Second Master Plan
For
Chennai Metropolitan Area, 2026

Volume I
Vision, Strategies and Action Plans

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Acknowledgement

Preparation of Master Plan calls for efforts and energy of titanic proportion. And the fact that it requires enormous data from multifarious sources makes the exercise all the more tedious and difficult. Further the fact that master plan is one of the few documents which impact positively and negatively the entire metropolis, the pool of stakeholders become wide and large thereby making the public consultation process huge and painstaking but at the same time very useful. Nonetheless the sustained collective efforts of the master plan preparation exercise culminated in the documentation of the Second Master Plan.

The preparation of the modified / fresh Second Master Plan started in 2005. The guidance and leadership provided by the past Chairpersons and the present Chairperson, CMDA & Hon'ble Minister for Information Thiru. Parithi Ilamvazhuthi has been immense. It is in the fitness of things to acknowledge the same as well as the support and consultation rendered by the past and present Members of the Authority.

Given the stupendous nature of the master planning task and the intricacy of details involved, providing the right leadership and direction is not an easy one. But the same came in good measure from the past Vice-Chairperson Thiru. R. Santhanam, IAS (from Nov, 2006 to Nov, 2007) and some of his predecessors. Notable among the past Vice-Chairpersons are Thiru. S.A.Subramani, IAS and Tmt. Jayanthi, IAS. The contributions made by the immediate past Vice-Chairperson Thiru T.R.Srinivasan, IAS. and the present Vice Chairperson Tmt. Susan Mathew, IAS are also acknowledged. The day-to-day guidance and support provided and the inputs given by the past Member-Secretary Thiru. Md.Nasimuddin, IAS was of immense help. The contributions made by the present Member-Secretary Thiru.Vikram Kapur, IAS and the past Member-Secretaries, Thiru K.Alaudin IAS, Thiru.M.F.Farooqui IAS, Dr. Niranjan Mardi IAS, Thiru. Vibhu Nayar IAS, Thiru. Rajeev Ranjan IAS, Thiru. V.K. Jeyakodi IAS, Thiru. P.R.Sampath IAS, Thiru. G. Santhanam IAS, Thiru. Malik Feroze Khan, IAS, Thiru. R.N.Choubey IAS and M.R.Mohan IAS are also acknowledged.

It would be unfair if the contributions made by the past Chief Planners of CMDA, Tvl. T.L.Prakasam, A.Damodaran, A.R.Doss, A.R.Ranganathan and N.Dharmalingam, are not duly acknowledged as they had significantly contributed in the preparation of draft Second Master Plan 2011 which in one way or other paved the way of the present document.

As the planning exercise encompassed various sectors, it required the support and positive interaction with many public and private agencies / departments. It would be unfair if their collective contribution and cooperation are not acknowledged. Their support has also been acknowledged at appropriate places in the document.

Uploading the draft Master Plan-II document in the CMDA website and sale of more than 3000 copies of the printed document coupled with the public consultation organised along the length and breadth of the metropolis for over 4 months did provide ample scope for the broadest public participation and brought forth more than 900 letters containing suggestions / objections thereby deepening the scope and content of the Plan document. The media, particularly the print media, have extended their mite by enhancing the quality and coverage of the public participation by debating the contents of the document. Notwithstanding the fact that it required painstaking efforts to skim through all the suggestions and objections and sift doable and tangible suggestions from the maze of ideas furnished individually and as groups, it was indeed a satisfying experience, at the end of the day, to note that the feedback from virtually every segment of stakeholders could be gathered in making the master plan as complete and comprehensive as possible. The contribution by the various committees constituted to examine in detail the suggestions and objections received from the public was not only significant but also laudable given the constraints in which these committees worked. As a mark of acknowledgement of their contribution members of these committees are enlisted elsewhere in the document. The High Court-appointed Monitoring Committee also contributed by way of certain suggestions.

The two-day workshop organised by CMDA which solicited the views and suggestions from the top level officials of various Government agencies, experts, engineers, architects, NGOs etc. has also greatly assisted in enhancing the quality of the document preparation. As for fine-tuning the policy options and future directions of growth for the metropolis, the deliberations at the meetings of the Secretaries of various departments chaired by the Chief Secretary to Government also found very useful.

Guidance provided by Thiru.L.K.Tripathy IAS, Chief Secretary to Government from time to time and the support extended by Thiru.R.Sellamuthu IAS, Secretary to Government, Housing and Urban Development Department are also thankfully acknowledged.

Last but not the least, the untiring efforts made by the study team comprising the entire Master Plan Unit and other support members headed by Thiru C. Palanivelu, Chief Planner despite all odds ensured that the document is prepared meticulously without any compromise on quality or content and submitted to the Government in time.

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Acronyms

A/R	Auto Rickshaw
ADB	Asian Development Bank
ATC	Area Traffic Control
BOO	Build, Own & Operate
BOOT	Build, Own, Operate & Transfer
BPL	Below Poverty Line
BSNL	Bharat Sanchar Nigam Ltd.
CAA	Constitutional Amendment Act
CBD	Central Business District
CBDRM	Community Based Disaster Risk Management
CBED	Community Based Environmental Development Programme
CBO	Community Based Organisation
CMA	Chennai Metropolitan Area
CMWSSB	Chennai Metropolitan Water Supply & Sewerage Board
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CoC	Corporation of Chennai
CPHEEO	Central Public Health and Environmental Engineering Organisation
CPT	Chennai Port Trust
Crore	100 lakhs = 1 00 00 000
CRZ	Coastal Regulation Zone
CTH Road	Chennai Tiruvallur High Road
CTP	Chennai Traffic Police
CTS	Comprehensive Transportation Study
CTTS	Comprehensive Traffic & Transportation Study
CUA	Chennai Urban Agglomeration
DCR	Development Control Rules
DDP	Detailed Development Plan
DES	Department of Economics and Statistics
DMRC	Delhi Metro Rail Corporation
DMRH	Director of Medical and Rural Health Services
DoH	Department of Highways
DPHPM	Dept. of Public Health and Preventive Medicine
DR	Development Regulations
ECR	East Coast Road
EIA	Environmental Impact Assessment
ELCOT	Electronics Corporation of Tamil Nadu
EMP	Enviromental Management Plan
ETB	Electric Trolley Bus
EWS	Economically Weaker Section
FMP	First Master Plan
FoB	Foot Over Bridge
FSI	Floor Space Index
GIS	Geographical Information System
GNT Road	Grand Northern Trunk Road
GoI	Government of India
GoTN	Government of Tamil Nadu
GST Road	Grand Southern Trunk Road

GWT Road	Grand Western Trunk Road
H&UD Dept.	Housing & Urban Development Department
ha	hectare
HHI	Household Interview
HIG	High Income Group
HOV	High Occupancy Vehicle
HT Line	High Tension Line
HTL	High Tide Line
ICC	Inner Circular Corriodor
IL&FS	Infrastructre Leasing & Financial Services
IPT	Intermediate Public Transport
IRR	Inner Ring Road
IT	Information Technology
ITES	Information Technology Enabling Services
JNNURM	Jawaharlar Nehru National Urban Renewal Mission
km	kilometre
KWMC	Koyambedu Wholesale Market Complex
LB Road	Lattice Bridge Road
LC	Level Crossing
LIG	Low Income Group
lpcd	litres per capita per day
LPG	Liquified Petroleum Gas
LRT	Light Rail Transit
LT Line	Low Tension Line
m	million
MBI Road	Marmalong- Bridge- Irumbuliyur Road
MEPZ	Madras Export Processing Zone
Mft3	Million cubic foot
MG Road	Mahatma Gandhi Road
mg.	milligram
MICE Tourism	Meetings, Incentives, Convention and Exhibitions Tourism
µg/m3	microgram per cubic metre
MIG	Middle Income Group
Million	10 lakhs =100 000
MINARS	Monitoring of Indian National Aquatic Resources
MLD	Million Litres per Day
MMDA	Madras Metropolitan Development Authority
MPC	Metropolitan Planning Committee
MR	Mixed Residential
MRTS	Mass Rapid Transit System
MTC	Metropolitan Transport Corporation
MUDP	Madras Urban Development Project
MVA	Mega Volt Ampere
MW	Mega Watt
NCTPS	North Chennai Thermal Power Station
NGO	Non-Government Organisation
NH	National Highway
NHAI	National Highways Authority of India
NMT	Non-Motorised Transport
Nos./nos.	numbers

OMR	Old Mahabalipuram Road
ORR	Outer Ring Road
OSR	Open Space Reservation
PCE	Passenger Car Equivalent
PCO	Public Call Office
PCU	Passenger Car Unit
PDA	Pallikaranai Drainage Area
PR	Primary Residential
PTCS	Pallavan Transport Consultancy Services
PWD	Public Works Department
RITES	Rail India Technical & Economic Services
rly.	railway
ROB	Road Over Bridge
RSPM	Respirable Suspended Particulate Matter
RTS	Rapid Transit System
RUB	Road Under Bridge
SCAT	Sydney Co-ordinated Adaptive Traffic System
SCOOT	Split Cycle Offset Optimisation Technique
SEZ	Special Economic Zone
SIDCO	Small Industries Development Corporation
SIPCOT	State Industries Promotion Corporation of Tamil Nadu
SMP	Second Master Plan
SPM	Suspended Particulate Matter
sq.km	square kilometre
sq.m	square metre
T/W	Two Wheeler
TDM	Travel Demand Management
TDR	Transfer of Development Rights
TEU	Twenty Equivalent Unit
TIDCO	Tamil Nadu Industrial Development Corporation
TN	Tamil Nadu
TNEB	Tamil Nadu Electricity Board
TNHB	Tamil Nadu Housing Board
TNHSP	Tamil Nadu Health Systems Project
TNPCB	Tamil Nadu Pollution Control Board
TNSCB	Tamil Nadu Slum Clearance Board
TNUDF	Tamil Nadu Urban Development Fund
TNUDP	Tamil Nadu Urban Development Project
TNUIFSL	Tamil Nadu Urban Infrastructure Financial Services Ltd.
TP	Town Panchayat
TPP Road	Tiruvottiyur- Ponneri- Panchetty Road
TSPM	Total Suspended Particulate Matter
TWAD	Tamil Nadu Water supply And Drainage Board
UGD	Under Ground Drainage
ULB	Urban Local Bodies
UMTA	Unified Metropolitan Transport Authority
UNDP	United Nations Development Programme
V/C	Volume-Capacity Ratio
VP	Village Panchayat
WB	World Bank

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About Chennai

Chennai situated on the shores of the Bay of Bengal is the capital of Tamilnadu state. It is the fourth largest metropolis in India. It's older name 'Madras' was officially changed to 'Chennai' in 1996.

2. Chennai Metropolis [with latitude between 12°50'49" and 13°17'24", and longitude between 79°59'53" and 80°20'12"] is located on the coramandal coast in southern India and the land is a flat coastal plain. Three rivers viz. Kosasthalaiyar, Cooum and Adyar pass through Chennai Metropolitan Area. These rivers are placid and meander on their way to the sea. Buckingham Canal, a man made canal, is another large waterway which runs north south through this Metropolis. Sholavaram lake, Red Hills lake and Chembarambakkam lake are the three large lakes in the Area.

3. Chennai lies close to the equator and most of the year it is hot and humid. Highest temperature attained in May-June is usually about 40^{0}C (104 ^{0}F) for a few days. The coldest time of the year is early January when the temperature is about 20^{0}C (68^{0}F). Predominant wind direction is from South East to North West.

4. Chennai Metropolitan Area comprises the area covered by Chennai City Corporation (Chennai District), 16 Municipalities, 20 Town Panchayats and 214 villages forming part of 10 Panchayat Unions in Thiruvallur and Kancheepuram Districts. It extends over 1189 Sq.Kms, and has a population of 7.04 million as per 2001 census.

5. While majority of people in Chennai are Tamil speaking, a sizeable population is Telugu speaking. Since Madras (presently Chennai) was the capital of the erstwhile Madras Presidency covering most of the areas now under the states of Andhra Pradesh, Karnataka and Kerala it has inherited a mix of languages [viz. Telugu, Kannada, Malayalam]. Chennai has become progressively more cosmopolitan after Independence with people from north mainly Rajasthan, Gujarat and Punjab settling in this Metropolis for business. Theosophical Society and Kalakshetra School of Music and Dance located in southern Chennai attracted foreigners to settle in Chennai. Recently the growth of IT industries in this Metropolis has been attracting a mix of people from other states as well as from abroad.

6. Chennai is famous for its classical dance called Bharathanatyam and the 'carnatic music season' event held every year during December and January is one of the world's longest cultural events attracting people not only from various places in India but also from foreign countries.

7. Chennai has a very heterogeneous mix of architectural style ranging from ancient temples to British colonial era buildings to the latest modern buildings. Most of the buildings constructed during colonial era are of Indo-Saracenic style.

8. Chennai is a major transportation hub for road, rail, air and sea transport connecting major cities inland and abroad.

9. Chennai is one of the major educational centres in India with a number of colleges and research institutions. Recently it has also been emerging as an important health centre with a large number of super specialty hospitals.

10. Chennai is thus emerging as an important metropolis in the South Asian region.

Introduction

The process of modern city planning seeks to steer market forces in the city building towards citizen welfare and public good. Zoning and building byelaws are still among the primary tools of such planning. In addition, master plans seek to lay out a physical pattern of land use and transportation routes for the city or metropolitan area as a whole. Thus master plans serve as a guide for public agencies to tailor their sectoral programming to the plan while facilitating private investments in the same manner.

2. Chennai the fourth largest metropolis in India is the focus of economic, social and cultural development and is the capital of the Tamilnadu state. It is growing at a rapid pace, and there is a demand for integration of the past developments with the future requirements. A co-ordinated and integrated approach among the various agencies involved in urban development is the need of the hour. Participatory process in planning is equally important and review and implementation of the plan at the local body level is a must to achieve the objectives of making this metropolis more livable and of international standard.

3. Though Madras Town Planning Act was enacted in 1920 itself and a few Detailed Town Planning schemes were sanctioned for small areas within the Chennai City, no comprehensive plan for city or metropolitan region was prepared. The Madras Town Planning Act was superseded in 1971 by the Tamilnadu Town and Country Planning Act.

4. The functions of the CMDA as per section 9-C of the Tamil Nadu Town & Country Planning Act, 1971 (Tamil Nadu Act No. XXXV of 1972) are (i) to carry out a survey of the Chennai Metropolitan Planning Area and prepare reports on the surveys so carried out; (ii) to prepare a master plan or a detailed development plan or a new town development plan as the case may be, for the Chennai Metropolitan Planning Area; (iii) to prepare an existing land use map and such other maps as may be necessary for the purpose of preparing any development plan; (iv) to cause to be carried out such works as are contemplated in any development plan; (v) to designate the whole of the Chennai Metropolitan Planning Area or any part thereof within its jurisdiction as a new town and to perform the following functions, namely (a) to prepare a new town development plan for the area concerned; and (b) to secure the laying out and development of the new town in accordance with the new town development plan; (vi) to perform such other functions as may be entrusted to it by the Government.

5. Master Plans are broad based plans and they are not meant to serve as `daily blue-prints'. Taking cue from this Master Plan, detailed sectoral plans have to be prepared and programmes for projects & their execution have to be worked out and implemented by the Departments / Agencies concerned .According to section 17, sub-section (2) of the Act, the Master Plan may propose or provide for all or any of the following matters, namely (a) the manner in which the land in the planning area shall be used; (b) the allotment or reservation of land for residential, commercial, industrial and agricultural purposes and for parks, playfields and open spaces; (c) the allotment or reservation of land for public buildings, institutions and for civic amenities; (d) the making of provision for the national highways, arterial roads, ring roads, major streets, lines of communication including railways, airports and canals; (e) the traffic and transportation pattern and traffic circulation pattern; (f) the major road and street improvements; (g) the areas reserved for future development, expansion and for new housing; (h) the provision for the improvement of areas of bad layouts or obsolete development and slum areas and for relocation of population; (i) the amenities, services and utilities; (j) the provision for detailed development of specific areas for housing, shopping, industries and civic amenities and educational and cultural facilities; (k) the control of architectural features, elevation and frontage of buildings and structures; (l) the provision for regulating the zone, the location, height, number of storeys and size of buildings and other structures, the size of the yards and other open spaces and the use of buildings, structures and land; (m) the stages by which the master plan shall be carried out; and (n) such other matters as may be prescribed.

6. The 74th Constitutional Amendment Act (CAA) mandates the setting up of Metropolitan Planning Committee (MPC) in every Metropolitan area. It redefined the powers, authority and responsibilities of Municipalities etc. As per the Act amendment, subject to provisions of the Constitution, the Legislature of a State may by law, endow – (a) the Municipalities with such powers and authority as may be necessary to enable them to function as institutions of self government and such law may contain provisions for devolution of powers and responsibilities upon Municipalities, subject to such conditions as may be specified therein, with respect to – (i) the preparation of plans for economic development and social justice; (ii) the performance of functions and implementation of schemes as may be entrusted to them including those in relation to the matters listed in the Twelfth schedule, (b) the committees with such powers and authority as may be necessary to enable them to carry out the responsibilities conferred upon them including those in relation to the matters listed in the Twelfth schedule.

7. The CAA also provided that the MPC shall, in preparing the draft development plan, have regard to (i) the plans prepared by the Municipalities and the Panchayats in

the Metropolitan area; (ii) matters of common interest between the Municipalities and the Panchayats, including co-ordinated spatial planning of the area, sharing of water and other physical and natural resources, the integrated development of infrastructure and environmental conservation; (iii) the overall objectives and priorities set by the Government of India and the Government of the State; (iv) the extent and nature of investments likely to be made in the metropolitan area by agencies of the Government of India and of the Government of the State and other available resources whether financial or otherwise.

8. The constitution of a Metropolitan Planning Committee by amending the Tamil Nadu Town and Country Planning Act is under active consideration of the Government of Tamil Nadu. As provided in the respective local bodies' Act, Village Panchayats are expected to prepare Annual Plans for economic development and social justice within their area, and the Corporation and Municipalities are expected to prepare Annual Plans and 5 year Plans for investments; the MPC would prepare perspective plans with 20-25 year perspective with 5 year programmes and annual budgets and forward it to the State Government. In the new situation envisaged under the 74th CAA, CMDA will also act as the Secretariat of the Metropolitan Planning Committee to assist in the formulation and review of the draft Metro-Perspective plan. This draft Metropolitan plan contemplated to be prepared by the MPC is different from the Master Plan prepared under Section 17 of the Tamilnadu Town and Country Planning Act. It is pertinent to note that the Delhi Development Authority has notified the Master Plan for Delhi-2021 recently in Feb 2007. Mumbai Metropolitan Regional Development Authority is in the process of revising their Master Plan for the Mumbai Area prepared in 1995. Bangaluru Development Authority has notified the Master Plan-2015 for Bangaluru Metropolitan Area on 25th,June 2007.

9. The process of preparation of Master Plan for the Metropolis started in 1973, by constitution of an adhoc body viz CMDA in 1973; it became a statutory body by Act amendment in 1974 (Tamilnadu Act 22 of 1974) and notification of the CMA was made in 1975. The draft master plan for CMA consented by Government was notified in Gazette on 5.08.75 and from that date developments are regulated with reference to Master Plan / Development Control Rules. The first Master Plan was finally approved by the Government in G.O.Ms.No. 2395, R.D. & L.A., dated 4.12.76. A review of the implementation of the First Master Plan is given in chapter I.

10. The major agencies involved in the infrastructure planning and development in Chennai Metropolitan Area are listed below.

The Details of Agencies and their Responsibilities			
Sl. No.	Agency	Responsibility	Jurisdiction
Local Government			
1	Chennai Corporation-	Provision of roads, construction of ROBs, RUBs, pedestrian subways etc., streetlights, solid waste collection and management, micro-drainage, parks and play grounds in their area of jurisdiction	Within the local body area
2	Municipalities	Provision of roads, construction of pedestrian subways etc., streetlights, solid waste collection and management, micro-drainage, parks and play grounds in their area of jurisdiction	
3	Town Panchayats		
4	Village Panchayats		
Parastatals Agency			
i	TNHB	Neighbourhood development including provision of plots and ready built houses, Sites and Services schemes.	Tamil Nadu State but focus is more on CMA
ii	MTC	Bus Transport	CMA
iii	Traffic Police (Greater Chennai)	Traffic Management Schemes	Greater Chennai
iv	TNEB	Electricity generation and supply	Tamil Nadu State
v	CMWSSB	Water Supply & Sewerage facilities for CMA	CMA*
vi	TNSCB	Provision of housing, infrastructure and livelihood programs in slum areas	Tamil Nadu State but focus is more on CMA
vii	Highways Department	Major roads within Chennai City, all bus route roads and major district roads, construction of ROBs, RUBs, pedestrian subways etc.	Tamil Nadu State
viii	PWD	Implementation & Maintenance of macro drainage system	Tamil Nadu State
ix	CMDA	Metropolitan Planning, Coordination of project implementation	CMA

* Though CMWSSB has jurisdiction over the CMA as per its Act, its area of operation is limited presently to Chennai City Corporation area and a few adjoining areas such as Mogappair, I.T.Corridor etc. However it has proposal to expand its area of operation covering the entire CMA.

11. The Authority (Board) has representation from the elected representatives of the Urban & Rural Local Self Governments within the CMA. In the preparation of development plans such as Master Plan and Detailed Development Plans, the Local Governments are duly consulted soliciting their views, recommendations and also involving them in the preparation of the plans. CMDA has delegated its powers to various local self-governments within CMA to issue planning permits depending on their status, and availability of technical manpower. Planning permissions for all types of developments are issued through the concerned local bodies only; local bodies also issue building licenses under the Local body Act along with Planning Permissions.

12. Draft Second Master Plan 2011 for CMA was prepared and submitted to Government and the Government gave its consent for the draft in G.O.Ms.No.59 H&UD 30.06.1995. After public consultation it was submitted to Government in December 1995 for approval. In the meanwhile, a Writ Petition was filed in the Hon'ble High Court of Madras against finalisation of the Plan and the Hon'ble High Court had ordered interim injunction confining issue of final notification and the interim order was made absolute on 1.07.1997. The High Court in its order-dated 10.07.2001 in Writ Petition No. 14819 / 95 dismissed the Writ Petition. Government in G.O.Ms. 408 H&UD dated 5.10.2001 had returned the draft Master Plan 2011 to CMDA directing to modify the Master Plan taking into account the recent urban developments, amendments to the DCR made till then, future needs of CMA etc and resubmit the same.

