malaria of over 50 per 1000. This area too suffered from an outdated infrastructure unable to meet the present levels of demand. Thus there were problems of contaminated drinking water, blocked drains and inadequate garbage clearing facilities.

Kumaran Nagar located in Saidapet had the highest population density in the city of 1,56,275 persons per square kilometre. Analysis of the ground
water showed high levels of TDS and chloride content. This area had problems of inadequate supply of piped water, with the problem being aggravated by the poor quality of well water. The underground drains also got frequently blocked, and the area got flooded during the rains.

Chintadripet is located in the last loop of the Cooum river, with the hutments being located along the river bank. The area also had pucca houses located close to the river. Being located so close to the highly polluted waters of the Cooum was the main hazard faced by the hutment dwellers. These huts did not have drainage facilities and used the river banks as toilets as well as to dump all their wastes, making the entire area extremely unhygienic. The houses in this area also suffered from high levels of congestion.

The hutments along the Adyar river at Jafferkhannpet also had very poor environmental conditions. Proximity to the polluted waters of the river exposed the residents to various water borne diseases. This area also did not have drainage facilities and the residents used a nearby open ground and the river bank as a toilet. Other wastes were also let out into the river. Water supply too was inadequate, as they were dependent only on water from bore wells sunk in the area.

Thiruvottiyur is an industrial area located in M.M.A. to the north of Madras city. This area had high levels of air pollution, and no infrastructural facilities such as protected water supply and under ground drainage. Indiscriminate discharge of effluents by the industries located there into the soil polluted the ground water and in many cases rendered it unfit for
consumption. As this was the main source of water in the area its pollution has put the residents in great hardship. Due to the absence of underground drainage facilities sullage water was being let out into the open. The area also got flooded during the rains and the rain water in many cases even entered the homes of the residents.

Ambattur is another industrial township located in M.M.A. to the west of Madras city. The environmental problems here too were a result of proximity to highly polluting industries and absence of protected water supply and drainage facilities. The industrial effluents polluted the air and ground water in the area. In the absence of piped water supply ground water was the only source of water and its pollution had severe health implications to the residents.

Pammal too is an industrial area where the environment had been greatly polluted by the effluents from the leather tanneries. The ground water had been so badly polluted that it could not even be touched. Piped water supply was provided only every fortnight and hence the residents were put to great hardships. The area also got flooded during the rains and the rain water even entered the houses in some cases.

The primary survey brought into focus the living conditions and ground situation in the selected environmentally sensitive areas. A detailed understanding of these problems and the peoples attitudes is essential in order to draw out workable plans for landuse management and future development.
For the purpose of providing good environmental conditions in M.M.A. development strategies were identified at various levels. At the macro level strategies were formulated for improving environmental conditions for the city and the rest of M.M.A. At the micro level the strategies were stated for the specific environmentally sensitive areas that were identified and the sample locations where the primary survey was conducted.

The strategies identified for the city as a whole were with regard to reducing congestion, cleaning of the waterways and ensuring proper water supply, drainage and solid waste management. The need was also identified for empowering the local governing bodies and involvement of NGO's in the environmental improvement programmes. In the rest of M.M.A. the strategies were the need for providing protected water supply and drainage facilities. It was also found necessary that laws regarding landuse zoning and pollution control are strictly adhered to.

At the micro level, study of the sample locations revealed the need to reduce congestion, and maintain water supply and sewage lines. The slums were in urgent need of improvement and relocation with the provision of protected water supply and drainage facilities. In the areas outside the city the strategies identified were with regard to development of infrastructure and checks on the pollution caused by the industries. There is also a need to monitor the increasing tenants in small houses in old residential areas.
There is also a great need for the development of Geographical Information Systems (GIS), where an environmental information base is created. This information base could be used by all agencies involved in urban development work. Environmental Impact Assessment studies also need to be conducted before undertaking any development work including the approval of residential development projects in urban areas. Also in the areas that have been identified as environmentally sensitive, environment monitoring cells in collaboration with Tamil Nadu Pollution Control Board need to be set up to assess the environmental conditions in these areas and maintain a check on the levels of risk. This should work in close collaboration with other development agencies in M.M.A.