13. While revising the Master Plan, the existing land use plan was prepared based on the high-resolution imageries viz. IKONOS for the years 2001, 2003 and 2004 (1 metre resolution) and also the CARTOSAT for the year 2005 (2.5metre resolution). Latest Census 2001 data were made use of and the demography analysis made. Latest trends in developments including I.T. & ITES developments, automobile and its ancillary unit's developments and electronic industries developments around the CMA were also taken into account. CMDA's Infrastructure Investment Plan implemented since 2003 and the City Development Plan for this Metropolis prepared for JN-NURM were also taken into consideration. Metro rail is another major investment on the anvil to relieve congestion. Latest policies and programmes of the Government in various sectors were considered. Keeping the horizon year for the Master Plan as 2026, future demands were worked out and the Second Master Plan prepared. Developable lands were identified and extents worked out using remote sensing techniques. Taking into account the physical constraints and regulatory constraints also, population distribution and land use distributions spatially over various local bodies within CMA were made. All the maps in the revised Master Plan were prepared in the digital format using computers extensively.

14. The revised draft Second Master Plan was submitted to government by CMDA in December 2005 for approval with a request to give an opportunity to the public and local authorities for giving their suggestions before final approval. The Government in G.O. Ms. No. 331 H&UD department dated 5.12.2006 have returned the draft Master Plan to CMDA with the direction to prepare Master Plan afresh incorporating further developments in the field and submit a proposal for consent under section 24(2) of Tamil Nadu Town and Country Planning Act 1971. This was done in February 2007 and the Government gave its consent on 30.03.2007.

15. Though the Act requires 60 days' time to be given to the public inviting objections and suggestions, CMDA gave more than 140 days. Copies of the draft Master Plan in English and Tamil and the short version of the Plan in English and Tamil were made available to the public. These were also hosted on the official website *www.cmdachennai.org* so that it can be accessed by the public and downloaded free of cost. CMDA conducted public consultations at 14 centres spread over the CMA between April and July 2007 in which the officials and elected representatives of local bodies within CMA have also participated. Meetings with important stakeholders like the Builders Association and the Architects Association were also held. A separate consultation with the Mayor and the Councilors of Chennai Corporation was held and their suggestions obtained. The proceedings of these public consultations were put up on the CMDA website. A two-day Workshop was organized in the last week of August 2007 in which the concerned Government Departments/agencies, experts in the field, academicians, etc. participated and gave their valuable suggestions. The views / suggestions of different departments of Government were also obtained in a meeting chaired by the Chief Secretary to government on 31.08.2007.

16. More than 900 letters containing objections and suggestions were received from various associations and the general public. To examine the objections and suggestions seven subject-wise Committees (Land Use, DCR, Transport, Environment, Water Supply and Drainage, Solid Waste Management and Housing) were constituted comprising representatives from Government Departments / Agencies, CMDA, experts in the field and representatives from NGOs/CBOs. The Committees' recommendations were placed before the Authority at its meeting held on 28-10-2007 for consideration and the decisions of the Authority have been incorporated in the Second Master Plan.

17. The Vision of CMDA is to make Chennai a prime metropolis which will become more livable, economically vibrant, environmentally sustainable and with better assets for the future generations.

18. The Chennai Metropolis is expected to become one of the Mega Cities in the world with more than 10 million population, in the next 10 years. The Chennai City Corporation with 176 sq.km. area will accommodate about 59 lakh population while the rest of the Metropolitan Area with an extent of 1013 sq.km. will accommodate about 66 lakh population by 2026. For a balanced, planned development, a multipronged approach is recommended for adoption which includes regulation of developments through land use and development regulations, decongestion measures like shifting of certain traffic intensive wholesale activities from congested localities to planned areas,

development of new town / satellite towns and formulation and implementation of integrated urban infrastructure development projects by the agencies concerned.

19. Chennai is a hub for the region surrounding it. There is no declared region in the area for the purpose of planning and in 1975 the Metropolitan Area itself was declared as a region with boundaries limiting the planning process. But the Government have been considering to declare the areas adjoining the CMA as a Region comprising parts of Thiruvallur and Kancheepuram Districts for preparing Regional Plan, considering the developments coming up in the Kelambakkam-Tiruporur, Orgadam-Sriperumbudur and Gummidipoondi-Ponneri areas. When such a large Regional Plan is prepared it should take into account the Master Plan for CMA, for balanced development in the region.

Chapter I

Review of the First Master Plan

A. Introduction:

1.1 In the process of preparation of Second Master Plan (SMP), it is pertinent to review the working of the First Master Plan (FMP) and draw appropriate lessons. The FMP was notified in the Government Gazette on 5th August 1975 calling for objections and suggestions and it was approved in 1976. The FMP had estimated that by 2001 the Chennai Metropolitan Area (CMA) would have a total population of 7.1 million including 4 million in Chennai City.

B. Strategies

1.2 The following strategies were proposed in the FMP for dispersal of the projected population and for the overall development of the Chennai Metropolitan Area.

i) To relieve congestion in the City through development of radial corridors linked to three satellite towns and six urban nodes; to decentralize the economic and industrial activities into urban nodes and satellite towns.

ii) To orient development projects towards raising the levels of income both at the State level and Metropolitan level.

iii) To take up large-scale industrialization, strengthening of service and light industries with medium range employment and increasing tertiary sector employment and to locate large-scale industries in the hinterland of CMA to satisfy the employment needs of the resident population.

iv) To optimize the use of existing infrastructure facilities and plan their expansion to meet the future needs by regulating land uses and building activities.

v) To take up the following projects for immediate implementation.

Roads:

a) Construction of the missing links of the IRR and construction of intermediate ring road and Outer Ring Roads (ORR).

b) Construction of three terminals for long distance buses and truck terminals on the radial corridors at their junction with the ORR.

c) Construction of new western express way connecting Anna Nagar with Avadi.

Railways:

a) Construction of the MRTS along the North-South Eastern corridor.

b) Introduction of electrified sub-urban train system on Madras-Thiruvallur and Madras-Minjur lines.

c) Construction of a combined railway terminal.

d) Construction of a circular railway.

vi) To decentralize the Central Business District (CBD) by shifting wholesale markets and transport terminals.

vii) To take up a massive housing programme by acquiring about 12,000 hectare (120 sq.km.) at urban nodes and satellite towns; most of the new housing by public agencies to be provided in the urban nodes;

viii) To take up detailed studies and programmes by meeting the future demand of water at 227 lpcd.

ix) To provide educational and health facilities at convenient locations to serve the different sections of the population.

x) To allocate lands for various uses in proper locations so as to promote orderliness and smooth functioning.

C. Review:

1.3 The extent to which the objectives and strategies of the First Master Plan were realized is discussed below:

Demography:

1.4 Population projected for 2001 for the City and CMA almost tallied with the actual as per Census 2001.Out of the three satellite towns and six urban nodes proposed, CMDA was involved fully in the development of Maraimalai Nagar New town and Manali urban node. Though population proposed for the 3 satellite towns (planning area) was one lakh each, the actual population that settled in these towns was 1.16 lakh at Thiruvallur, 0.55 lakh at Gummidipoondi and 0.5 lakh at Maraimalai Nagar. In respect of the urban node at Manali, 500 acres of land were acquired and developed as a residential township to accommodate a population of 70,000.

Industries:

1.5 A number of medium and small-scale industrial developments have come up in the areas zoned for industrial development at Madhavaram, Vyasarpadi, Kodungaiyur, Ambattur, Noombal, Pammal and Perungudi. Industrial estates at Villivakkam, Thirumazhisai and an exclusive one for women entrepreneurs near Avadi have been developed. Income studies have shown that the contribution of the tertiary sector has steadily increased.

Traffic and Transportation:

1.6 As regards traffic and transportation projects, MRTS has been completed from Chennai beach upto Velachery and the stretch between Thiruvanmiyur and Velachery will be put into operation shortly. The FMP estimated that the MRTS would considerably ease

the congestion in the City. But the patronage has been far below expectations. Poor accessibility, inadequate inter-modal transfer facilities, lack of coordination among different agencies and delay in providing the link to St. Thomas Mount are some of the issues that have to be addressed immediately. The Velachery- St Thomas Mount link has now been taken up. Electrification and optimization of suburban transport system in the western and northern corridors has been completed.

1.7 The level crossings at Tambaram, Sanatorium, Chromepet, Pallavaram, St. Thomas Mount, Saidapet, Nelson Manickam Road, Harrington Road, Gengu Reddy Road, and Ennore etc have been replaced by underpasses or overpasses with CMDA playing a coordinating role.

Roads:

1.8 A number of major roads such as Anna Salai, Periyar EVR Salai, Waltax Road, etc. were widened as proposed. Inner Ring Road was completed. Intermediate Ring Road was formed (except between NH-4 and NH-5); Outer Ring Road was delayed because of land acquisition since 1995.

Decongestion:

1.9 As part of decongestion measures the wholesale markets for perishables viz. flowers, fruits and vegetables have been shifted to Koyambedu, at the periphery of the City. Though the Iron and Steel market has been developed at Sathangadu, the activity could be shifted only partially because of unwillingness of the traders and other related issues. The Chennai Mofussil Bus Terminus has been developed along IRR at Koyambedu and the bus terminals from the Central Business District shifted. While the truck terminal at Madhavaram was completed, the terminals along GST Road and GWT Road could not be taken up for want of adequate land and problems associated with airport vicinity.

Housing:

1.10 TNHB has developed housing for about 52000 families while other public agencies have contributed about 25000 units; the TNSCB has constructed nearly 65000 tenements in Chennai. The private sector has played a major role in respect of HIG and MIG housing. 2001 Census has shown that there is no significant gap between number of households and housing units.

1.11 Government efforts since 1971 to improve slums and provide them with better housing has reduced drastically the number of slums in the City; several projects such as MUDP-I, MUDP-II, TNUDP etc. have been executed during the period to alleviate the problems of slum dwellers.

Water Supply and Sewerage:

1.12 After creation of CMWSSB a number of comprehensive studies to improve water supply and sewage system have been taken up and their recommendations implemented including augmentation of sources and improving efficiency in supply in Chennai City. However supply of 227 lpcd still remains a distant dream.

1.13 FMP anticipated the capacity of sewerage treatment units as1177.5 MLD by 2001.However the actual available capacity by that period was only 481 MLD. During the SMP the capacity of sewage treatment has to be augmented to meet the future demand.

Education and Health:

1.14 Remarkable achievements have been made in this sector because of Government's sustained action and considerable private initiative within the Metropolitan Area.

Recreation spaces**:**

1.15 The existing parks belonging to Chennai Corporation within the City have been improved; new spaces for parks have been created (though small in extent) when planning permissions for multi-storeyed buildings and special buildings from large extent of lands were issued. But in the case of layout developments, including TNHB developments, large spaces have been created and local bodies have taken them over under DCR. A number of stadia were renovated or newly constructed and the Sports Development Authority of Tamil Nadu is taking care of the need for specialised and higher order sports requirements.

Land use zoning**:**

1.16 Developments have generally occurred as per the Master Plan except for a few variations by way of commercial and institutional activities in residential / agricultural areas and the coming up of unapproved layouts in agricultural areas.

1.17 CMDA has been periodically reviewing the land use zoning part of the plan. When a large number of requests are received in a particular area, comprehensive reclassifications have been made not only for residential activities, but also for industrial activities, such as zoning of about 300 m on either side of Poonamallee By-pass Road, Rajiv Gandhi Salai, etc.

Development Regulations:

1.18 These regulations have served as a tool for regulating the developments in CMA. However in the last twenty years or so, there have been a number of unauthorized/ deviated developments taking advantage of the loopholes in the Tamilnadu Town and Country Planning Act, 1971 and the Local Bodies' Acts and poor enforcement. The Regularisation Schemes announced between 1999 and 2002 have not yielded the desired results.

1.19 As far as Chennai City area is concerned, Detailed Development Plan for 56 planning units have been prepared covering about 60% of the area, and the remaining area could not be covered for various reasons including the non-availability of micro level / subdivision level land data, ongoing resurveys by Revenue Department etc.

D. Conclusion:

1.20 The success of any plan depends on several factors: clear enunciation of objectives, setting of realistic physical targets, allocation of adequate financial and other resources, commitment of implementing departments and agencies, investment climate, private initiative and involvement, participation of stakeholders at every stage of planning and implementation, political will and public cooperation. Despite several constraints many of the objectives of FMP have been realized.

Chapter II

Demography

A. Growth of Population in CMA

Chennai has a long history since 1639. The Chennai City Corporation was constituted in 1798. The City extending over an area of 68 sq.km in 1901 had a population of 5.40 lakhs. Since 1941, it had grown rapidly and the growth of population in Chennai City and other local bodies within CMA is given in the Table below: -

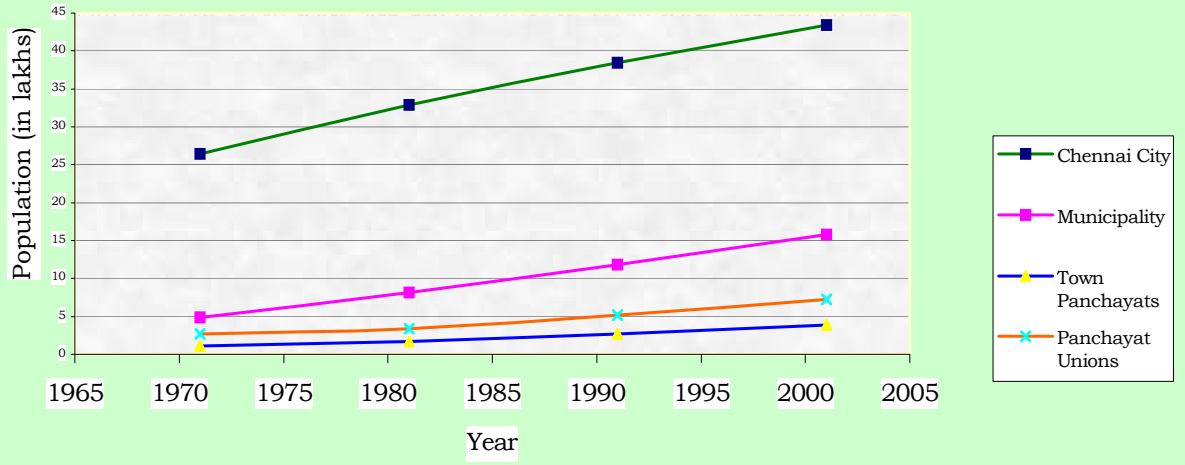
Table No. 2.1: Growth of Population in CMA

Sl. No.		Population (in lakhs)				Annual Rate of growth (%)			Area Sq. Km.	Gross Density per Ha. in 2001
		1971	1981	1991	2001	71-81	81-91	91-01		
1.	Chennai City	26.42	32.85	38.43	43.43	2.20	1.58	1.23	176	247
2.	Municipalities	4.84	8.14	11.84	15.81	5.24	3.80	2.91	240	66
3.	Town Panchayats	1.11	1.64	2.71	3.86	4.43	4.94	3.62	156	25
4.	Village Panchayats	2.67	3.38	5.20	7.31	2.40	4.38	3.58	617	12
5.	CMA Total	35.04	46.01	58.18	70.41	2.76	2.37	1.93	1189	59

Source: Census of India, and CMDA

2.2 The Municipalities and Town Panchayats have experienced higher growth rate than that of the City. The density pattern indicates that the City has the highest gross density of 247 persons/ha, whereas the average gross density in CMA is only 59 persons/ha. The gross density in most of the municipal areas and Town Panchayats is very low, indicating that these areas offer high potential for growth and would be the receiving residential nodes in future.

Fig.No. 2.1 Growth of Population in CMA 1971-2001



B. Birth & Death Rates

2.3. The registered birth rates in Chennai City in 1981 were 31.20 and varied from 38.6 to 24.06 during 1981-91 and have reduced to 22.62 in the year 2003. Similarly the death rate also reduced to a considerable extent from 9.20 in 1981 to 8.01 in 2003. The rate of natural increase declined from 22.00 in 1981 to 14.61 in 2003.

C. Migration

2.4. The cosmopolitan nature of Chennai is a result of its attractiveness to migrant groups from all over India. Migrants came not only predominantly from the surrounding Tamil and Telugu speaking areas, but also from southern and northern India. These migrant groups from other states have made their distinctive mark on the patterns of residential and social organisations within this Chennai Metropolis.

2.5. Chennai is a city of migrants like any other metropolitan city in India. According to 2001 Census, migrants to Chennai City from other parts of Tamil Nadu State constitute 74.5 %, and the table below shows a downward trend in the migration to the City from 37.24% in 1961 to 21.57% in 2001. Migrants from other parts of India constitute 23.8% and the remaining 1.71 % of the migrants is from other countries.

Table 2.2: Migration to Chennai City, 1961-2001 (in Lakhs)

Year	Total Population	Total migrants to the City from						Un- classified	Total migrants in lakhs	% of Total Migrants to total population
		Other parts of Tamil Nadu		Other parts of India (Excluding Tamilnadu)		Other Countries				
		No. in lakhs	%	No. in lakhs	%	No. in lakhs	%			
1961	17.29	4.47	69.45	1.71	26.60	0.25	3.90	--	6.44	37.24
1971	24.69	5.51	70.61	2.00	25.63	0.29	3.76	--	7.80	31.59
1981	32.84	7.19	71.28	2.55	25.31	0.34	3.41	--	10.08	30.70
1991	38.43	6.44	70.51	2.42	26.47	0.28	3.01	0.04	9.18	23.90
2001	43.44	6.98	74.49	2.23	23.80	0.16	1.71		9.37	21.57

Source: Census of India, 1961, 1971, 1981, 1991 & 2001 Social and Cultural Table

Fig.No. 2.2 MIGRATION TO CHENNAI CITY 1961- 2001

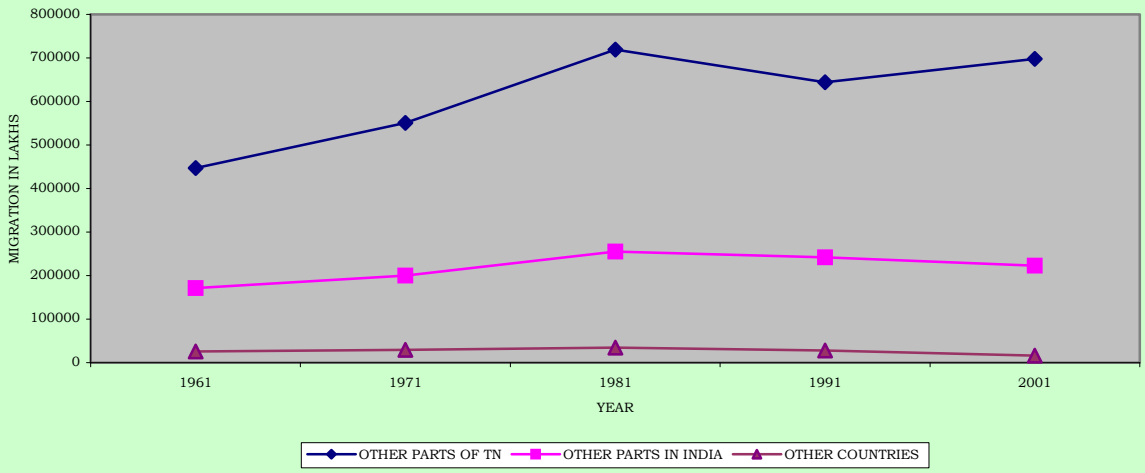


Table 2.3: Migration to Chennai Urban Agglomeration (CUA)* - 2001

Sl. No.	Place	Males	Female	Total	% to Total
1.	Total Migrants	8,55,103	7,53,196	16,08,299	
2.	Elsewhere in the district of enumeration	1,38,235	1,24,844	2,63,079	16.35
3.	Other Districts of the State	5,49,214	4,71,981	10,21,195	63.50
4.	Outside the State	1,55,431	1,45,307	3,00,738	18.70
5.	Outside India	25,360	22,360	23,287	1.45

Source: Census India, Tamilnadu Migration Tables-2001.

** CUA comprises Chennai City, 14 Municipalities, 20 Town Panchayats and 21 Village Panchayats around Chennai City as defined in the Census of India, 2001. Its extent is 633 sq.km.*

2.6. The composition of growth in Chennai City is given in the table below.

Table 2.4: Composition of Growth - Chennai City

1	Population in the reference year	32,84,622 (in 1981)	38,43,195 (in 1991)
2	Natural increase	6,40,370 (1981-91)	5,82,745 (1991-01)
3	In-migration	9,18,298 (1981-91)	9,37,111 (1991-01)
4	Jurisdiction change	- (1981-91)	- (1991-01)
5	Sum of (1) to (4) above	48,43,290	53,63,051
6	Population in the next reference year	38,43,195 (in 1991)	43,43,645 (in 2001)
7	Net increase in population	5,58,573 (1981-91)	5,00,450 (1991-01)
8	Out-Migration (arrived)	10,00,085 (1981-91)	10,19,406 (1991-01)

2.7. An interesting and important fact found is the out-migration from Chennai City to its suburbs and other areas. The population of the Chennai City in 1991 was 38.43 lakhs which include 9.18 lakh migrant population and natural increase of 6.40 lakh (for 1981-91) population; the net population increase works out to only 5.59 lakhs which shows that there was a net out-migration of 10 lakhs (30.4% of 1981 population) from City (during 1981-1991). Similarly, an out-migration of 10.19 lakhs (26.5% of the 1991 population) is noted during 1991-2001. Though there were large-scale building construction activities noted during the above periods, the out-migration of resident population from Chennai City proves that considerable conversion of residential premises into non-residential mostly for office, shopping, hotels and other commercial purposes took place; this trend will continue in this metropolis.

D. Sex Ratio

2.8. Sex ratio is denoted by number of females per 1000 males. The sex ratio in CMA increased from 936 in 1991 to 956 in 2001. The sex ratio in Chennai City and CMA are presented in Table below.

Table 2.5: Sex Ratio in Chennai City & CMA

Year	Chennai City	CMA	Urban TN
1961	901	909	992
1971	904	907	978
1981	934	927	977
1991	930	936	972
2001	957	956	987

Source: Census of India

E. Literacy

2.9. Census figures indicate that the literacy rates in Chennai City and the CMA are more or less equal and these figures compare favourably with the overall literacy rate in urban Tamil Nadu. The table below gives the comparative picture.

Table 2.6: Literacy Levels in CMA **in percentage**

	1961	1971	1981	1991	2001
City	59.47	62.01	68.68	72.54	76.81
CMA	54.82	58.64	66.56	70.32	76.09
Urban TN	21.06	30.92	40.43	51.33	73.51

Source: Census of India

F. Age Structure

2.10. Age structure of a population in a city / metropolis plays a major role in urban planning. It gives an idea about dependent population, working population, jobs to be created, the present and future requirements of educational, health and other facilities and amenities. It depends on birth rate, death rate and also migration. Age structure of population in CMA as per Census 1971 to 2001 is given in the table below:

Table 2.7: Age Structure in CMA in %

Age Group	1961	1971	1981	1991	2001
0-4	13.2	12.51	11.03	8.68	7.31
5-9	12.39	11.74	10.35	9.56	7.97
10-14	10.64	10.97	11.37	10.51	8.95
15-19	8.66	9.97	10.61	10.22	9.55
20-24	10.73	11.05	10.68	11.14	10.47
25-29	10.21	9.29	9.61	10.20	10.33
30-34	7.98	7.15	7.46	8.06	8.46
35-39	6.69	6.99	6.66	7.48	8.04
40-44	5.49	5.14	5.36	5.68	6.19
45-49	4.15	4.33	4.70	4.98	5.50
50-54	3.65	3.51	3.70	3.92	4.37
55-59	2.10	2.46	2.73	2.90	3.10
60-64	2.06	2.30	2.40	2.64	2.83
65-69	1.10	1.15	1.37	1.51	1.96
>70	1.20	1.65	1.97	2.33	3.02
not stated	0.00	0.00	0.00	0.18	1.93
Total	100.00	100.21	100.00	100.00	100.00

2.11. From the above, it may be seen that the proportion of primary school going children percentage has reduced from 12.39% in 1961 to 7.97% in 2001, and the proportion of secondary school going age group has also reduced from 10.64 in 1961 to 8.95 in 2001. But the proportion of old age group has increased from 4.36 to 7.81% in the said period.

G. Population Projection

2.12. Population projections have been carried out for CMA based on the past trends. The following assumptions have been made;

(i) The declining trend in the growth rate will continue in the future years also.

(ii) Past growth rates, existing density, potential for development, area available for development, accessibility to public transport system (especially the rail system), proximity to the employment generating centres etc. could be the basis for working out future projections and assignments.

2.13 It is estimated that CMA would house a population of 126 lakhs by 2026, of which Chennai City alone would account for 58 lakhs. The population projection of CMA is presented in Table below.

Table 2.8: Projected Population for CMA and Chennai City (In Lakhs)

Sl. No.	Description	Actual	Projection					Gross density Persons / hectare
		2001	2006	2011	2016	2021	2026	2026
1	Chennai City	43.44	46.28	49.50	52.39	55.40	58.56	333
2	Municipalities	15.81	18.52	21.75	25.60	30.20	35.69	149
3	Town Panchayats	3.86	4.73	5.89	7.41	9.45	12.22	78
4	Village Panchayats	7.31	8.70	10.59	12.96	15.99	19.88	32
5	CMA [total]	70.41	78.96	88.71	99.66	111.97	125.82	105

H. Strategies

2.14. In order to realize the vision of the Master Plan in making Chennai more livable and economically vibrant the following strategies are proposed in respect of this sector:

i) to increase overall density of the Chennai Metropolitan Area from the present 59 persons per hectare to 105 persons per hect.; while doing so the density of Chennai will increase from 247 persons per hect. in 2001 to 333 persons per hect. in 2026, while in the rest of CMA the average density will go up from the present 27 persons per hect. to 67 persons per hectare.

ii) to encourage high rise development along wider roads and larger plots; to allow multi-storeyed buildings in the rest of CMA also in order to have planned development with large open spaces on ground.

iii) to allow higher FSI along the MRTS influence areas for residential developments with smaller dwelling sizes.

iv) to consider extension of the Transfer of Development Rights concept for lands taken over for development to solve problems of land acquisition for housing and infrastructure.

v) to earmark adequate areas in the plan for employment generating activities.

vi) to provide better infrastructure facilities like roads, water supply, sewerage, etc. and provide better connectivity through rail and road transport network to the areas identified for development.

vii) to encourage development of Thiruvallur and Gummidipoondi as satellite towns as envisaged in the FMP by provision of adequate infrastructure like housing and other developments and providing better housing facilities at affordable cost; to develop new towns/ neighbourhoods near Tiruporur in the southern corridor along Rajiv Gandhi Salai and near Sriperumbudur, in the western corridor along GWT Road.

viii) to take up housing development near Mahindra Park SEZ either by provision of plots or by regulating layout development by private entrepreneurs.

ix) to encourage green building concept

x) to provide special facilities to take care of the needs of the elderly persons whose population is likely to go up, e.g. more old age homes, low-floor buses, special seats in buses, special seats in toilets and ramps in public buildings.

xi) to provide for preservation and conservation of ecologically sensitive areas in CMA and to create more parks and playgrounds for recreation purposes.

xii) to encourage social housing provision by private developers of large group developments / multi-storeyed developments through Development Regulations.

xiii) to encourage LIG housing by allowing additional FSI of 0.25 to private developers for such developments.

I The Plan

2.15 Action plans to achieve the strategies mentioned above have been indicated in the sectoral chapters especially economy, transportation, shelter, infrastructure, and environment in Volume I. Development Regulations detailed in Volume II provides for some of the strategies like Transfer of Development Rights, additional FSI for specific purposes and encouragement of green building concept.

Chapter - IV

Traffic and Transportation

A. Introduction

4.1 The need to take an integrated long term view of transport needs of CMA and to plan road development, public transport services and suburban rail transport as a part of the urban planning process have been well recognized as essential for the efficient functioning of the urban system.

4.2 The traffic and transportation schemes are presently implemented by several departments and agencies. While long-term planning and coordination is carried out by CMDA, individual schemes are executed by Southern Railway, National Highways Authority of India (NHAI), Department of Highways (DoH), Corporation of Chennai (CoC), and Metropolitan Transport Corporation (MTC). Traffic enforcement is done by Chennai Traffic Police (CTP).

4.3 While the urban rail network development is carried out by the Southern Railway, the major arterial & sub-arterial road corridors and other roads are developed and maintained by NHAI, DoH and the local bodies concerned respectively. The roads within the local body areas are improved and maintained by the Directorate of Municipal Administration, Directorate of Town Panchayats and Directorate of Rural Development through the local bodies concerned. As regards traffic management and enforcement, the same is looked after by the CTP in respect of Greater Chennai Area and District Police for the remaining CMA. The public bus transport is with MTC.

B. Existing situation

Road Network

4.4 The total length of road network in Chennai City is 2780 km. Chennai has radial and ring pattern of road network. Prime radial network comprises

(i) Anna Salai (NH45)
(ii) Periyar EVR Salai (NH4)
(iii) Chennai-Kolkotta Salai (NH5) and
(iv) Chennai-Thiruvallur Salai (NH205).

4.5 Other radial roads include Kamarajar salai, East Coast Road, Rajiv Gandhi Salai (OMR), NSK Salai (Arcot Road) and Thiruvottiyur High Road. Orbital road network implemented as per the First Master Plan comprises Jawaharlal Nehru Road (IRR) and Chennai By-pass Road. The orbital road network has improved the accessibility and reduced the congestion on the radial network particularly Anna Salai and Periyar EVR

Salai. Radial roads in and around Chennai Metropolitan Area (CMA) for a length of 250 km have also been improved.

Rail Network

4.6 Commuter rail system in CMA operated by Southern Railway essentially consists of the following 3 lines:

i. Chennai Beach - Tambaram, running south-west
ii. Chennai Central – Thiruvallur, running west and
iii. Chennai Central – Gummidipoondi, running north.

4.7 The first 2 lines have dedicated tracks for commuter trips. The 3rd line, however, caters to both suburban and inter-city passenger movement.

4.8 In addition phase I and phase II of MRTS are currently in operation traversing a length of more than 15 km covering the residential and IT corridor in the south-eastern part of the City.

Road Characteristics

4.9 Following problems mark the road network:

- Poor quality of riding surface
- Inadequate, shrunken and encroached footpaths
- Lack of properly designed intersections
- Poor lighting conditions
- Missing links in the road network
- Mismatch between the growth rate of vehicles and road supply. Increase in road space accounts only 3 to 4% of the total area while 425 vehicles are added to the City every day and
- Poor drainage system compounded by frequent cutting open of carriageways and footpaths for attending to utility / service lines repair thereby substantially reducing the effective availability of road space / footpath.

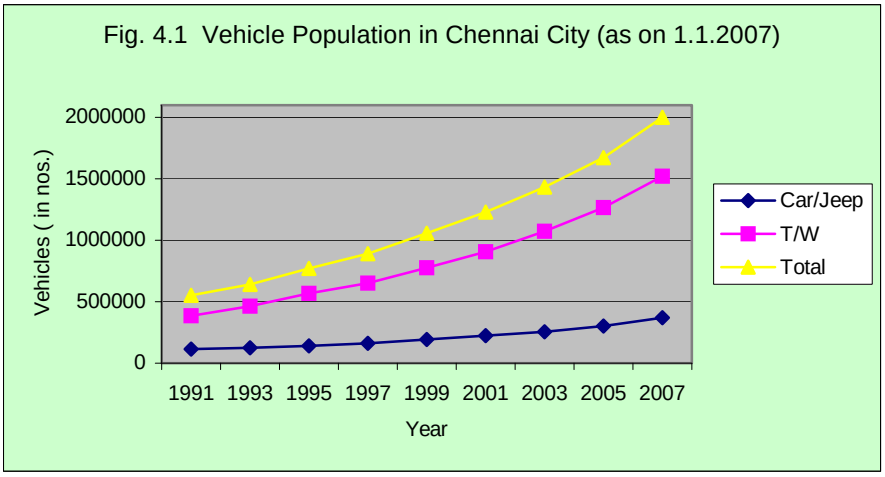
Rail Characteristics

4.10 (i) The capacity of Chennai Beach – Tambaram rail line is especially restricted by the presence of a number of road / rail level crossings. Both the Chennai Beach – Tambaram and the Chennai Central – Gummidipoondi rail corridors witness overcrowding of trains during peak hours.

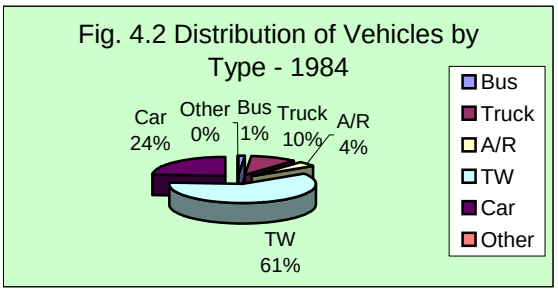
(ii) Despite development of the new rail corridor viz. MRTS, the patronage of the corridor has been below par. The same can be attributed to many factors which include lack of adequate access and circulation, under-development of inter-modal interchanges at the stations, higher rail fares and non-exploitation of the inter-operability of services among the four rail sectors.

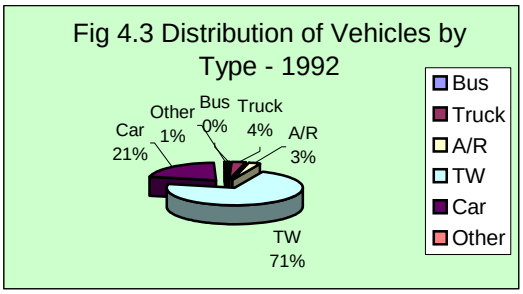
Trend of growth of vehicle population and its composition

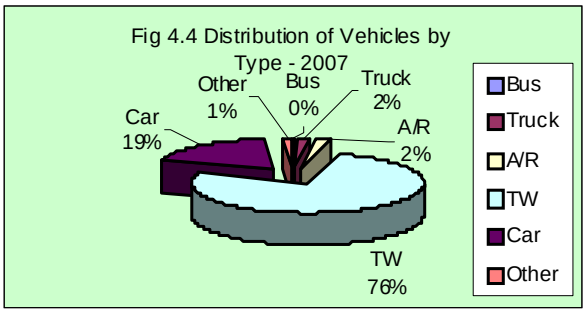
4.11 Motor vehicle population has increased at a phenomenal rate during the last few decades. Fig.4.1 presents the trend of growth of motor vehicle population in Chennai City. Composition of vehicle population for the period 1984, 1992 and 2007 is shown in Fig. 4.2, 4.3 & 4.4 respectively. Figures reveal that the number of buses remained almost stagnant while two wheelers experienced a remarkable increase from 87,000 (1984) to 15, 19,357 (2007).



Distribution of Vehicle type



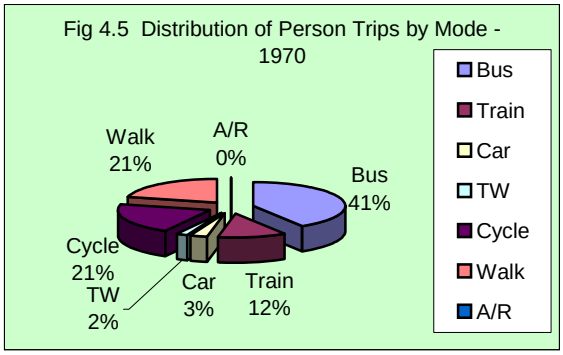


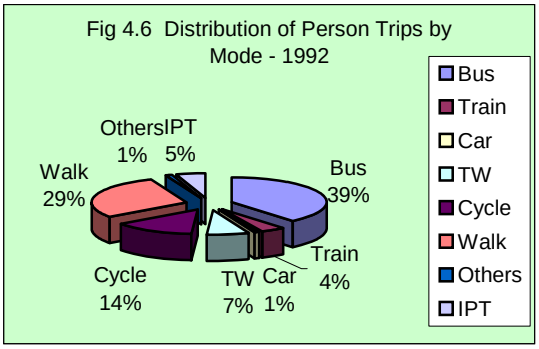


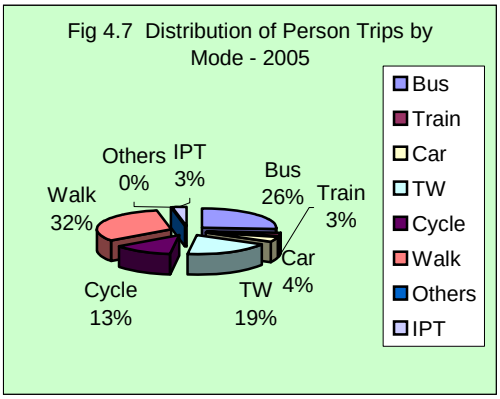
Travel Characteristics

4.12 Per Capital trip rate is 1.30 per day and trip rate per household is 5.88 per day, as per the CTTS (Comprehensive Traffic and Transportation Study of 1992-95). Total person trips performed in Chennai were about 7.45 m and 9.59 m trips during 1992 and 2005 respectively. Fig. 4.5, 4.6 & 4.7 present distribution of person trips by mode during

1970, 1992 and 2005. It could be observed that the share of public transport, cycle and IPT have declined over years. This dismal trend can be attributed to the increasing vehicular ownership, the stagnant growth of bus fleet and the unsafe rights-of-way for the cycles.







Traffic characteristics

4.13 Arterial roads leading to the CBD carry heavy traffic and are congested. Level of congestion on arterials and other major roads has increased seven-fold for the period 1984 to 2004. The average volume carried by Anna Salai during 2006 was about 1.58lakh PCU as against its capacity of 60,000 PCU per day.

4.14 The volume capacity (V/C) ratio on many links during peak hours was more than one. In CBD, the V/C ratio was more than 1.5 for most of the road links. Phenomenal growth of vehicles coupled with minimal increase in road space, has led to a low speed of 15 kmph in CBD and 20 kmph in other major roads. Provision of orbital roads such as IRR and Chennai By-pass (southern segment) has generally increased the speed on the radial roads.

Bus Transport

4.15 MTC with a fleet size of 2815 buses is operating along 551 routes. Almost invariably buses run with crush-load. The overcrowding is as high as 150%. The demand far outstrips supply leading to inhuman conditions of travel. This could be attributed to the inadequate fleet strength and poor frequency. MTC has extended its coverage up to 50

km beyond the CMA. During 2007, MTC has purchased about 500 new buses. It has also introduced a new service known as deluxe bus at a premium with an objective to encourage those who use personal modes to shift to bus transport.

Goods Transport

4.16 The number of goods vehicles in Chennai has increased from 6,671 in 1980 to 32,629 in 2005. According to a study by CMDA (1985) the main items of movement are manufactured goods (15.5%), building materials (9.9%), industrial raw materials (9.2%), perishables (9.1%) and parcels (8.5%).

4.17 The most important places of arrival and dispatch are George Town, Salt Cotaurs, Chennai Harbour, industrial estates at Guindy and Ambattur and the timber yards near Chromepet and Tambaram on NH-45 and the petroleum installations at Korukkupet and Manali.

4.18 At present the movement of goods vehicles is considered as a nuisance and hazard to other users and several restrictions are placed on their movement which evidently place an economic cost on the City.

4.19 CMDA had taken steps to shift some of the wholesale markets and create truck terminals on the periphery of the City. Of these Sathangadu steel market, Koyambedu perishables market and Madhavaram truck terminal have been made operational.

Traffic Management and Enforcement

4.20 The City faces severe problem of congestion due to runaway growth of personalised vehicles. The traffic management in the City is marked by introduction of a series of one-way traffic system. The one-way traffic system has, however, implications on pedestrian safety and fuel consumption. One-way traffic is generally desirable when there are complementary roads and the additional traveling distance is not more than 300m as per IRC. Hence whenever such systems are introduced, the interests of public transport modes and pedestrians are duly addressed.

4.21 Traffic control devices, traffic signs and road markings are not adequately maintained to retain their legibility and visibility. Inadequate enforcement of traffic rules, lack of road sense and restraint by road-users and insufficient regulatory measures characterise the present situation.

Parking

4.22 Demand for parking in the CBD is 2 times the supply. Acute shortage of parking supply is witnessed in commercial areas of Anna Salai, T. Nagar, Purasawalkam and Mylapore. Unauthorised and indiscriminate parking impedes free flow of traffic and causes accidents. Peak parking demand, as per a study in 2003, was 13,000 PCE as against the supply of 5,100 PCE. For example the supply in T. Nagar is 794 PCE against a demand of 2151 PCE and the supply in Parrys is 704 PCE against a demand of 4426 PCE. The haphazard parking has led to loss in the road capacity that ranges between15% to 60%.

Pollution due to Vehicular Emission

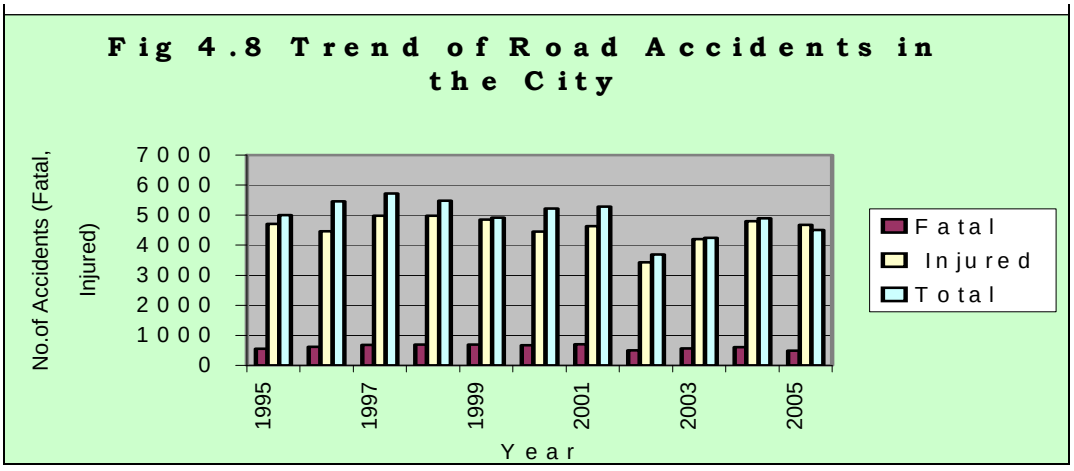
4.23 Pollution due to vehicular emission has done a lot of harm to the environment. Periodical monitoring conducted by the Tamil Nadu Pollution Control Board (TNPCB) revealed the following level of pollution:

Pollutant	***Load***	***Permissible level***
Carbon Monoxide (Co)	1908 to 4198 µg/m^3	2000 µg/m^3
Suspend particulate Matter (SPM)	264 TO 451 µg/m^3	200 µg/m^3

4.24 Another study carried out by TNPCB has also shown that the emission from nearly half the vehicles in the City exceeded the permissible limit.

Road Accidents

4.25 Accident data reveals that on an average about 620 persons die on City roads annually. Fig. 4.8 shows the trend of road accidents over the years. Fatality rate works out to 35/10,000 vehicles. Other sources of data indicate that 42% of road accidents involve pedestrians and 10% cyclists. Chennai Traffic Police (CTP) is responsible for reporting and investigation of road accidents.



Unified Metropolitan Transport Authority (UMTA)

4.26 The National Transportation Policy Committee (1980) recommended establishment of single transport authorities for Delhi, Mumbai, Calcutta and Chennai. In pursuance of this the Government of Tamil Nadu (GoTN) in June 1994 accepted in principle to form a Unified Metropolitan Transport Authority (UMTA) for Chennai. Based on the recommendations of a consultancy commissioned in 1995, GoTN have taken up with Govt. of India (GoI) for the setting up of the UMTA for Chennai.

4.27 The National Urban Transportation Policy approved by the GOI in April 2006 has also recommended creation of UMTA. Following various initiatives taken subsequently, the GoTN have decided in July 2007 to create the UMTA Orders since issued on 24-10-07.

C. Projected Travel Demand

4.28 The travel demands have been projected on the basis of increase in per capita trips. The per capita trip that was 1.44 in 2005 (*HHI Survey carried out as part of the DPR for the Chennai Metro Rail Project, DMRC, 2005)* has been projected to 1.6 by 2016 and 1.65 by 2026.

4.29 Three scenarios based on different modal splits between the road and rail system have been contemplated. These have been worked out gradually increasing the modal share of the public transport and also increasing the share of the rail transport within the public transport modes. The scenario selected for master planning has the following assumptions.

i) The modal split between public and private transport will change from 28:72 (2005) to 55:45 (2011) and 60:40 (2016), 65:35 (2021) and 70:30 (2026) in line with the trend in share of public transport increasing with city size.

ii) The sub modal split between bus and rail will have to change from 91:9 (2005) to 75:25 (2011) and 70.30 (2016), 65:35 (2021) and 60:40 (2026).

Table 4.1: Projected Daily Trips by Public Transport

		2004	2011	2016	2021	2026
1. Population in lakh		75.61	88.71	99.62	111.98	125.82
2. Daily per capita Trips		1.32	1.50	1.60	1.60	1.65
3. Total Daily Person Trips in lakh		99.81	133.07	159.39	179.17	207.60
Scenario 2 Modal Split %	Private	64.57	45	40	35	30
	Public	35.43	55	60	65	70
Total Daily Person Trips by Public Transport in lakh		35.36	73.19	95.64	116.46	145.32
	By Rail %	14.54	25	30	35	40
	By Road %	85.46	75	70	65	60
Daily Trips in lakh	By Rail	5.14	18.30	28.69	40.76	58.13
	By Road	30.22	54.89	68.95	75.70	87.19

Source: Short term study to update CTTS (1992-95)(CMDA, RITES & PTCS, 2004)

4.30 The total person trips in the CMA which was 9.59 m / day have been projected to 20.76 m / day in 2026. The number of trips carried by bus transport in 2005 would become nearly 3.5 times in the year 2026. Similarly the volume of passengers to be carried by rail transport will be nearly 24 times the present volume.

D. Policies and Strategies

4.31 To cope with the scale of the travel demand projected for the horizon year 2026, the policies and strategies proposed are as follows:

i) Moving people rather than vehicles

Redefining the role of both the rail and bus transits so that they move the bulk of the travel demand in the metropolis. The strategy includes within itself

- Augmenting the coverage and capacity of the rail and bus transits resulting in higher accessibility and mobility to the commuters
- Removing bottlenecks in the rail transit and bus transit networks i.e. replacing road / rail level crossings by underpasses / overpasses, providing flyovers at critical road intersections
- Priority for bus transit by reservation of lanes along major arterial roads and priority at traffic signals
- Making the transit system affordable to all segments of the commuting population by differential pricing commensurate with the level of service, at the same time reducing the gap between the cost of operation and the revenue and
- Running mini-buses between the railway y. stations and nearby bus transit corridors and between railway. stations and residential areas.

ii) Integrating land use and urban transportation

Recognising the strong interrelationship between land use and transportation, land uses can be planned matching transportation supply and vice versa. The strategy includes within itself

- Carrying forward the process of planning and developing a road and transport network based on comprehensive traffic and transportation studies, as done in the implementation of the First Master Plan
- Recognising the energy, economic and environmental advantages of densifying developments around transit nodes, restructuring the land use distribution and disposition accordingly
- Ascertaining the adequacy or otherwise of the road and transport supply vis-à-vis, the land use planning for the plan period by undertaking a comprehensive transportation study and
- Recognising the fact that there is a wide gap in the supply of 2nd and 3rd order roads in the Outer-CMA and that in the absence of which the primary road network gets

unduly congested, developing a road network plan with a grid of 2km x 2km so that development of these road grids is implemented by the respective local bodies.

iii) Priorities to non-motorised transport (NMT)

Appreciating the fact that the modal share of trips made by cyclists and pedestrians is more than 45%, allocating higher proportion of road space for them, if not an equitable one. The strategy includes within itself

- Footpaths are not less than 1.5m in residential streets and 3.0m on major roads with commercial activities
- Redeeming the existing footpaths from such encroachments as flag-posts, hoardings, hawkers, shops, places of worship, eat-outs, construction materials, parking of vehicles, PCOs, telephone boxes, electrical transformers / junction boxes, traffic umbrellas, waste bins, milk booths etc.
- As in the case of evicting the encroachments on water-bodies with stringent penal actions as provided for in the recent Ordinance, similar legal framework is proposed for evicting the encroachments on footpaths / roads
- Demarcating stretches of roads or areas exclusively for movement by pedestrians and cyclists and
- Providing safe passage of pedestrian / cyclists by sub-ways.

iv) Optimising the existing road and transport infrastructure

Keeping pace with the increasing mobility requirements, increasing the supply of road and transport infrastructure. The core of the strategy, apart from creating new additional infrastructure, includes within itself -

- Optimising the capacity of existing road network by widening critical road links and intersections
- Optimising the capacity of signalised road intersections by periodically recalibrating the signal cycle times to cope with the traffic volumes including deployment of Area Traffic Control (ATC) system
- Programming to widen all the roads to their prescribed street alignment width in a phased manner with a finite timeframe
- Articulating the road network by developing missing links
- Improving the throughput of a corridor as a whole by appropriate intersection treatment in a phased manner vis-à-vis improving intersections sporadically across the road network
- Introducing high occupancy vehicles (HOV) lanes along critical road corridors
- Commensurate with the development densities along the corridor(s) upgrading the same as multi-modal transit corridors
- Introducing additional sub-urban rail stations along existing rail corridors

- Quadrupling the existing sub-urban rail system
- Augmenting the rail network for commuting by shifting the inter-regional terminal from city core to the city fringe (e.g. shifting the long distance terminal from Egmore to Tambaram) and
- Increasing the length of trains (3 coaches to 6 coaches to 9 coaches).

v) Putting a parking policy in place

Recognising parking control as a powerful tool in combating traffic congestion, the strategy is to

- Give effect to the off-street parking norms arrived at for various landuses through a comprehensive parking study; these are binding on all including the enforcing authority namely Chennai Traffic Police
- Develop multi-level parking at major traffic generating locations with (or without) private participation
- Develop park-and-ride facility at all critical sub-urban / RTS / metro rail stations
- Develop park-and-ride facility at all critical bus terminals
- Enforce effectively accommodating visitors' parking within flats
- Launch a special drive by CPT to remove unauthorised on-street parking and in the case of certain critical commercial streets, ban on-street parking permanently after giving adequate notice to the commercial establishments to arrange to provide off-street parking on their own to their customers, recognising the fact that the roads are meant only for movement and not for parking
- Introduce the concept of community parking
- Use the underneath space of flyovers for parking
- Ban operation of tourist cars / vans / taxis / trucks / lorries / buses if the operators do not have parking of their own
- So price the parking as to improve the parking turnover and reduce the use of private modes
- Make land owning agencies viz. Corporation of Chennai etc. to readily part with their land for the construction of multilevel parking complexes and
- Review the adequacy of parking standards periodically say, once in 5 years to cope with the increasing vehicular growth.

vi) Redefining the role of para-transit

Recognising the gap in travel demand unserved by either the transit modes or private modes, redefining the role of para-transit as a viable modal choice. The strategy is to

- Encourage wider coverage and capacity by the para-transit comprising autos, share autos, taxis, call taxis, call autos, maxi-cabs and cycle rickshaws
- Provide parking for para-transit at critical rail stations / bus terminals / bus stops

- Encourage cycle-rickshaws to operate between residential areas and transit routes and
- Regulate the operation of para-transit by enforcing minimum safety norms.

vii) Segregating freight traffic from passenger traffic

The seaport activities of the City necessitate the freight traffic to flow to and from the CBD. With the expanding cargo movement and the general traffic flowing virtually all through the day without the distinction between peak and non-peak hours, the necessity to plan and develop exclusive and semi-exclusive freight corridors not only from economic considerations but also to minimise the conflicts between passenger and freight traffic. The strategy is to

- Plan and develop exclusive elevated corridors for freight traffic within the City core
- Plan and develop orbital roads in the form of urban bypasses to segregate inter-city traffic from intra-city traffic which essentially facilitate semi-exclusive freight movement
- Enhance the connectivity of seaports with National Highways and
- Plan and develop outstation truck terminals and parking.

viii) Deploying various travel demand management (TDM) measures

Recognising the fact that all the travel demand can not be satisfied by matching road and transport supply, the potentials of attacking the problem on the demand side itself rather than on the supply side merit consideration. The strategy is to

- Stagger the school opening times zone- wise
- Stagger the office opening times
- Stagger the holidays to markets sub-CBD- wise
- Encourage car-pooling and van-pooling
- Encourage the coverage and fleet size of share autos and maxi-cabs
- Allocate HOV lanes along major arterial roads
- Encourage new industrial complexes to provide quarters for their employees within their premises
- Decentralise major activities to reduce traffic
- Encourage tele-shopping and shopping through internet
- Deploy congestion pricing, hefty parking fees, permit system to own private vehicles, etc.

ix) Putting in place an environmental development management mechanism

To mitigate the negative impact of vehicular traffic on environment particularly air quality, it is necessary that various suitable measures are taken. The strategy is to

- Enlarge the segments of vehicular population converted to pollution free fuels viz. LPG / CNG / battery

- Strictly enforce the road users obtain EUC
- Establish an air quality monitoring system which maps the quality of air across the road network periodically
- Subject every major transport development measure to comply with environmental safeguards and
- Subject every major transport development measure to safety audit.

x) Setting up a unified institutional framework encompassing all modes

Recognising the positive synergies in setting up a single organisation to take care of all vehicular modes and to remove or minimise the redundancies in the number of departments / agencies presently looking after the various functions to plan, operate and regulate the different modes, creating a set up namely Unified Metropolitan Transport Authority (UMTA) for Chennai. The strategy is to

- Set up UMTA within a specified timeframe with coordinating, planning and advisory role initially but eventually graduating into a full-fledged regulatory and tariff fixing authority for all urban transport modes in CMA
- Take continued efforts to integrate bus and rail transport pending the formation of UMTA
- Mobilise additional resources for road development including collection of betterment levy provided for in the Tamil Nadu Highways Act
- Make private sector to participate not only in the development of urban transport infrastructure but also in the operation (e.g. bus transport, LRT, multilevel parking, toll plaza etc.) by employing such financing models as BOO, BOOT etc.
- Implement those options of development of urban transport infrastructure borne out of broad based public participatory approach and
- Establish a traffic database by capturing information on the traffic along road corridors by installing automatic traffic recorders.

xi) Enforcement as a potential tool for development

Unless the enforcement is incisive, the entire urban development planning exercise will not produce the desired results. The traffic could have been kept well under control if only the encroachments on road / footpaths and the unauthorised on-street parking have been ruthlessly removed by effective enforcement. The strategy is to

- Effectively keep all the roads, footpaths and designated off-street parking clear of encroachments both by the asset owning agencies and by the CTP by constant patrolling
- Organise campaigns and special drives to educate the road users to adhere to traffic discipline
- Delink driver training and licensing from the vehicle registration and licensing and

- Ensure training institutes catering to heavy vehicle drivers have driving simulators and audio visual presentation and evaluate drivers by written, oral and field tests.

xii) Promoting other transit options

Given the configuration of certain segments of the road network which can not lend themselves for development of metro rail or RTS, it is necessary to identify alternative transit solutions matching the profile of these segments of road network. The strategy is to

- Plan and develop mono-rail / LRT /ETB
- Plan and develop SKYBUS and
- Plan and develop hovercraft transport along seacoast.

xiii) Promoting innovative technologies / practices

The utility and capacity of urban transport infrastructure can be maximized by reinventing some of the (abandoned but) best practices or by deploying methods and techniques exploiting the advances in new technologies. The strategy is to

- Introduce the potential of information technology in the traffic management system viz. SCOOT / SCAT in area traffic control system, advanced passenger traveler information system etc.
- Make available the road metal recycling machinery (associated milling machine) to the contractors or include in the contract document use of the machinery mandatory to ensure that new road surface is laid without increasing the height of the pavement, considering the avoidable nuisances, caused by the constant raising of the road levels, to the properties on either side
- Construct half-elevated and half-below-road pedestrian sub-way which allows ease of crossing the road with the objective of improving the utility of pedestrian subways
- Adopt German type mobile flyover technology on pilot basis and extending the same based on its success
- Dewater vehicular sub-ways promptly during monsoon and use the same for rain water harvesting, Construct foot-over bridges / pedestrian sub-way connecting shopping complexes on either side in commercial centres
- Develop any road from the edges so that the reserve land is naturally protected as median
- Develop new roads with ducts for services / utilities
- Cement-concrete the existing road pavement particularly the road intersections and
- Take advance action to acquire land or tracts of land around major transit nodes / intersections so that these could be utilised not only for major junction improvement in future but also plan and develop organised urban (growth) centres exploiting the vantage location of these lands.

E. The Plan

4.32 The shelf of urban transport infrastructure projects, based on various studies, incorporated in the draft Master Plan II, has been publicly disclosed. The shelf of projects has subsequently undergone enlargement and fine-tuning not only in the light of the objections and suggestions received during the public consultative process and subsequently moderated by the Committee on Transport constituted specifically for the purpose but also in the light of the schemes proposed for implementation in the medium and long term by a high level committee comprising all the agencies concerned with the urban transportation. The broad shelf of urban transport infrastructure projects with rough cost estimates wherever readily available is indicated in the Annexure I & II.

4.33 A quick review of the shelf of projects, indicate that the targeted modal share of 70% by public transport is fairly realizable provided the metro rail network is implemented in full and the road network expanded by development of elevated highways. The total person trips by motorised vehicles constituted 54.5% of all person trips made in the CMA in 2005. The target of 70% of these trips by the public transport (i.e 38.15% of all person trips by motorised vehicles) by 2026 works out to 7.9m trips / day. With the implementation of 46km of Metro rail which would carry not less than 0.4m trips / day, the MRTS together with the sub-urban network 0.8m trips / day and the MTC with the expanded fleet size of not less than 6000 and a network of BRT carrying about 7.0m trips / day, the target is fairly achievable *(even though the rail transit is expected to carry as much as 6 m trips / day).* As for the remaining person trips by motorised vehicles (i.e 30% of all person trips by motorised vehicles) works out to 3.4m trips per day by 2026. Implementation of the network of elevated highways, the network of BRT and the series of debottlenecking measures viz. underpasses / overpasses, flyovers, etc proposed in the shelf would assist in coping with these many trips by private vehicles.

4.34 While every scheme in the shelf might merit consideration in its own right, it is necessary that the shelf is validated as a whole with a view to eliminate any redundancy. Further some schemes that prima facie qualify on a conceptual basis require detailed studies to establish their feasibility. The recently commissioned 18-month Comprehensive Transportation Study (CTS) would assist in validating the shelf of schemes. Implementation of every major scheme would, however, be preceded by a public interface and a detailed feasibility study to comply with the economic, environmental and social considerations.

F. Monitoring and Review

4.35 A committee to be known as " Traffic, Transportation, Road and Rail, Para Transport and Communication Committee" with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of

policies and strategies in this sector and to initiate such studies and assemble such information as needed for the purpose. This committee will meet at least once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

4.36 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Annexure I

List Of Medium – Term Transportation Schemes

Sl. No.	Project	Broad Cost (Rs. in crores)
A.	**Urban Rail Transit System**	
A1	Augmentation of rail network	
i)	MRTS extension from Velachery (about 5km)	600.00
ii)	3rd rail line from Beach to Korukkupet (4.1km)	55.23
iii)	3rd rail line from Korukkupet to Athipattu (18km)	70.56
iv)	Central- Egmore rail link (2.6km)	80.00
	Sub –total (A1)	805.79
A2	Road/Rail crossings - RoB/RuB	
i)	At Vyasarpadi on GNT Road	74.53
ii)	Villivakkam - Ambattur (11/31A - 12/1)	15.00
iii)	Tambaram - Vandalur (32/11-12)	15.00
iv)	Villivakkam - Ambattur (13/4 – 6)	15.00
v)	Ambattur - Avadi (17/34 - 18/2)	15.00
vi)	Pattabiram Military siding (1042 – 1043)	15.00
vii)	Avadi - Pattabiram East (23/12-14)	15.00
viii)	Tondiarpet - Tiruvottiyur (7/22-24)	15.00
ix)	Tambaram - Perungalathur (32/8-9)	15.00
x)	Vandalur - Oorapakkam (36/6-7)	15.00
xi)	On MKT Road @ Minjur Station (LC16)	15.00
xii)	Karunikar street	8.00
xiii)	Meenambakkam	10.00
xiv)	Vaishnav College @ Chrompet	2.70
	Sub -total (A2)	245.23
A3	Pedestrian facility @ Railway Stations	
	Escalators in sub-urban stations (30)	75.00
	Sub –total (A3)	75.00
	Total (A)	**1126.02**
B.	**Urban Bus Transit System**	
B1.	*Fleet augmentation*	
	Replacement of 500 to 600 buses / year & augmentation of 500 to 600 buses / year	733.00

Sl. No.	Project	Broad Cost (Rs. in crores)
	Sub –total (B1)	733.00
B2.	Depots and terminals	
i)	Construction of 26 new bus depots *(Kovalam,, Kelambakkam, Thaiyur, Semmancheri, Medavakkam, Agaramthen, Vandalur, Guduvancherry, Mudichur, Somangalam, Kundrathur, Mangadu, Noombal, Kamarajnagar, Kil Ayanambakkam, Chembarabakkam, Pudusathram, Thirunindravur, Pudur, Ayappakkam, Teachers' Colony (Kolathur), Alamathi, Padiyanallur, Karanodai, Madhavaram Milk Colony and Manali New Town)*	212.00
ii)	Construction of 11 new bus terminals *(Broadway, Anna Square, Sholinganallur, Tambaram East, Vandalur, Mangadu, Saligramam, Chembarabakkam, Thirunindravu, Ayapakkam and Kallikuppam)*	33.00
iii)	Renewal of existing depots and bus terminals (34)	100.00
iv)	Machinery & equipments for the new depots	50.00
	Sub – total (B2)	395.00
B3.	*Other operational infrastructure such as computerisation & networking, electronic route boards, electronic ticketing system, on-line GPS for vehicle tracking, PIS and IVRS system*	175.00
	Sub – total (B3)	175.00
B4.	*Bus Rapid Transit ways (Limited)*	
i)	Rajiv Gandhi Salai (OMR) (20km)	100.00
ii)	Taramani Link Road (5km)	25.00
iii)	MBI Road (15km)	75.00
iv)	Pallavaram Thorapakkam Road (15km)	75.00
v)	Sardar Patel Road (10km)	50.00
vi)	NSK Salai (Arcot Road) – KS Road (20km)	100.00
vii)	Mt. Poonamallee Road (15km)	75.00
	Sub -total (B4)	500.00
B5.	*Bus lay-byes & Shelters*	
i)	Construction of bus lay-byes and bus shelters (200 Nos.)	50.00
ii)	Bus stand improvement (Municipalities)	2.70
iii)	Bus stand improvement (TP)	0.75
iv)	Bus stand improvement (VP)	4.90
	Sub -total (B5)	58.35
	Total (B)	**1861.35**

Sl. No.	Project	Broad Cost (Rs. in crores)
C	**Development Of Road Network**	
C1	Elevated highways	
i)	From Light House to Besant Nagar across Adyar Estuary (10 km length) and on to ECR (along existing road links)	500.00
ii)	Along City Waterways (52.6km along existing links and 46.7km new construction)	2500.00
iii)	Along Jawaharlal Nehru Salai (IRR) from SIDCO Junction (km0/6) to Koyambedu Kaliamman Koil Street Junction (km8/1)	600.00
iv)	Along Arcot Road from Vadapalani up to Porur	300.00
v)	Along Thiruvottiyur High Road from Tollgate to Ernavur Bridge	250.00
vi)	Along Rajaji Salai from Parrys Corner to Tollgate @ Thiruvottiyur	350.00
vii)	Along Nungambakkam High Road, Valluvar Kottam High Road, Mc. Nichols Road, College Road and Haddows Road	300.00
viii)	Along G.S.T Road from Chennai Port to Tambaram	1,400.00
	Sub -total (C1)	6,200.00
C2	Development of Freight Corridors	
i)	Elevated Highway along the banks of River Cooum from Chennai Port to Maduravoyal	800.00
ii)	Truck terminal on GST Road @ Maraimalai Nagar	75.00
iii)	Truck terminal @ the intersection of ORR & 200' wide arterial road at Karunakkarancheri	500.00
	Truck parking at Manali	75.00
	Sub-total (C2)	1450.00
C3.1	*Major Flyovers*	
i)	@ Madhya Kailash junction	150.00
ii)	@ Thiruvanmiyur West Avenue x LB Road junction	30.00
iii)	On Anna Salai combining i) Blackers Road junction, ii) Dams Road x Thiru-Vi-Ka Road (General Patters Road) junction and iii) Binny's Road x Pattulos Road junction;	75.00
iv)	On Anna Salai combining i) Eldams Road x Theagaraya Road intersection, ii) Cenatoph Road junction, iii) Venkata Narayana Road x Chamiers Road intersection and iv) CIT I Main Road junction	82.00
v)	@ the junction of Anna Salai and Sardar Patel Road	22.00
vi)	On Periyar EVR Salai combining i) Nelson Manickam Road junction and ii) Anna Nagar III Avenue junction	60.00

Sl. No.	Project	Broad Cost (Rs. in crores)
vii)	@ the intersection of IRR x Anna Nagar II Avenue Road @ Thirumangalam	30.00
viii)	@ the intersection of IRR x Arcot Road @ Vadapalani	30.00
ix)	@ the intersection of GNT Road x Madhavaram High Road @ Moolakkadai	42.72
x)	@ the intersection of Mount-Poonamallee Road x KS Road x Kundrathur Road @ Porur	28.40
xi)	@ the junction of Taramani Link x M.B.I.Road @Vijayanagaram	60.00
xii)	@ the junction of M.P.road x Poonamallee Kundrathur Road @ Poonamallee Town.	60.00
xiii)	@ the junction of Mount Madipakkam Road x Pallavaram Thorapakkam Road	30.00
xiv)	@ the junction of Anderson Road Medavakkam Tank Road x Konnur High Rd	30.00
xv)	@ Anna Nagar Roundtana	30.00
xvi)	@ the junction of New Avadi Road x Kilpauk Garden Road	15.00
	Sub-total (C3.1)	775.12
C3.2	*Mini Flyovers*	
i)	At the intersection of Old Jail Road and Basin Bridge Road @ Mint jn.	20.00
ii)	On Dr. Ambedkar College Road @ Ganesapuram	15.00
	Sterling Rd. and College Road junction	20.00
	Dr. Gurusamy bridge Road and Periyar EVR Salai	20.00
	Sub-total (C3.2)	75.00
	Sub-total (C3)	850.12
C4	Widening of Bridges And Culverts	
	Widening of major bridges across rivers	
i)	Additional two lanes to Thiru-Vi-Ka Bridge across Adyar river	9.00
ii)	Construction of new bridge across Cooum river at Mogappair	5.00
iii)	Construction of new bridge across Ennore creek	20.00
iv)	Additional two lanes to the bridge on Sardar Patel Road across B'canal	1.00
v)	Construction of new bridge across Cooum river at Nolambur	5.00
vi)	Construction of new bridge across Cooum river along Karumariamman koil Road	5.00
	Sub -total (C4)	45.00

Sl. No.	Project	Broad Cost (Rs. in crores)
C5	New Link Roads	
i)	Tambaram Eastern Bypass (from MBI Road to GST Road) (9 km)	45.00
ii)	Puzhal to IRR (4 km)	20.00
iii)	Link Road between Thiru-Vi -Ka Bridge and Kotturpuram Bridge along southern bank of Adyar river and extending up to Marai Adigal bridge (4.4 km)	50.00
iv)	Link road between Madhaya Kailash and Muthuramlinga Thevar Salai along West Canal Bank Road (1.8 km) (elevated)	40.00
v)	Link from Kotturpuram – Gandhi Mandapam Road and West Canal Bank Road (utilising the approach road to Birla Planetarium and existing road behind CLRI) (1.16 km)	25.00
vi)	Link road along Ponni Amman Koil Street connecting Gandhi Mandapam Road and West Canal Bank Road (1 km)	30.00
vii)	Link road between Rajiv Gandhi Salai (OMR) and East Coast Road (Pallavan Kudiruppu to Prarthana Theatre) (3 km)	30.00
viii)	Link road between Rajiv Gandhi Salai (OMR) and East Coast Road at Palavakkam	30.00
ix)	Outer Ring Road from NH45 to TPP Road : 0/00 – 62/0 (62 km)	900.00
x)	Outer Ring Road from ECR to NH45	157.00
xi)	Outer Ring Road from Seemapuram to Ennore Port	93.40
xii)	Missing link of Outer Ring Road from MBI Road to Rajiv Gandhi Salai (OMR) through Jaladampettai (4km)	60.00
xiii)	Ambattur Estate to ORR (via Paruthipattu) (15 km)	150.00
xiv)	Bypass roads to Tirumazhisai & Tiruvallur towns (12 km)	180.00
xv)	Link road between New Avadi Road and Medavakkam Tank Road	5.00
xvi)	Mudichur Road to Darkas Road (2km)	4.00
xvii)	Velachery – Rajiv Gandhi Salai link Road (3.2km) (4 lane)	32.00
xviii)	Velachery - Kelambakkam Link Road –(8.6) (4 lane)	86.00
xix)	Darkas Road to Mudichur Road via TNHB Colony (1.2km)	1.44
xx)	Tambaram Sanatorium to ORR (5.5km) (4 lane)	55.00
	Sub-total (C5)	1993.84
C6.	Widening Strengthening and resurfacing of arterial, sub-arterial and collector roads to at least 4 lane width	
i)	in City (100 km)	100.00
ii)	in CMA (400 km)	1,600.00
iii)	Nesapakkam Road	14.00
iv)	Improving Bus Route Roads (300 km)	300.00

Sl. No.	Project	Broad Cost (Rs. in crores)
v)	Vadaperumbakkam Chettimedu Nayaru Road, km 0/0-24/0 (four lane)	150.00
vi)	The link road connecting Kaliamman koil street and NH4 through Nerkundram road to act as a parallel road to Jawaharlal Nehru Salai (IRR) behind the KWMC (km 0/0-2/4) (four lane)	47.00
vii)	Alandur Road (4 lane)	7.20
viii)	Velachery tank south bund Road (2km) (4 lane)	12.00
ix)	From Anna Salai (Alandur) to Station (3km)	18.00
x)	Medavakkam Main Road (0.9km)	5.40
xi)	Velachery Road (3km)	3.00
xii)	Mudichur Road from G.S.T. Road to ORR (5.8km)	34.80
xiii)	Choolaimedu High Road (four lane)	5.00
xiv)	Redhills road from Srinivasa Nagar to CTH Road	15.00
xv)	Thirunneermalai Road (1.5km)	10.50
xvi)	Kishkinta Road (2.7km)	1.69
xvii)	Agaram Road	15.00
	Sub-total (C6)	2,338.59
C7	Concreting of City Roads	
C7a	Concreting of City Roads (20km) I phase *(Cochrane Basin Road, Tondiarpet High road, Konnur High Road, Anna Nagar III & IV Avenue, MGR Salai, Ashok Nagar IV Avenue, Ashok Pillar Road, Anna Main road and Velachery Main Road)*	95.00
C7b	Concreting of City roads II Phase *(i) Kamarajar Salai & Santhome High Road : km 2/7-7/5 (4.8km) @ Rs.20.00cr; ii) Nungambakkam High Road (1.4 km) @ Rs.5.00cr; iii) Dr.Radhakrishna Road & Cathedral Road (3.3 km) @ Rs.17.00cr; iv) College Road & Haddows Road (1.5 km) @ Rs.5.00cr; v) Rajaji Salai (2.5 km) @ Rs.10.00cr; vi) Lattice Bridge Road (3.5 km) @ Rs.14.00cr; vii) Venkatnarayana Road & North Usman Road (3 km) @ 12.00cr; viii) Muthuramalinga Thevar Salai (Chamiers Road & Greenways Road) (3 km) @ Rs.13.00cr; ix) Purasawakkam High Road (1.5 km) @ Rs.13.00cr and x) Millers Road, Gangadeeswar Koil st. & Alagappa Road (1.5 km) @ Rs.10.00cr)*	118.00
C7c	Concreting of Major roads *(i) G.S.T road to 0/0 – 28/0 (28 km) @ Rs.150.00cr and ii) G.N.T.Road (Walltax Road) 0/8-3/2 (2.5 km) @ Rs.10.00cr)*	20.00
	Sub-total (C7)	233.00
C8	*Iimprovements with white-topping and landscaping @* ***25 junctions*** *@ Rs.3.00cr each* *(Jawaharlal Nehru Salai (IRR) @ its jn. near SIDCO, its jn. with Pillayar Koil st. near Kasi Theatre, its jn. with Udhayam theatre, its*	75.00

Sl. No.	Project	Broad Cost (Rs. in crores)
	jn. @ Ashok Pillar, its jn. with Ambedkar road, its jn. with P.T. Rajan Salai,its jn. with Anna Nedum Pathai, its jn. with Periyar Pathai, its jn. @ Vinayagapuram,its jn. with Kaliamman Koil St.,its jn. with Anna Nagar II Avenue,its jn. @ Thirumangalam and its jn. with School Road;Adyar jn.;Thiruvnmiyur jn.;TTK Road & Dr. Radhakrishnan Salai jn.;Turnbulls Road jn.;Canal Bank Road & Mandhaveli jn.;Parrys Corner & Rajaji Salai jn.;Kellys jn;.Purasavakkam High Road & Millers Road jn.;Kilpauk Garden Road & Anna Nagar I Avenue @ Chinthamani; Anna Nagar Roundtana;Konnur High road & Medavakkam Tank road jn.; and Perambur High Road & Lucas Road jn.)	
	Sub-total (C8)	75.00
C9	*Utility Duct and Storm Water Drains along Major Roads*	
i)	City Roads (500 km)	700.00
ii)	NH (urban) & Jawaharlal Nehru Salai (IRR) (70 km)	90.00
	Sub-total (C9)	790.00
C10	*Road works including bridges/culverts / concreting / black-topping in Municipalities, Town Panchayats and Village Panchayats in outer -CMA*	
i)	Road works including bridges/culverts in 16 Municipalities in outer CMA *(**Ambattu**r : 933 works : 270.7 km @ Rs.151.17cr;**Avadi** : 506 works : 475.68 km @ Rs.79.24cr; **Kathivakkam** : 142 works : 37.77 km @ Rs.5.12cr; **Madhavaram** : 1288 works : 328.40 km @ Rs.66.05cr; **Thiruvottiyur** : 689 works : 482 km @ Rs.105.20cr**;** **Alandur** : 848 works : 187.19 km @ Rs.39.71cr; **Pallavapuram** : 1396 works : 374 km @ Rs.83.74cr; **Tambaram** : 187 works : 178.25 km @ Rs.43.87cr; **Anakaputhur** - 153 works - 56.57 km @ Rs.8.26cr; **Pammal** : 626 works : 121.6 km @ Rs.15.80cr; **Puzhuthivakkam** : 398 works : 120.94 km @ Rs.22.92cr; **Madhuravoyal** - 321 works - 102.72 km @ Rs.15.95cr; **Poonamallee** : 256 works : 105.01 km @ Rs.10.39cr; **Thiruverkadu** : 150 works : 91 km @ Rs.11.93cr; **Valasaravakkam** : 115 works : 82.22 km @ Rs.12.54cr; and **Manali** : 90 works : 26.50 km @ Rs.3.26cr)*	675.15
ii)	Concreting of roads in the above 16 Municipalities in outer CMA *(939 works : 170.52 km)*	22.69
iii)	Black-topping of roads in the above 16 Municipalities in outer CMA *(1637 works : 438.45 km)*	38.61
iv)	Road works(including bridges/culverts / concreting / black-topping) in Town Panchayats in outer CMA	61.30
v)	Road works(including bridges/culverts / concreting / black-topping) in Village Panchayats in outer CMA	145.10
	Sub -total (C10)	942.85
	Total (C)	**14918.40**

Sl. No.	Project	Broad Cost (Rs. in crores)
D	**Pedestrian Facilities**	
D1	Subways	
i)	Along **Anna Salai** @ the following 6 locations @ Rs.3cr each: a) GP Road junction b) Nandanam Chamiers Road junction c) Thodhunter Nagar d) Saidapet Bazaar Road junction e) Little Mount A.G. Church f) TNPL Office	18.00
ii)	Along **GST Road** @ the following 2 locations @ Rs.3cr each: a) M.K.N. Road junction b) Chrompet	6.00
iii)	Along **Periyar EVR Salai** @ the following 6 locations @ Rs.3cr each: a) Dasaprakash b) Pachaiappas College c) Aminjikarai Market d) Anna Arch e) N.S.K. Nagar junction f) Vaishanava College	18.00
iv)	Along **Jawaharlal Nehru Salai (IRR)** @ the following 7 locations @ Rs.3cr each: a)Ekkattuthangal b)14th Avenue junction c) Ashok Pillar d) Arcot Road junction e) C.M.B.T. f) Kaliamman Koil junction g) Thirumangalam	21.00
v)	Along **other major roads**@the following 13 locations @Rs.3cr each: a) Nungambakkam High Road @ IOC junction b) Dr.Radhakrishnan Salai @ Q.M.C. c) Sardar Patel Road @ Anna University d) Sardar Patel Road @ C.L.R.I. e) Kamarajar Salai @ PWD Complex f) Kamaraj Salai near Light House g) College Road @ Meteorological Office h) Thiruvanmiyur ECR - Marundeeswarar koil point i) N.S.K. Salai - Vadapalani Depot j) N.S.K. Salai - Meenakshi College k) Porur - M.P. Road junction l) Greenways Road @ Sathya Studio m) Thiruvanmiyur - LB Road junction n) Valasaravakkam - Arcot Road junction o) Old Jail Road opp. Stanley Hospital p) GNT Road opp. Puzhal Central Prisons	48.00
	Sub-total (D1)	111.00

Sl. No.	Project	Broad Cost (Rs. in crores)
D2	Escalators	
	Providing escalators at 20 FoB / Sub-way locations	50.00
	Sub-total (D2)	50.00
D3	Footpaths	
i)	Along Arcot Salai	10.00
ii)	Along Mt.Poonamallee Road	28.00
iii)	Along Kundrathur Road	10.00
	Sub-total (D3)	48.00
	Total (D)	**209.00**
E.	**Multi -Level Car Parking**	
i)	At Panagal Park, T.Nagar *(8 floors catering to 361 cars & 290 TW)*	15.89
ii)	Broadway Bus Stand *(7 floors catering to 69 buses, 369 cars & 310 TW)*	14.80
iii)	MUC ground *(5 floors catering to 576 cars & 178 TW)*	28.88
iv)	Govt. Estate Anna Salai *(6 floors catering to 426 cars)*	11.17
v)	Adyar (Gandhi Nagar) bus terminal *(1 floor catering to 100 cars & 105 TW)*	5.62
vi)	T.Nagar bus terminal *(5 floors catering to 36 buses & 472 cars)*	16.62
	Total (E)	**92.98**
F	**Expansion Of Port Activities**	
i)	Additional facilities at Chennai port under National Maritime Development Project *(including reception facilities for ICD containers, multi-level car-parking facility, 2nd container terminal, desalination project of 3000MT/ day, ship repair facility and port connectivity-bridging gap)*	**418.00**
ii)	Expansion of the Ennore Port through EPL *(including tankage terminals, 1000 MW power plant, Ennore Special Economic Zone, 2000 MW power plant, container terminal, LNG terminal, LNG Regassification facilities and power plant, POSCO Steel - steel plant)*	**6500.00**
	TOTAL (F)	**26918.00**
G	**Expansion Of Airport Activities**	
	Expansion of existing airport	**2000.00**
	Development of Greenfield airport	
	TOTAL(G)	**2000.00**

Sl. No.	Project	Broad Cost (Rs. in crores)
H	**Creating Traffic Data Base For City**	
	Installation of automatic traffic recorders at 15 locations	**10.00**
	TOTAL (H)	**10.00**
I	**Air Quality Monitoring System**	
	Establishment of air quality monitoring system for the City	1.00
	Total (I)	**1.00**
	Grand Total	**47811.90**

- *Costs are not readily available*

Annexure II

The List of Long – Term Urban Transportation Schemes

Sl. No.	Project	Broad Cost (Rs. in crores)
A.	**Urban Rail Transit System**	
A1	Augmentation of rail network	
i)	Metro rail (46.5 km including14km UG)	9032.00
ii)	4th rail line from Beach to Athipattu (22.1km)	50.23
iii)	Extension of MRTS from Thiruvanmiyur to Mammallapuram	4000.00
iv)	Avadi -Sriperumbudur -Kancheepuram new link	355.00
v)	Saidapet -Sriperumbudur - Kancheepuram new link (partly elevated)	2500.00
vi)	Athipattu -Puthur & Link line from Periyapalayam to Tiruvallur	635.00
vii)	2nd line from Chengalpattu to Arakkonam (60 km)	150.00
viii)	3rd & 4th line from Tambaram to Chengalpattu (30 km)	150.00
ix)	5th & 6th line from Chennai to Avadi	300.00
x)	4th line from Tiruvallur to Arakkonam (30 km)	80.00
xi)	3rd & 4th line from Athipattu to Gummidipoondi (25 km)	120.00
xii)	Dedicating 4 lines for commuter service between Egmore and Tambaram consequent to development of Tambaram Railway Station as coaching terminal	*
xiii)	Additional metro rail from Foreshore Estate-Mylapore-T.Nagar-Vadapalani-Porur	*
xiv)	Rail line from Sriperumbudur and Chengalpattu via Oragadam	*
xv)	Rail line from Kelambakkam to Vandalur	*
xvi)	Rail line from St. Thomas Mt. to Porur	*
xvii)	Circular rail line from Chennai Beach to Chennai Beach via Tambaram, Chengalpattu, Kancheepuram and Arakkonam	*
	Sub-total (A1)	17372.23
A2	*Road/Rail crossings - RoB/RuB*	
	A new RoB between Wimco Nagar and Ennore railway stations	25.00
	Sub-total (A2)	25.00
A3	*Inter-City Rail Terminals*	*
i)	Augmentation of passenger terminal facilities at Chennai Central and Tambaram stations	300.00
ii)	Developing rail terminals at MM Nagar, Thiruvallur and Gummidipoondi	*
iii)	New coaching terminal at Thirumazhisai	*
iv)	Royapuram Railway Station as coaching terminal	*
v)	Tambaram Railway Station as coaching terminal	*

Sl. No.	Project	Broad Cost (Rs. in crores)
vi)	Villivakkam Railway Station as Coaching Terminal	*
	Sub-total (A3)	300.00
A4	*Pedestrian facility @ Railway Stations*	
i)	Pedestrian subway at Nungambakkam	2.0
ii)	Pedestrian subway at Kodambakkam	2.0
iii)	Escalators in sub-urban stations (30)	75.00
	Sub-total (A4)	79.00
A5	*Commercial exploitation of vantage rail stations*	
i)	RTS Stations (9)*(Mandaveli, Greenways Road, Kottur, Kasthurba Nagar, Indira Nagar, Thiruvanmiyur, Taramani , Perungudi &Velachery)*	50.00
ii)	Sub-urban stations (15)	75.00
	Sub-total (A5)	125.00
	Total (A)	**17901.23**
B.	**Urban Bus Transit System**	
B1	*Bus Rapid Transit-ways (Full-fledged)*	
i)	Anna Salai (30km)	300.00
ii)	Periyar EVR Salai (25km)	250.00
iii)	Jawaharlal Nehru Salai (IRR) (45km)	450.00
iv)	GNT Road (20km)	200.00
v)	CTH Road (15km)	150.00
vi)	Chennai Bypass (20km)	200.00
vii)	Outer Ring Road (ORR) (62km)	620.00
viii)	CMBT to Sriperumbudhur (25km)	300.00
	Sub-total (B1)	2470.00
B2	*Inter-City Outstation Bus Terminals*	
	Terminals at the 4 intersections of ORR with NHs	800.00
	Sub-total (B2)	800.00
	Total (B)	**3270.00**
C	**Mono-Rail / LRt**	
i)	Dams Road jn.-Royapettah-Mylapore-Adyar-Guindy (Halda jn.)	480.00
ii)	Kalangaraivilakkam RTS Staion- Anna flyover-Kilpauk-Perambur	1000.00
	Total (C)	**1480.00**
D	**Development Of Freight Corridors**	
i)	Road connecting Ennore Port (northern gate) and NH5 @ Thatchur	100.68
ii)	Road connecting Ennore Port (northern gate) and TPP Road @ Vallur	142.98

Sl. No.	Project	Broad Cost (Rs. in crores)
iii)	Developing an exclusive road along Beach connecting Ennore Port and Chennai Port for container traffic	1500.00
iv)	Truck terminal @ the intersection of ORR & GST Road	750.00
v)	Truck terminal @ the intersection of ORR & GWT Road	750.00
vi)	Truck terminal @ the intersection of ORR & GNT Road	750.00
	Total (D)	**3993.66**
E	**Development Of Road Network**	
E1	*Elevated highways*	
i)	Along Anna Salai	750.00
ii)	Along EVR Salai	600.00
iii)	Along Kamarajar Salai	480.00
iv)	Along Rajiv Gandhi Salai	900.00
v)	Along Arcot Road	360.00
vi)	Aminjikarai to Sterling Road	225.00
vii)	Along Kathivakkam High Road	600.00
viii)	Along Thiruvottiyur High Road from Monroe statue to Manali	600.00
ix)	Along NH45 from Kathipara to Tambaram	1350.00
	Sub-total (E1)	5865.00
E2	*Grade - Separators*	
i)	@ Sothupakkam Road x Chennai bypass	30.00
ii)	@ NH4 x Thirumazhisai Road	30.00
iii)	@ Vadakarai – Madhavaram Road x Naravarikuppan Town Panchayat limits.	30.00
	Sub-total (E2)	90.00
E3	*Widening Strengthening and resurfacing of arterial, sub-arterial and collector roads*	
i)	CTH Road from Avadi to Thiruvallur as a 6-lane expressway	200.00
ii)	Approach road from Rajiv Gandhi Salai to Nookampalayam Road from 10m to 30.5m	90.00
iii)	Navalur-Thalambur-Siruseri Medavakkam Road	200.00
iv)	Existing 50' approach road connecting the Global Hospitals to the Medavakkam-Sholinganallur Road (Perumbakkam)	7.00
v)	Strengthening and improving the network of radial roads of 250km length *(improved during 1998-2000)*	200.00
	Sub-total (E3)	697.00
E4	*New Link Roads*	
i)	Network of secondary roads to supplement the ORR	*
ii)	Link from Tambaram to NH -4 (Sunguvarchattram) (24km)	250.00
iii)	Walajabadh Road – Sriperambudur Link Road (10.2km) (4lane)	102.00

Sl. No.	Project	Broad Cost (Rs. in crores)
iv)	Providing an east-west link connecting the RoB near Ambattur Rly.and IRR near Villivakkam station, north of the Central-Arakkonam Rail line	150.00
v)	Link connecting Sadayankuppam Road to Ennore Expressway	75.00
vi)	An approach road on Alamathi Road to Red Hills-Tiruvallur main road	25.00
vii)	Link connecting Vanagaram-Ambattur Road and Porur through Chettiaragaram	25.00
viii)	Link connecting Ambattur-Red Hills Road and IRR by widening and strengthening the Water Canal Road from Madanamkuppam	25.00
ix)	Integrating inter-and intra-regional road network just outside CMA	*
	Sub-total (E4)	652.00
	Total (E)	**7304.00**
F	**Pedestrian Facilities**	
F1	*Escalators*	
	@ 20 FoB / Sub-way locations	50.00
	Sub-total (F1)	50.00
F2	*Elevated walkway*	
	Along the median of roads and pathways on the bank of River Cooum and linking them to provide access to railway stations, bus stops and parking areas	*
	Total (F)	**50.00**
G	**Development Of Waterway Transport**	
i)	Developing the waterways in CMA as inland transport corridors	*
ii)	Exploring the operation of hovercraft along the seacoast	*
	Total (G)	*
	Grand Total	**33998.89**

** Costs are not readily available*

List Of Roads Requiring Advance Action to Acquire Land to Maintain the Street Alignment Prescribed in the Second Master Plan

(Within 10 years, the land frozen as street alignment shall be made available for the road widening purpose either by compulsory acquisition or by operating Transfer of Development Rights (TDR) tool.)

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
A	***ROADS OWNED BY CoC***			
1	M.S.Koil Street,* Suriyanarayana Road *	Ebrahim Sahib Street	City Limits	30.5

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
2	Thambu St (Royapuram)	East Kalmanda-pam Road	Sheik Mastry St.	10.0
3	Kathivakkam High Road *	Cochrane Basin Road	City Limits	30.5
4	Moolakkadai-Thondiarpet Road	G.N.T. Road	B'canal	27.0
5	Kodungaiyur – Chinna sekkadu Road (New Link)	Moolakkadai-Thondiarpet Road	City Limits	18.0
6	Erukkancherry High Road (GNT Road)	Basin Bridge Road	City Limits	27.0
7	Madhavaram High Road	Melpatti Ponnappa Street	GNT Road	24.0
8	Paper Mills Road	Siruvallur Road Junction at Perambur High Road	City Limits	18.0
9	Konnur High Road	Medavakkam Tank Road	Its junction with New Avadi Road	30.5
10	C.T.H. Road	New Avadi Road	Jawaharlal Nehru Salai (IRR) (City Limits)	30.5
11	New Avadi Road	Kilpauk Water works	Its junction with Konnur High Road	30.5
12	New Link Road *	New Avadi Road	Medavakkam Tank Road	24.0
13	New Avadi Road	Periyar EVR Salai	Kilpauk Water works	18.0
14	Kilpauk Garden Road	Taylors Road	Anna Nagar 1st Main Road	18.0
15	Thiru Narayana Guru Road (Hunters Road & Choolai High Road)	Perambur Barracks Road	Sydenhams Road (Rajamuthiah Road)	24.0
16	Periyar EVR Salai	Mc.Nichols Road	City Limits	30.5
17	Nelson Manickam Road	Periyar EVR Salai	Tank Bund Road	18.0
18	Tank Bund Road	Nelson Manickam Road (junction of Sterling Road)	Valluvar Kottam	18.0
19	Village Road (Valluvar Kottam Road)	Kodambakkam High Road	Nungambakkam High Road	27.0
20	Uthamar Gandhi Salai (Nungambakkam High Road)	Anna Salai	Sterling Road	27.0
21	Greams Road *	Anna Salai	Pantheon Road	18.0

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
22	Ethiraj Salai (Commander-in-Chief Road)	Pantheon Road	Cooum River	18.0
23	Dr.Radhakrishnan Salai (Cathedral Road) *	Anna Salai	Music Academy	30.5
24	Eldams Road *	Anna Salai	TTK Road	18.0
25	TTK Road	Chamiers Road Junction	Alwarpet Junction	18.0
26	Pasumpon Muthu Ramalinga Thevar Road (Greenways Road)	Durgabai Deshmuk Road	MRTS alignment	30.5
27	Sardar Patel Road	Anna Salai	Madya Kailash (I.T. Expressway)	30.5
28	Dr.Muthulakshmi Salai (L.B.Road)	M.G. Road	City Limits	30.5
29	West Avenue Road	L.B. Road	East Coast Road (MTC terminus)	24.0
30	East Coast Road	West Avenue Road (MTC Terminus)	City Limits	30.5
31	Taramani Road	Vijayanagar Junction	L.B. Road Junction	45.0
32	Perungudi Station Road (New link)	Taramani Road	Perungudi Station	18.0
33	Velachery Road	Vijayanagar Junction	City Limits	45.0
34	Velachery Byepass Road	Velachery Road Junction	Vijayanagar Junction	45.0
35	Velachery Road *	Sardar Patel Road	Byepass Junction	45.0
36	Nandambakkam – Nesapakkam Road (Lake View Road and its extension Kanu Nagar Main Road)	Anna Road Junction near CMWSSB Plant	Adayar River (City Limits)	18.0
37	Ramapuram – Neasppakkam Road (Kamarajar Salai)	Nandambakkam – Nesapakkam Road	City Limits	18.0
38	Vanniar Street	Rajamannar Salai	Arcot Road	18.0
39	Arcot Road	Railway line	City limit	30.5
40	Nesapakkam Road	Arcot Road	Reddy Street	24.0
41	Nesapakkam Road	Reddy Street	CMWSSB Sewage Farm (southern end)	24.0
42	Nesapakkam Road	CMWSSB Sewage Farm (southern end)	Jawaharlal Nehru Salai (IRR)	27.0

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
B	***ROAD OWNED BY DoH***			
1	Ennore Expressway	City Limits	Kathivakkam High Road junction near Ennore creek	45.0
2	Thiruvottiyur High Road	City Limits	Manali Expressway	27.0
3	Manali Expressway	TPP Road	Ennore Expressway	61.0
4	Vallur-Edayanchavadi Road	Edayanchavadi – Athipattu Road	TPP Road	18.0
5	TPP Road	Kamaraj Salai junction (near Organic Chemicals)	CMA Limits	30.5
6	Kattur Road	TPP Road	CMA Limits	30.5
7	Kathivakkam High Road – Basin Road - Manali Road	City Limits	Kamaraj Salai junction (near Organic Chemicals)	30.5
8	Kodungaiyur – Chinnasekkadu Road (New Link)	City Limits	Kamaraj Salai	18.0
9	Vichoor – Vilangadupakkam Road	Nayaru – Vichoor Road	Vadaperumbakkam - Perungavur Road	18.0
10	Kadapakkam - Vichoor – Nayaru Road	TPP Road	Nayaru Junction	18.0
11	Karanodai –Nayaru Road	GNT Road	Nayaru Junction	18.0
12	Vadaperumbakkam – Perungavur – Nayaru Road	Madhavaram - Red Hills Road	Nayaru Junction	18.0
13	Sholavaram – Budur -Thirunilai Road	GNT Road	Nayaru – Vichoor Road	18.0
14	Redhills - Budur Road	GNT Road	Sholavaram - Thirunilai Road	18.0
15	Karanodai Palaya Erumeivettipalaya m Road	GNT Road	Palaya Erumai vettipalayam	18.0
16	GNT Road (through Bypass Road)	City Limits	CMA Limits	45.0
17	Madhavaram-Red Hills Road	GNT Road at Moolakadai	Red Hills Bypass Road	18.0
18	Madhavaram High Road	City Limits	GNT Road at Moolakadai	18.0
19	Sembium – Red Hills Road (Extension of Paper Mills Road)	City Limits	GNT Road	18.0
20	NH Bypass Road	GWT Road	GNT Road	61.0

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
21	Ambattur Red Hills Road	CTH Road	GNT Road	24.0
22	CTH Road	City Limits (Jawaharlal Nehru Salai) (IRR)	CMA Limits	45.0
23	Avadi-Morai Road	CTH Road	CMA Limits	18.0
24	Vellanur-Pammadukulam Road	Avadi-Morai Road	ORR	18.0
25	Pandeswaram - Keelakondaiyur Road	Avadi _ Morai Road	Thiruninravur – Periyapalayam Road	18.0
26	Morai -Kadavur Road	Morai junction	Kadavur junction	18.0
27	Thandarai – Palavedu Road	CTH Road	Thiruninravur-Periyapalayam Road	18.0
28	Thiruninravur Periyapalayam Road	CTH Road	CMA Limits	18.0
29	Korattur - Thiruninravur Road	Poonamallee - Thirumazhisai - Thiruvallur Road	CTH Road	18.0
30	Poonamallee - Thirumazhisai - Thiruvallur Road	GWT Road	CMA Limits	18.0
31	Kuthambakkam - Nemam Road	GWT Road	Poonamallee - Thirumazhisai - Thiruvallur Road	18.0
32	Poonamallee – Pattabiram Road	Poonamallee Bypass Road	CTH Road	18.0
33	Poonamallee – Avadi Road	Poonamallee Bypass Road	CTH Road	18.0
34	Proposed East-west arterial Road	Chennai Bypass Road at Ambattur Estate	ORR	61.0
35	Vanagaram – Ambattur Road	GWT Road	Arterial Road at Athipattu	18.0
36	GWT Road (through Bypass Road)	City Limits	CMA Limits	45.0
37	Poonamallee High Road	Mangadu Road junction	Poonamallee Bypass road junction	30.5
38	Mount Poonamallee Road	Kathipara	western boundary of St.Thomas Mt.Contonment	18.0
		western boundary of St.Thomas Mt.Contonment	Porur jn.	27.0
		Porur jn.	Poonamallee High Road	30.5

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
39	Mangadu Road	Mount Poonamallee Road	Porur - Kunrathur Road	18.0
40	Mangadu-Moulivakkam Road	Mangadu Road	Porur - Kunrathur Road	18.0
41	Porur – Kunrathur Road	Porur Junction	CMA Limits	30.5
42	Arcot Road	City limits	Porur Junction	30.5
43	Maduravoyal - Porur Road	GWT Road	Arcot Road	18.0
44	Ramapuram – Valasarawakkam Road	Mount-Poonamallee Road at Manapakkam	Arcot Road @ Valasarawakkam	18.0
45	Anna Salai, Kuppusamy St, Naidu St, Bharathi Salai, Kamaraj Salai	City Limits	Arcot Road (near ARS Garden)	18.0
46	Nandambakkam Nesapakkam Road	Mount Poonamallee Road	City Limits	18.0
47	GST Road	City Limits	CMA Limits	45.0
48	Pallavaram – Kundrathur Road	GST Road	Porur - Kunrathur Road	18.0
49	Pammal – Polichalur Road	Pallavaram – Anakaputhur Road	Polichalur	18.0
50	Pallavaram – Thiruneermalai – Thirumudivakkam Road	GST Road	ORR	18.0
51	Thirumudivakkam – Kunrathur Road	Pallavaram – Thirumudivakkam Road	Porur - Kunrathur Road	18.0
52	Tambaram – Thiruneermalai Road	Tambaram - Naduveerapattu Road	Thiruneermalai Road	18.0
53	Tambaram – Naduveerapattu Road	GST Road	Poonthandalam Road	18.0
54	Poonthandalam Road	Kundrathur Sriperumbudur Road	Naduveerapattu	18.0
55	Mudichur Road	GST Road	Vandalur – Padappai Road at Mannivakkam	18.0
56	Mudichur – Manimangalam Road	Mudichur Road	CMA Limits	18.0

Sl.No	Name of the Road	Stretch		Right of way (m)
		From	To	
57	Vandalur – Padappai Road	GST Road	CMA Limits	18.0
58	Kelambakkam Road	GST Road	CMA Limits	30.5
59	Tambaram Bypass Road (New Link)	GST Road	MBI Road	45.0
60	MBI Road	GST Road	Tambaram Bypass junction	30.5
61	MBI Road	Tambaram Bypass Junction	City Limits	45.0
62	Mount-Madipakkam Road	GST Road	MBI Road at Medavakkam	18.0
63	ORR South Eastern Segment (New Link)	MBI Road	Rajiv Gandhi Salai (OMR)	61.0
64	Extension of MMRD Scheme Road (New Link)	Rajiv Gandhi Salai (OMR)	ECR	30.5
65	ECR	City Limits	CMA Limits	30.5
66	Sholinganallur – Kudimiyandi Thoppu Road	Rajiv Gandhi Salai (OMR)	ECR	18.0
67	Medavakkam – Sholinganallur Road	MBI Road	Rajiv Gandhi Salai (OMR)	18.0
68	Sithalapakkam – Ottiyambakkam Road	Maduraipakkam Road	CMA Limits	18.0
69	Medavakkam-Maduraipakkam Road	MBI Road	CMA Limits	18.0
70	Vengaivasal – Madambakkam Road	MBI Road	Madambakkam Road	18.0
71	Madambakkam Road	MBI Road at Rajakilpakkam	Maduraipakkam Road at Sithalapakkam	18.0
72	Agaramthen Road	Madambakkam Road	Maduraipakkam Road at Kovilancheri	18
73	Rajiv Gandhi Salai (OMR)	Madya Kailash Junction	CMA Limits	As notified for acquisition by DoH shown in the individual village map
74.	Nookampalayam Road	Rajiv Gandhi Salai (OMR)	Semmancheri village limits in the west	18.0

* *Excluding the stretches covered in approved Detailed Development Plans*

Chapter - V

Shelter

A. Introduction

5.1 Shelter is a basic need. When the need for shelter is not satisfied, it becomes almost impossible for an individual to think of satisfying his/her family aspirations and intellectual needs. Primary responsibility of any city is to provide its members with a decent and habitable shelter. A standard housing does not mean merely land and building, but includes basic services like water supply, sanitation and access roads.

B. Current scenario

5.2 The gap between households and housing units in 2001 was of the order of 36,000 units in the Chennai Metropolitan Area while in the City it was much less. The problem in Chennai city is that 15% of the dwelling units are semi-pucca and 10% of the units are Kutcha. Nearly 41% of the dwelling units are either one room units or units without an exclusive room.

5.3 Even though the proportion of the housing units with 'Kutcha' roofing materials accounts for only about 10%, in absolute numbers it is large i.e., 93,701 and these are vulnerable to fire accidents, particularly in summer months some times resulting in casualties.

Houseless Population and Pavement Dwellers

5.4 According to Survey of Pavement Dwellers in Chennai City conducted by the consultant SPARC for CMDA in 1989-90, the number of households who were living in pavements was 9491 at 405 clusters at an average of about 23 households at a place; their population was 40763 (20811 Male and 19950 Female) with 40.2% children population. Although the problem is not as severe as in other metro cities, due to large scale construction activities and increasing informal sector employment the problem is bound to become acute and it is important both from the point of view of these houseless pavement dwellers as well as keeping the pavements for their legitimate use, to find acceptable solutions to this problem.

Slum Scenario

5.5 Chennai City has a slum population of 819,872, which constitutes about 19% of the City Population. The Scheduled Castes Population in slums is of the order of 269,301 persons apart from 1830 constituting the Scheduled Tribe population. The slum population in the municipalities outside City as per a recent survey is indicated below:

Table No. 5.1: Slum Population in Selected Municipalities			
Municipal Town	**Population (2001)**	**Slum Population**	**% of Slum Population**
Ambattur	310967	12690	4.1
Alandur	146287	4740	3.2
Avadi	229403	5895	2.6
Pallavaram	144623	14365	9.9
Tambaram	137933	3675	2.7
Tiruvottiyur	212281	20400	9.6
Madhavaram	76093	5150	6.8
Kathivakkam	32590	4395	13.5

Source: Pre-feasibility study for identification of Environmental Infrastructure requirements in slums in CMA, 2006 (Conducted for TNSCB &TNUIFSL).

Fishermen Housing

5.6 Chennai is a coastal metropolis and there are 84 fishermen villages along the coast of which 43 are in Chennai City, 30 are in the northern part of City upto Minjur and 11 in the south upto Uthandi. There are 12 landing sites in Chennai (14 and 38 in the northern and southern parts). Housing for fishermen becomes important particularly because the housing has to be close to their working area namely the sea and the restrictions placed by CRZ for several types of development. According to a recent count there are 36,162 fishermen households with an average household size of 3.81. They live in 31,688 pucca as well as kutcha structures of which 16,482 are in Chennai, 8439 in northern part of CMA and 6767 in the southern part of CMA. The growth of population among fishermen has increased by 5% between 2000 and 2005 and thus this trend is likely to continue. At present fishermen housing is dealt by Tamil Nadu Slum Clearance Board (TNSCB) and Fisheries Department.

Housing for Upper Income Groups

5.7 Till 1995 Tamil Nadu Housing Board (TNHB) was engaged in land development for housing and housing construction for the Middle and High Income Groups. However most of the upper income housing were constructed by individuals. This has changed since the entry of a large number of small and medium private builders into the real estate and construction market. This trend is also changing with the entry of large private sector real estate building construction companies into the housing field and today the upper income housing is market-driven. Hence shelter policies will have to be restructured in a way that adequate lands at affordable cost become available through public sector for EWS housing and slum rehabilitation and generally for all housing coming under the low income groups.

C. Principal Stakeholders

5.8 The principal stakeholders in providing housing in Chennai area are TNHB and TNSCB in the public sector. In the private sector builders including corporate builders and individuals are the chief contributors. Only the public sector has been involved in the housing of EWS and Low Income Groups, which constitute nearly 65% of the households. The TNHB has vast experience in developing neighbourhoods and composite developments providing for EWS housing through its neighbourhoods and sites-and-services programmes under the Madras Urban Development Projects. The TNSCB has experience in insitu development of slums with grant of tenure and also in large slum rehabilitation schemes. The role of cooperative sector in housing is limited to provision of loans to individuals. Till now the private sector has not been involved in housing for the low income groups and EWS. Their contribution has been mainly in providing houses for the high affordable groups.

D. Projection of Housing Demand

5.9 The housing need for CMA has been projected taking into consideration the growth of households, vacancy rate, demolition rate of buildings and replacement rate, The housing demand is estimated based on the growth of households, vacancy rate, replacement rate and affordability. The following table gives the details of projected demand for 2026.

Table No. 5.2 : Projection of Housing Demand in CMA

	2001	2006	2011	2016	2021	2026
Population	7040616	7896230	8871228	9966636	11197763	12582137
Households	1619000	1754718	1971384	2214808	2488392	2796030
Total Housing Demand	**62520**	**193638**	**413012**	**659479**	**927151**	**1237482**
EWS (30%)	10796	58091	123904	197844	278145	371245
LIG (35%)	21882	67773	144554	230818	324503	433119
MIG (20%)	12504	38728	82602	131896	185430	247496
HIG (15%)	9378	29046	61952	98922	139073	185622

Special Requirement for Fishermen

5.10 The Fisheries Department has estimated the additional requirement of housing for fishermen at 42,543 units by 2025.

E. Policies and Strategies for Housing and Inclusive Development

5.11 Projected annual demand for housing varies from 38,000 units in the first 5 years (ending 2006), 44,000 units in the second 5 years, 49,000 units in the third 5 years, 54,000 units in the fourth 5-year and 62,000 units in the fifth five years (ending 2026). The present supply is about 60,000 units per annum.

5.12 The principal policies and strategies for CMA have been evolved based on the National Urban Housing and Habitat Policy 2005 and the National Slum Policy. Currently Government is evolving a detailed housing policy. The specific strategies proposed for inclusive housing are:

a) Review of space standards considering land cost, availability of developable lands, land requirements, affordability and space standards for housing developments.
b) New housing for EWS and LIG as well as rehabilitation of slum households will be in composite and special neighbourhoods whether developed by the public, private, cooperative or joint sector. These may be in the form of built dwelling units or affordable serviced sites.
c) When housing neighbourhoods and apartment blocks are developed by the private sector on lands exceeding one hectare, 10% of the land shall be reserved and developed for housing for LIG/EWS with dwelling units not exceeding 45 sq.mt either within the site proposed for development or in a location within a radius of 2 km from the site under reference.
d) The concept of Transfer of Development Rights will be made applicable to all types of social housing.
e) All shelter programmes will be integrated with provision of infrastructure, security of tenure, health and education, livelihood opportunities and skill training and micro finance.
f) Public-Private Partnerships will be facilitated to enhance capacity of construction industry to deliver housing for EWS and LIG through prefab and other innovative technology routes.
g) Housing will be developed in proximity to employment centers both existing and proposed.
h) In the event of housing being developed away from existing employment centers, new employment locations nearby will be created/encouraged.
i) Pavement dwellers will be provided with affordable opportunities for housing in selected sites preferably close to their present pavement residence.

5.13 Other Strategies proposed are:

a) Taking note of the demands for various target groups for housing, working women's hostels, student hostels, employees housing by employers, single person dwellings and night shelters will form part of housing action plans.

b) Standard housing includes basic services like water supply, sanitation and proper access roads. Before the Government declared that the layout of house sites unauthorisedly is opposed to public policy and prohibited registration of plots therein, a number of unauthorized layouts had come up in the last 30 years, which lack basic services. These unapproved layout areas should be properly merged with the urban fabric by framing suitable regulation and permitting constructions in these plots.

c) Land assembly using innovative measures such as land readjustment, land pooling, guided development and neighbourhood developments by TNHB and TNSCB severally or jointly will be encouraged to minimize undesirable speculation and increase in land cost to ensure planned development to provide for the needs of the lower income groups.

d) Problems of shelter for the urban poor and their shelter improvement should be addressed through improvement of physical surroundings so that it has adequate basic services such as water supply, drainage, sanitation, street lighting, and other physical conditions leading to better hygienic environment; secondly, through the improvement of the actual structures that the slum dwellers live in , preferably by themselves (extending assistance in terms of financial and physical resources) and by encouraging *in-situ* development ; thirdly, through the improvement of the whole economic and social environment beyond the mere physical condition they live in.

f) TNSCB would take steps to segregate the slums in unsuitable sites which require resettlement in the nearby sites or elsewhere; high dense slums which cannot be improved 'as – is – where – is' require to be housed in storeyed tenements; for slums which can be improved 'as-is-where-is' plans may be prepared with phasing and the same implemented in order to achieve the goal of total eradication of slums in near future, say at the latest by 2021. This policy would incorporate land readjustment and redevelopment using the BOT route.

g) Identification of suitable land for urban renewal such as redevelopment and rehabilitation taking into consideration of age and structural stability of buildings, land use and level of infrastructure will be made by TNHB and TNSCB.

h) Encouragement and incentives are proposed for development of self-contained new towns and settlements around and inside the CMA with all infrastructure facilities

including those required for the IT developments with all attendant infrastructure facilities and housing needed.

i) To discourage speculation and encourage optimum utilization of land, levy of a suitable nature in proportion to permissible FSI can be thought of.

j) All Government lands have to be properly identified, documented and safeguarded to prevent encroachment.

k) Retrofitting of old and vulnerable houses to make them disaster-resistant encouraged by involving financial institutions.

5.14 Area Development Strategies are

a) CMDA will facilitate formulation of local level housing action plans by urban local bodies in association with public-private sector institutions.

b) The housing locations in action plans of urban local bodies will be close and easily accessible from major road arterials and railway, existing and planned

c) CMDA will facilitate local housing plans by rural local bodies by convergence of rural development schemes of government.

d) Housing and neighbourhood developments will not be encouraged on high value agricultural land and prohibited on environmentally unsuitable land.

e) Fisheries Department in coordination with CMDA and TNSCB will facilitate fishermen housing and settlement development close to their work sites.

F. The Plan

5.15 The plan has set apart lands for new housing in different parts of CMA. The following Table indicates the estimated new housing to be provided in different sectors of CMA.

Table No. 5.3: Estimated New Housing in CMA

CMA Sector	Estimated New Housing in lakhs	Extent Earmarked in hect.	Suggested Density (Net)	LIG/EWS housing in lakhs
City	3.34			2.17
Urban Local Bodies (ULBs)				
North	3.76	9474	300	2.44
South	2.49	6728	300	1.62
Village Panchayats				
North	1.32	11784	100	0.86
South	1.46	7827	125	0.95

5.16 Specific locations for housing neighbourhoods and composite housing developments, camping sites and night shelters for pavement dwellers and houseless people will be included in the Detailed Development Plans made in accordance with the provision of the Tamilnadu Town and Country Planning Act.

5.17 Acquisition has been initiated by TNHB for about 1700 acres of land in 8 villages in CMA for housing development. A map showing the location of these sites is annexed. It has also proposed to acquire further lands around the city in consultation with CMDA.

5.18 Areas will be identified for urban renewal areas where assembled lands of 10,000 sq.m. and above will be given priority in housing development.

5.19 TNHB will mainly act as a facilitator for land and site development and providing opportunities for the construction of housing units to private agencies by private-public sector participation.

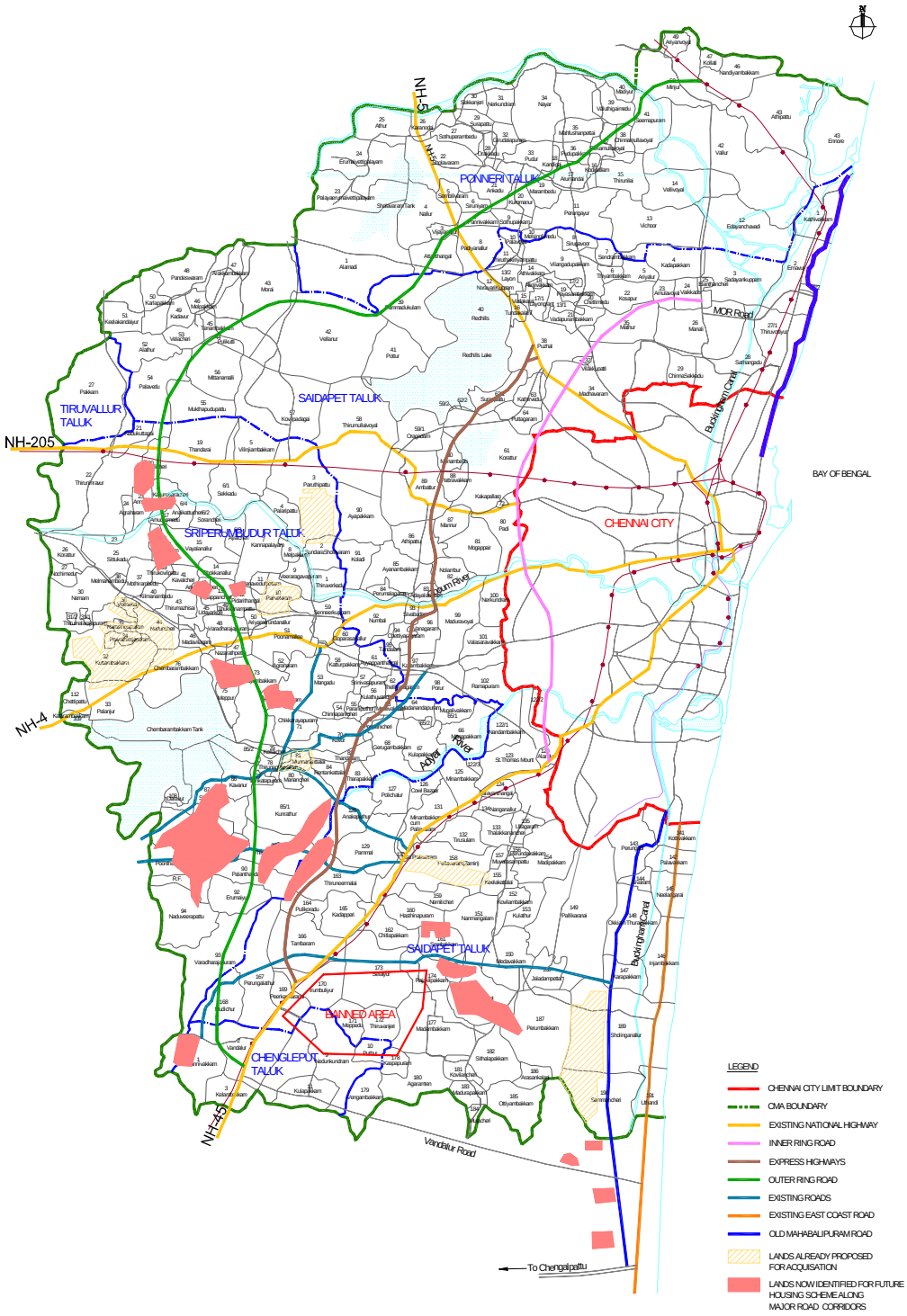
5.20 The parameters for regulating layouts and subdivision of land, apartment constructions, raising of trees and greenery, provision of utilities and related matters to support sustainable housing development are incorporated in the Development Regulations Volume II.

G. Monitoring and Review

5.21 A committee of CMDA to be known as "Shelter and Infrastructure Committee" with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector and to initiate such studies and assemble such information as needed for the purpose. This committee will meet at least once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

5.22 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Location of TNHB Proposed Projects in CMA



Chapter - VI

Infrastructure

Water Supply and Sanitation

A. Introduction

Provision of water supply for potable purposes as well as commercial and industrial uses, evacuation of used water and ensuring good sanitation are basic to economic development and safeguarding the health of the people of Chennai Metropolitan Area. This calls for integrated programmes and management efforts over the entire urban area covering the City, the Municipal Towns, the developing Urban Local Bodies and the new areas that will become urbanized.

B. Current Scenario

6.2 The present situation is that while the city corporation area is better served with water and sanitation infrastructure and facilities, the rest of the area suffers in comparison. The following table brings out the wide differences both in terms of public supply of drinking water to resident population and sewerage and sanitation systems.

Table No. 6.1 Water Supply and Sewer Current Scenario in Selected Municipalities in CMA

Area	Max. Water Availability million litres per day 2007	Per capita Supply Best of Times (lpcd)	Extent of Sewered Area %	Effluent Treated million litres per day 2007
Chennai City	645	107	99	486
Selected Municipal Towns				
Thiruvottiyur	30	11	No UGD (for a part)	No Treatment plant
Madhavaram	5	54	No UGD	No Treatment plant
Pallavaram	5	46	No UGD	No Treatment plant
Ambattur	4	27	No UGD	No Treatment plant

Source: Commissioner of Municipal Administration

6.3 While the supply side situation overall is as above the availability of services for the poorer sections is minimal. Even in the better-serviced City area most of the slum settlements – more than 90% of slum households – receive water from metro tankers (according to a recent study). In spite of near 100% underground sewerage available in the City, the toilets (including community/public latrines) connected to the sewer system cover only 77.5% of slum households. According to a recent survey, less then 30% of slum households have individual latrine facilities.

Quality of Water

6.4 The following Table shows the quality of water supplied by Metro water to the City.

Table No. 6.2 Quality of Water Supplied by CMWSSB in Chennai city		
Principal Parameters of Quality	**WHO Standard**	**Quality As Realised at Consumer End**
1. Turbidity (NTU)	10 Max	**5**
2. Colour (unit on platinum cobalt scale)	25 Max	Colourless
3. Total Dissolved Solids (mg per litre maximum)	2000 Max	370

Source: CMWSSB

6.5 The Metro water gets the water supply from a diverse number of sources from lakes and tanks fed by monsoon, underground aquifers as well as distant sources such as from Krishna River and Veeranam Lake. In addition water is sourced from open and shallow wells, bore-wells not only from the CMA but also from places outside by individuals, institutions and water tanker operators. The following Table shows these different Metro water sources.

Table No. 6.3 Sources and Availability of water	
Source	**Quantity in Mld**
Public Poondi, Sholavaram, Red Hills Lake System (including diversion of flood flow from Araniyar to Korataliyar	200
Ground Water from Northern Well Fields	100
Southern Coastal Aquifer	5
Sub Total (A)	305
Krishna Water I Stage	400
Krishna Water II Stage	530
New Veeranam (CWSAP-I)	180
CWSAP-II (Proposed)	20
Sea Water Desalination (Proposed)	200
Sub Total (B)	1330
Grand Total (A) + (B)	**1635**
Mark II hand pumps (public)	6970 Nos.

Source:CMWSSB

6.6 The salient features of the Sewerage Macro System Units are given below: All the locations except Nesapakkam are at the edge of the City. The total treatment capacity is 481 MLD per day as against an estimated sewage generation of at least 700 MLD.

Table No. 6.4 Salient Features of the Sewerage Macro Systems Treatment Units			
Zone	**Location**	**Type**	**Capacity (mld)**
I	Kodungaiyur	Activated Sludge Plant	270
II	Kodungaiyur	Activated Sludge Plant	
III	Koyambedu	Activated Sludge Plant	94
IV	Nesapakkam	Activated Sludge Plant	63
V	Perungudi	Activated Sludge Plant	54
Total			**481**

Source: CMWSSB

6.7 Localised sewerage systems are in existence in Alandur, Valasaravakkam, and Ambattur. Several of them are partial and a few of them have just been completed. In respect of the local bodies of Pallavaram, Tambaram, Madhavaram, Kathivakkam, Porur,

Ullagaram, Puzhithivakkam, Avadi, Maduravoyal and Thiruvottiyur proposals have been formulated for instituting underground sewerage systems.

6.8 Metro water has taken up the development of water supply and sewerage system along the IT Corridor being established south of Chennai for a projected future demand of 50 MLD. Concurrently an underground sewerage system is also proposed. This corridor will include a number of Town and Village Panchayats on both sides of the Rajiv Gandhi Salai (OMR).

Equity Considerations

6.9 In the present system there is a wide disparity in the quantity, quality and timing and methods of water supply as between the general category of consumers and consumers with low affordability. It should be the effort to design a system based on use for drinking purposes and personal hygiene as common to all groups and requirements for sanitation depending upon the quantities for toilet flushing. Even in the European context many of the cities are proposing a supply of between 100 and120 lpcd for residential supply with nearly 50% sourced from recycled water for toilet flushing.

C. Principal Stakeholders

6.10 According to the Chennai Metropolitan Water Supply and Sewerage Act Metro water is responsible for supply of protected water and provision of sewerage facilities over the whole of CMA extending to 1189 sq.km. However presently its activities are confined to the City Corporation limits within 176 sq.km. and a further 8 sq.km. in the immediate environment of the City. Metrowater should strive to extend its operations gradually to cover the entire CMA. The principal stakeholders in the public sector in the rest of the CMA are the local bodies, municipalities and town and village Panchayats. These local bodies are mainly responsible only for maintenance of the system and distribution installed by Tamil Nadu Water Supply and Drainage Board (TWAD) a parastatal organization. Recently however Government has directed the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) to be the nodal agency for execution and maintenance of underground sewerage schemes in the adjacent and distant urban areas within the CMA. Under this directive CMWSSB is required to develop proposals for execution of a comprehensive sewerage system for the entire metropolitan area in addition to existing sewerage system in Chennai.

6.11 In the private sector apart from individuals and institutions tanker contractors and bottled water suppliers are the main stakeholders. Organised stakeholders for evacuation of sewage is practically non-existent. The owners of properties are responsible for cleaning up of septic tanks. Septic tank water overflows are common in the extended areas.

D. Projection of Needs

6.12 Future demand for water in the CMA has been estimated separately for the City, the Municipalities, Town Panchayats and Village Panchayats assuming different supply standards from 150-120-100 lpcd for the City, 125-100-75 lpcd for Municipalities, 100-80-60 for Town Panchayats and 80-70-60 for the Village Panchayats. The annexed table (Annexure I) shows the water demand projections for 2026 for residential, commercial and industrial uses for the three scenarios mentioned above.

6.13 The demand for various uses is summarized in the following table as high, medium and low projected needs (Scenarios 1,2 and 3 respectively).

Table No:6.5 Estimation of Water Requirements for Various Uses - CMA (in MLD)

Use	High - Scenario 1	Medium – Scenario 2	Low – Scenario – 3
Residential	1606	1296	1046
Commercial	482	324	210
Industrial	161	130	105
Total	**2248**	**1750**	**1360**

6.14 An assessment (September 2007) of abstractable reliable quantity of water from various sources is given in the following table:

Table No:6.6 Safe Yield from Different Sources

Sl. No.	Name of source	Safe Yield in MLD	Remarks
1.	Poondi – Sholavaram – Red Hills Lake System	227	Based on the assessment during 1997 revision of Master Plan for water supply.
2.	Groundwater aquifer from Northern Well Field	68	
3.	Other sources like Southern Coastal Aquifer, Rettai Eri, Porur, etc.	5	
4.	Receipt of Krishna Water from Telugu Ganga Project (when full agreed quantity of 930 MLD (12 TMC) supplied)	837	10% loss from entry point to Poondi Lake has been considered.
5.	Veeranam lake (CWSAP-I)	180	
6.	Desalination Plant	200	a) 100 MLD in 2008 b) 100 MLD in 2009
7.	Local sources including Palar River in the CMA area other than City limits.	32	Based on the assessment during 1997 revision of Master Plan for water supply.
8.	Abstractable quantity of local groundwater in the city for uses other than drinking and cooking	240	
9.	Waste water reuse a) Already in use b) Expected in future (SIPCOT use)	 45 120	From 2009
	Total	**1954**	

Source: CMWSSB

6.15 Taking into account the pressure on available sources of supply particularly from groundwater for future planning scenario – I projections may be taken as a realistic supply to be achieved. This scenario requires only 2088 MLD of potable water for residential and commercial uses which is nearly equal to the safe yield from public supply taking into account all existing sources including the sea water desalination plant for 100 mld under construction at Kattupalli. If recycling of grey water for latrine flushing purposes is taken into account it would reduce the requirement of potable water further.

6.16 The water for industrial needs are assessed between 161 to 105 mld. The present sewage treatment capacity of the Chennai system is 481 MLD and on recycling could yield at least 300-400 MLD. which can very well meet not only the 2026 industrial demand but also meet any further demand by industries as far as the quantity is concerned.

6.17 Raising water supply standards beyond scenario – III will not only increase the cost of supply and distribution but also impinge on the treatment of used water which if not undertaken would lay a heavier toll on environmental safety.

E. Policies and Strategies

6.18 In the light of the above the following policies and strategies would lead to sustainable use of water resources without affecting future urban development of CMA in anyway.

a) Since all major sources have been tapped, Metro water's emphasis should now shift to holistic management of water and optimizing local resources.
b) It should immediately embark on identifying management measures including augmentation of local sources within the Chennai basin. The measures include
    i) maximizing rainwater harvesting from public areas and un built areas,
    ii) increasing storage capacity of surface tanks,
    iii) recharge of known and new aquifers,
    iv) recycling of black and grey water,
    v) reduction of loss through evaporation,
    vi) cutting down transmission losses and other avoidable losses at the consumers' end.
    vi) metering of all apartments and
    vii) restructuring of tariff.
c) Metro water should ensure that the quality of water supply conforms to those prescribed by the Central Public Health and Environmental Engineering Organisation (CPHEEO).

d) Metro water should be made responsible only for the allocation of water resources to constituent local bodies based on their population and standard of supply arrived at.

e) Expensive underground sewerage system should be limited to dense areas outside the City where metro-water would be responsible for construction, operation and maintenance of the systems.

f) Provision of integrated sewerage systems for the urban local bodies that are contiguous to each other should be planned so that the sewage generated from more than one local body can be treated in a single sewerage treatment plant.

g) The Alandur model of public-private participation could be replicated in other areas.

h) The existing and proposed sewage treatment plants should be able to deliver treated water that can be used for industrial use, for other non-potable uses and for recharging surface reservoirs and underground aquifers.

i) Metro Water can use a GIS based information system for long-term assets management and strengthening.

Area Policies

a) Local bodies to develop action plans for distribution of water allocated to them and other identified local sources of water in collaboration with metro water.

b) Local bodies to develop action plans for low-cost and alternative sanitation facilities in non-sewered areas.

c) Use of recycled grey water for toilet flushing purposes and gardening and other uses will be made mandatory for all new developments above the prescribed level of developments.

F. The Plan

6.19 The plan recommends allocation of water to areas within the City and outside as follows in order to encourage equitable distribution, providing opportunities for balanced development and improving living quality in the outlying areas of the City.

Table No. 6.7 Water Allocation 2026 _CMA

Area	Estimated Population 2026 In lakhs	Total Water Allocated 2026 MLD	Residential and Commercial MLD	Industrial Use MLD
Chennai City	58.56	949	879	70
Total CMA (Outside City)	67.26	802	743	59
North CMA (Thiruvallur District)	38.47	474	438	35
South CMA (Kancheepuram District)	28.79	328	305	24
Total	**125.82**	**1750**	**1621**	**129**

Note: Industrial use may have to be met mainly from recycled sewage.

6.20 The total water allocation is made up of 1635 MLD of water available from all present sources including desalination and 185 MLD of recycled sewage water. If additional recycled water is available the pressure on potable water will be reduced to that extent. The institution of conservation and management measures including local recycling of grey water for toilet flushing purposes would bring down the demand for further potable water and thus the need for exploring new sources such as additional desalination of water. It will also increase the long-term sustainability of the water sector and at the same time reduce adverse environmental impact from used water.

6.21 CMDA would facilitate in collaboration with Metro water formulation of local action plans by municipal bodies and viable groups of local bodies for instituting water distribution infrastructure and common sewage treatment plants.

6.22 The plan recommends a comprehensive hydro geological study for west CMA area including the Sriperumbudur area where presently the data is inadequate for identifying new underground aquifer recharge areas.

6.23 The plan recommends preparation of a water map indicating all potential surface and groundwater sources. The Integrated Water Management Plan may include desilting of existing lakes for augmentation of storage of rain/flood water and capturing monsoon run-off. The concept of zero run-off drainage with retention ponds, sediment traps and balancing lakes should be adopted.

6.24 The plan recommends the renovation and refurbishing about 320 surface tanks for augmenting local resources of potable water. The tanks that can be taken up on a priority basis are given in the Annexure II.

6.25 Parameters for conservation and better management of water and parameters for installation of sanitation and recycling in new developments are incorporated in the Development Regulations.

G. Electricity

6.26 Power is a basic infrastructure influencing the growth of industrial, agricultural and service sectors and ultimately the economic development. One of the determinants for quality of life is the level of availability and acceptability of affordable and quality power. It is one of the sectors, to which Government is giving priority in fixing the plan outlays at national as well as state levels.

6.27 Total number of HT and LT consumers in Chennai city is 21.14 lakhs with a connected load of 6289 MW as on 31.03.07. The maximum peak reached in 2006-07 in

Chennai was 1723 MW and the average daily consumption is between 30 to 35 MU. The generating stations of 1396 MW capacity in and around the City are as detailed below:

NCTPS	630 mw	(Coal based thermal station - TNEB)
ETPS	450 MW	(coal based thermal station - TNEB)
BBGTS	120 MW	(Gas based station - TNEB)
GMR VASAVI	196 mw	(Diesel based station - IPP)
Total	1396 MW	

6.28 The projected demand of Chennai area has been arrived based on the projected population for the period upto 2026 and by taking percapita consumption of 1 kw/person. The additional requirement of power at the end of each Plan period is as follows:

At the end of	2006 - 11	1100 MVA
	2011 - 16	1200 MVA
	2016 - 21	1400 MVA
	2021 - 26	1500 MVA

To cater to the additional requirements of power, the details of the new substations proposed by TNEB in the Chennai area upto 2026 are given below.

Table No. 6.8 New Sub Stations proposed

Sub Station	2011		2016		2021		2026	
	No.of SS	Capacity in MVA	No.of SS	Capacity in MVA	No.of SS	Capacity in MVA	No.of SS	Capacity in MVA
765 KVSS	-	-	-	-	1	3000	1	3000
400 KVSS	2	1260	2	1260	3	1890	3	1890
230 KVSS	6	1200	6	1200	9	1800	9	1800
110 KVSS	22	1100	24	1200	36	1800	36	1800
33 KVSS	44	704	48	768	72	1152	72	1152
Total	74		80		121		121	

It is planned to establish a thermal station at northern Chennai with the capacity of 1000 MW during the 11th Plan period under joint venture with National Thermal Power Corporation.

6.29 To meet the load growth due to increased industrial activity and population, TNEB is preparing and implementing a master plan for infrastructure development for every 5 years to meet out the load growth / demand with a perspective view to supply reliable and quality power to the consumers.

H. Postal Services

6.30 For growth and modernization, an efficient postal system is crucial and postal system is fast emerging as an important component of modern communication and I.T. sector. Our Indian postal system is the largest in the world. It also plays a crucial role in resource mobilization, apart from providing a variety of postal services. Major initiatives envisaged in the Tenth Plan include

- Up-gradation constituting the bulk of outlay proposed, identifying computerization and connectivity as the core activity in the tenth Plan, coupled with modernization and mechanisation programme and
- Expansion of postal network business development and
- financial services.

6.31 In CMA, a wide network of postal system exists and serves the population effectively. There are 134 major post offices in CMA. The postal department may have to dovetail their plan taking into account the population projection, distribution etc. envisaged in this Master plan.

I. Telecommunication

6.32 Telecommunication is an important tool for socio-economic development. Department of Telecommunication has been formulating development policies for accelerating the growth of telecom services in our country. There have been far-reaching developments in the recent past in the telecom, IT, consumer electronics and media industries worldwide. Considering the above and also to facilitate India's vision of becoming an IT superpower and develop a world-class telecom infrastructure in India, a New Telecom Policy was announced in 1999.

6.33 The New Policy Framework will focus on creating an environment, which enables continued attraction of investment in the sector and allow creation of communication infrastructure by leveraging technological development.

6.34 The area of operation of Chennai Telephones is co-terminus with the CMA boundary notified by CMDA. There is an exponential growth in Chennai in the last decades. It has grown from 26 exchanges with 2, 14,400 lines in 1992 to 209 modernized exchanges with equipment and total capacity of 17, 86,079 lines in 2005. Number of exchanges has grown to 331 in 2006. According to BSNL, in Chennai telephone district the number of their landlines were 10.09 lakhs and their cell phone connections were 5.78 lakhs. BSNL telephone density in Chennai alone works out to 20.08 and when the connections given by the private players also are taken into account the telephone density in Chennai may be in the order of about 30.

J. Monitoring and Review

6.35 A committee to be known as “Shelter and Infrastructure Committee” with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector including water supply and sanitation and to initiate such studies and assemble such information as needed for the purpose. This committee will meet at least once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

6.36 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Annexure - I

Estimates of water requirements					
I. Chennai City		Year			
		2011	2016	2021	2026
1.	Population in lakhs	49.95	52.39	55.4	58.56
2.	Water requirement in MLD for the resident population				
(a)	@ 150 lpcd	749	786	831	878
(b)	@ 120 lpcd	599	629	665	703
(c)	@ 100 lpcd	500	524	554	586
3.	Water requirement in MLD for the other than residential use such as office, commercial, industrial premises and other places of employment, education, etc.				
(a)	@ 30% of 2(a) above	225	236	249	264
(b)	@ 25% of 2 (b) above	150	157	166	176
(c)	@ 20% of 2(c) above	100	105	111	117
4.	Industrial use				
(a)	@ 10% of the 2(a) above	75	79	83	88
(b)	@ 10% of the 2(b) above	60	63	66	70
(c)	@ 10% of the 2(c) above	50	52	55	59
5.	Total requirement				
	@150 lpcd	1049	1100	1163	1230
	@120 lpcd	809	849	897	949
	@100 lpcd	649	681	720	761
II. Municipalities in CMA					
1.	Population in lakhs	21.75	25.60	30.20	35.69
2.	Water requirement in MLD for the resident population				
(a)	@ 125 lpcd	272	320	378	446
(b)	@ 100 lpcd	218	256	302	357
(c)	@ 75 lpcd	163	192	227	268
3.	Water requirement in MLD for the other than residential use such as office, commercial, industrial premises and other places of employment, education, etc.				
(a)	@ 30% of 2(a) above	82	96	113	134
(b)	@ 25% of 2 (b) above	54	64	76	89
(c)	@ 20% of 2(c) above	33	38	45	54
4.	Industrial use				
(a)	@ 10% of the 2(a) above	27	32	38	45
(b)	@ 10% of the 2(b) above	22	26	30	36
(c)	@ 10% of the 2(c) above	16	19	23	27
5.	Total requirement				
	@125 lpcd	381	448	529	625
	@100 lpcd	294	346	408	482
	@75 lpcd	212	250	294	348
III. Town Panchayats					
1.	Population in lakhs	5.89	7.41	9.45	12.21
2.	Water requirement in MLD for the resident population				
(a)	@ 100 lpcd	59	74	95	122
(b)	@ 80 lpcd	47	59	76	98
(c)	@ 60 lpcd	35	44	57	73

3.	Water requirement in MLD for the other than residential use such as office, commercial, industrial premises and other places of employment, education, etc.				
(a)	@ 30% of 2(a) above	18	22	28	37
(b)	@ 25% of 2 (b) above	12	15	19	24
(c)	@ 20% of 2(c) above	7	9	11	15
4.	Industrial use				
(a)	@ 10% of the 2(a) above	6	7	9	12
(b)	@ 10% of the 2(b) above	5	6	8	10
(c)	@ 10% of the 2(c) above	4	4	6	7
5.	Total requirement				
	@100 lpcd	82	104	132	171
	@80lpcd	64	80	102	132
	@60 lpcd	46	58	74	95
IV. Village Panchayats					
1.	Population in lakhs	10.59	12.96	15.99	19.88
2.	Water requirement in MLD for the resident population				
(a)	@ 80 lpcd	85	104	128	159
(b)	@ 70 lpcd	74	91	112	139
(c)	@ 60 lpcd	64	78	96	119
3.	Water requirement in MLD for the other than residential use such as office, commercial, industrial premises and other places of employment, education, etc.				
(a)	@ 30% of 2(a) above	25	31	38	48
(b)	@ 25% of 2(b) above	19	23	28	35
(c)	@ 20% of 2(c) above	13	16	19	24
4.	Industrial use				
(a)	@ 10% of the 2(a) above	8	10	13	16
(b)	@ 10% of the 2(b) above	7	9	11	14
(c)	@ 10% of the 2(c) above	6	8	10	12
5.	Total requirement				
	@80 lpcd	119	145	179	223
	@70lpcd	100	122	151	188
	@60 lpcd	83	101	125	155

Total Estimate of Water Requirement (CMA)					
Chennai Metropolitan Area		Year			
		2011	2016	2021	2026
1.	Population in lakhs	88	100	112	126
2.	Water Requirement in MLD for the resident population				
a)	Scenario I	1165	1284	1431	1606
b)	Scenario II	938	1035	1154	1296
c)	Scenario III	762	838	933	1046
3.	Water requirement in MLD for the others from residential use such as office, commercial, industrial premises and other places of employment, education etc.				
	Scenario I	349	385	429	482
	Scenario II	235	259	289	324
	Scenario III	152	168	187	295

4.	Industrial Use				
	Scenario I	116	128	143	161
	Scenario II	94	103	115	130
	Scenario III	76	84	93	105
5.	Total Requirement				
	Scenario I	1631	1797	2003	2248
	Scenario II	1267	1397	1558	1750
	Scenario III	990	1090	1213	1360

Annexure - II

List of Tanks to be renovated on priority basis

1. Porur Eri
2. Perugudi Eri
3. Kovilambakkam Eri
4. Tambaram pudhu Thangal
5. Tambaram pudhu Eri
6. Kadaperi
7. Pallikaranai Narayanapuram Eri
8. Pallikaranai Anai Eri
9. Pallavaram Eri
10. Velacehry Eri
11. Ayanampakkam Eri
12. Ambattur Eri
13. Korattur Eri
14. Nadukuthagai Eri

Chapter - VII

Social Facilities

1.Education

I. School Education

A. Current Scenario

Chennai, being the State capital, the educational facilities available are very good as well as specialized when comparing with the rest of the State. Some of the relevant statistics relating to literacy and educational infrastructure are given in the Table below.

Table No. 7.1: Literacy & Educational Infrastructure in the Districts Covered in CMA

Sl.No	Description	Chennai City	Kancheepuram District	Thiruvallur District
1	Life expectancy at birth (yrs) (2005)	M-77.14% F-77.56%	N.A	N.A
2.	Literacy rate (2001) Male Female	76.81 81.10 72.35	67.84 74.73 60.78	67.73 74.98 60.26
3	Sex ratio (2001)	95.10	96.10	97.10
4	Gross enrolment rate (2005)			
	(a) Primary	93.97	93.88	96.17
	(b) Upper Primary	94.58	97.91	93.81
	Total	93.85	95.29	95.25
5	Gross Dropout rate (2005)			
	(a)Primary	6.75	3.61	7.43
	(b) Upper Primary	6.02	7.04	8.02
6	Pupil-teacher ratio (2005)			
	(a) Primary	47	42	42
	(b) Upper Primary	39	56	55
7	Enrolment of girls in primary schools as % of enrolment of boys (2005)			
	(a) Primary	97.14	96.49	97.00
	(b) Upper Primary	98.60	92.66	94.51

Source : General Education Statistics of Tamil Nadu, Directorate of School Education

B. Principal Stakeholders

7.2 The Directorate of School Education, Directorate of Elementary Education, Directorate of Matriculation Education, Directorate of Non-formal and Adult Education and the Directorate of Teacher Education, Research and Training are the principal

stakeholders from Government. There are a number of private organizations, trusts and charitable institutions in the field.

C. Projection

7.3 Because of family planning and population control measures taken in the country, and especially in Tamilnadu, from 1971 there is large variation in age structure including the school going children age group. It is estimated that in the future years the school going age group will stabilize at 7.5 % for primary school going age group, 5.19% for middle school going age group and3.71% for high school going age group and 3.96% for the higher secondary going age group. Based on these estimates, the future demand for schools has been worked out and tabulated in table below.

Table No 7.2: Number of Schools Required 2026

	2001 No. of Schools	Average No of Students 2001	Average Strength assumed	2011	2016	2021	2026
Primary	1427	370	500	1329	1493	1677	1885
Upper Primary	775	471	500	920	1034	1161	1305
High School	998	261	400	822	923	1037	1165
HSC School	662	210	400	438	492	553	621

D. Strategy

a) Five year and annual plans should take into account the projection made in the Master Plan; decision should be taken on the share of government sector and public sector in the opening of new schools.

b) Spatial distribution of schools as per standards should be ensured.

c) Further reduction in the drop-out rate and increase in enrolment, especially of girls should be pursued.

d) Recruitment of trained teachers should be done on a regular basis.

e) In-service training at periodic intervals especially in science subjects and in English should be given priority.

II. Higher education:

E. Current Scenario

7.5 As regards collegiate, technical and other professional higher educational institutions in CMA, they serve not only the CMA region, but also the State apart from catering to the demand at the national level for certain specialized fields. However periodical reviews of change in demand for this category of educational institutions should be made at least once in 10 years and necessary infrastructures have to be provided. Attention should be paid to improving the quality of teaching in all subjects. Human resource development for the present and future demands and also research and development for economic development depend on investment and improvement on this higher education sector.

F. Principal Stakeholders

7.6 The Directorate of Collegiate Education, Directorate of Medical Education, Directorate of Technical Education, Directorate of Legal Education, Universities, etc. are the principal stakeholders from the Government sector. There are a number of private players running self-financing colleges and autonomous institutions of higher learning.

G. Strategy

7.7(a) Considering the emerging scientific and technological developments, specialized institutions, which can be supported by the metropolis should be assessed by a competent authority and proposed in and around CMA.

(b) Location of a business school in Chennai like the IIM should be planned.

(c) Considering the growth in the vehicle manufacturing units in and around Chennai a separate college for automobile engineering may be planned.

2. Health

H. Current Scenario

7.8 Planning for health becomes an integral part of metropolitan planning and health status of population is an important indicator of human resource development. Investments in health sector have direct relationship with longevity and improvements in physical and mental development of people. Tamil Nadu's health indicators place it near the top among the States of India. Policy of the Government is to provide a healthy and disease-free life to the people of Tamil Nadu.

7.9 Indian systems of medicine (Siddha, Ayurveda, Unani, Homeopathy and Yoga and Naturopathy) has regained its importance and the Government have attached special importance to the growth and development of Siddha system, which is part of Tamil culture.

7.10 The Tamil Nadu Health Systems Project (TNHSP), a 5-year project is being implemented since Jan. 2005, with a total outlay of Rs.597 crores. It aims to improve the effectiveness of the health care system, both public and private in the State through increased access to and utilization of health services (particularly by poor and disadvantaged) development of effective interventions to address key health challenges including non-communicable diseases, improved oversight and management of the health care system (both public & private), and increase effectiveness of public sector hospital services.

7.11 Chennai has established itself as the health capital of the country and is fast becoming the health destination of choice for people all over the world with its excellent facility, competent specialists and good nursing care.

I. Principal Stakeholders:

7.12 The Director of Medical & Rural Health Services (DMRH) is in charge of planning and implementation of programmes of medical services This Directorate provides the health services in the districts except in Chennai City. The Dept. of Public Health and Preventive Medicine (DPHPM) is providing primary health care services. Directorate of Medical Education deals with medical colleges and the Directorate of Family Welfare is in charge of planning and implementation of family welfare programmes. Directorate of Indian Medicine and Homeopathy deals with teaching as well as providing health care system of Indian Medicine. The National Institute of Siddha established at Tambaram developed at a cost of Rs.47 Crores is a joint venture of GOI and GTN and it has been established with the objective of imparting post graduate education in Siddha system and to provide medical care through Sidha system of medicine.

7.13 A large number of private hospitals deliver health care in CMA; Apollo Hospitals, Sri Ramachandra Medical College Hospital, Malar Hospital, Vijaya Hospital, Devaki hospital, CSI Rainy Hospital, CSI Kalyani Hospital etc. are the major hospitals. According to the approved Government list, as many as 130 private hospitals function in the City area itself.

7.14 From the Census figures, it appears that the total number of beds given relates only to Government hospitals and not private. Bed availability in private hospitals may be about 100% more than in Government ones.

J. Projection

7.15 Considering the longevity in life, improved health conditions predicated, it is assumed that the number of beds required in future may be at the rate of one in 500 population. The number of beds required for the projected population, for the year 2006, 2011, 2016, 2021, and 2026 are 15,800, 17,700, 19,900, 22,400 and 25,100 respectively.

7.16 The existing facilities particularly the specialized & higher order ones, serve not only the CMA population, but also the rest of Tamil Nadu and the adjoining states population; as regards private sector, it attracts patients from all over India and also some of the foreign countries. It would be difficult to assess the adequacy of these facilities. Because of accessibility of good infrastructure including specialist manpower, technology, private sector investments in health sector is high in recent times, and the trend is expected to continue.

K. Strategy

7.17a) A detailed study on the health infrastructure in CMA, delivery to poor, accessibility spatially, future requirements, contribution by private sector, modernisation requirements in govt. sector etc. has to be made which may be a basis for formulation of Master Plan for health infrastructure in CMA. The position may be reviewed every 10 years and suitable measures taken on health infrastructure investments.

b) Considering that in the plan period, majority of population will be in the rest of CMA, Govt. / Govt. agencies should concentrate on provision of more higher order / specialty hospitals in the rest of CMA. For human resource development in this field, complementing colleges should be located in the rest of CMA.

3. Tourism

L. Current Scenario

7.18 Chennai Metropolitan Area is bestowed with a number of tourist spots ranging from renowned temples to beach resorts, heritage buildings and amusement parks. Chennai is also the cultural capital of the south where music and dance find a special place in the hearts of the people. The dance and music festival season in December attracts a number of non-resident Indians as well as foreigners. The tourist arrivals in Chennai has shown a steady increase in the last three years as seen in the table below:

Table No: 7.3 Arrival of Tourists in Chennai

Year	Domestic	Foreign	Total
2004	5531103	429988	5961091
2005	6028582	499071	6527653
2006	7312540	564780	7877320

M. Strategies

7.19 The Department of Tourism has the following proposals on hand to attract tourists

i) Construction of a Convention Centre: With the advances in the industrial front, Chennai offers plenty of scope for MICE (Meetings, Incentives, Convention and Exhibitions) Tourism in a big way. Construction of a Convention centre within the CMA with suitable parking lots, infrastructure facilities, attractive layouts, etc. will attract business tourists in a big way.

ii) Pleasure boating at Buckingham Canal: Cruise tourism can be enthralling and exhilarating for both foreign and domestic tourists. Buckingham Canal from Sholinganallur to Muttukadu can be an excellent route for pleasure boating facilities. Desiltation of the Canal, strengthening the bunds and beautification with avenue trees, ornamental shrubs and flowering herbs will render it a delight for the tourists.

iii) Exhibition Ship: Exhibiting a ship for the tourists in a prominent place like Marina will be informative, educative and entertaining. This will be a value addition in fostering tourism in the City.

iv) Sun-et-Lumiere: Chennai has got an interesting history after the advent of the British. It has played a significant role in the freedom struggle. Organising a sound and light show highlighting freedom struggle at Rajaji Hall with certain additional constructions may inculcate patriotic fervour in the young minds apart from alluring the tourists to visit this historic building.

v) Lighting of Memorials: Illumination of memorials of great leaders can attract tourists in large numbers. Flood-lighting heritage buildings with more than 150 years of existence and monuments like the War Memorial would also attract tourists in large numbers.

vi) Art Gallery in Fine Arts College: Showcasing the artistic wealth of Tamil Nadu by displaying the works of outstanding personalities in an art gallery would be a fitting tribute to the genius of several artists who have enriched the culture and tradition of Tamil Nadu. Different types of paintings that have evolved over a period of time, specimens of mural paintings, etc. can be part of the gallery.

vii) Butterfly Park and Night Safari: Establishment of a Butterfly Park and introduction of Night Safari in Vandalor Zoological Park will attract a large no.. of tourists to visit the Zoo in the night time.

7.20 The Department of Tourism may prepare a comprehensive tourism development plan to attract domestic as well as foreign tourists and to develop tourism infrastructure providing for hotel accommodation, bed and breakfast facilities, paying guest accommodation and transport facilities and implement within a timeframe.

4. Recreation

N. Current Scenario

7.21 Recreation is a broad function which may be organised or unorganised, indoors or outdoors, daily or intermittent, local or distant. Sometime even sidewalks could be an important recreational facility in a residential area. Television viewing has become a major daily recreational facility within houses apart from music, hobbies & crafts. Indoor recreation activity pursued by people include the ones provided by cinemas, drama halls, music sabhas (halls), clubs, indoor stadium, exhibition and fairs; outdoor recreation facilities includes parks, playgrounds, beaches, zoos etc.

7.22 In order to provide for the preservation and regulation of parks, playfields and open spaces in the State of Tamil Nadu, the 'Tamil Nadu Parks, Playfields and Open Spaces (Preservation and Regulation) Act, 1960' was enacted. Parks, playfields & open spaces are periodically notified under the Act by the local bodies concerned.

7.23 Chennai is endowed with the second longest straight sandy beach in the world, called *Marina*. Elliots Beach, another major beach in Chennai attracts large number of people. Thiruvanmiyur Beach, Kottivakkam Beach, Neelankarai Beach and small beaches at Thiruvottiyur are also being used by people in these areas. These beaches are used by the people throughout the year and the Marina & Elliots Beaches attract thousands of people every day.

7.24 In Chennai City, there are about 195 parks with extent varying from 150 sq.m. to 3.5 hectares and totalling to more than 60 hectares. Playgrounds maintained by the Chennai Municipal Corporation number more than 200 with a total extent exceeding 50 hectares. In the rest of CMA, unlike the City, the parks & playfields are a very few. A world class cricket stadium is proposed to be located near Mamallapuram by a private agency.

7.25 CMA also boasts of a number of theme parks developed commercially in and around CMA, which attract not only the local population but also tourists.

7.26 CMA is dotted with a number of lakes (with minimum water spread in non-monsoon seasons), which may be developed as recreational spaces in a planned way taking into account its environmental aspects also. It will not only help in conserving these water bodies but also preventing encroachments and pollution.

O. Strategy

7.27 Maintenance of existing parks / playgrounds and provision of new parks and playgrounds in the rest of CMA require attention. A database on the existing parks & playgrounds within CMA can be created which is required for planning and its development.

7.28 CMDA can create OSR fund out of the OSR charges collected apportioning proportionately with reference to the amounts collected in the jurisdiction of the local bodies concerned, reserving a certain percentage for overall recreational facility development at CMA level.

7.29 The local bodies concerned should identify lands for development as open spaces and initiate and complete action for acquisition/alienation and provide these facilities. For acquisition of lands for parks / playgrounds and development of new facilities project proposals can be prepared by the local bodies concerned and financial assistance availed from the said OSR Fund to be created.

P. Monitoring and Review

7.30 A committee to be known as "Shelter and Infrastructure Committee" with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector including social facilities and to initiate such studies and assemble such information as needed for the purpose. This committee will meet at least once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

7.31 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Chapter - VIII

Solid Waste Management

A. Current Scenario

Solid waste includes domestic and commercial waste, industrial waste, hospital waste, e-waste and construction debris.

8.2 The Corporation of Chennai is the largest generator of solid waste estimated at 3000 tonnes per day. It has a network of transfer stations and two land fill sites at Kodungaiyur and Perungudi. The present system of collection, transfer and dumping does not make any distinction between types of waste other than domestic and commercial waste and to some extent construction debris. The disposal of hospital waste and industrial waste is the responsibility of the generator but much of this waste also gets into the Corporation system. Separate system has not been established for e-waste so far.

8.3 The following table provides an estimate of current daily generation of various types of waste.

Table No. 8.1 Solid Waste Generated Daily in CMA (in tonnes)

Area	Residential & Commercial	Hospital	Total	e-waste	Construction Debris
Chennai City	2620	80	2700	5	500
Municipalities	1073	11	1084	2	50
Town Panchayats	207	1	208	1	NA
Panchayat Union	255	1	256	2	-
Total	4155	93	4248	10	550

NA – Not Available

8.4 The current solid waste management system in the Corporation needs to be improved and the management in the rest of CMA requires immediate attention. The City Corporation has privatized (contracted) solid waste collection in a few zones. This has improved the quantity collected but no progress has been made in respect of total solid waste management. The Consultants M/s. Environmental Resource Management, UK (ERM) in 1996, made a study on Solid Waste Management in CMA but the recommendations of the study are yet to be implemented.

8.5 The Corporation maintains two solid waste dumping yards one at Kodungaiyur in the north and the other at Perungudi in the south. Both are over loaded and cause serious health problems to nearby residents. Besides the sites and surroundings are environmentally highly degraded. The municipalities of Alandur, Ambattur, Avadi and Thiruvottiyur have small sites of about 5 to 6 ha. being used as dumping grounds. Out of 16 municipal bodes in the CMA, 8 do not have any designated disposal facilities.

Principal Stakeholders

8.6 Solid waste management is an obligatory function of Municipal Corporations, Municipalities, Town Panchayats and Village local bodies.

8.7 The Tamil Nadu Pollution Control Board is responsible for enforcing the following rules in the Chennai Metropolitan Area

i) Municipal Solid Waste (Management & Handling) Rules 2000

ii) Hospital Waste (Management & Handling) Rules.

8.8 EXNORA through its several civic associations and several other resident associations have been active in door-to-door collection of solid waste in their neighbourhoods. This has been a significant feature for several years and Chennai City has a good standard of awareness and action for solid waste management at local levels.

Estimates of Generation of Solid Waste

8.9 Based on the per capita generation of solid waste it is estimated that by 2026 about 6590 tonnes of solid waste will be generated in the local body areas of CMA including Chennai City.

Local Body	Tonnes
Chennai Corporation	3400
Municipalities	2050
Town Panchayats	550
Panchayat Unions	540
All Local Bodies	**6590**

8.10 The ERM study of 1996 had recommended solid waste management coverage in the City to be increased from 90% (1996-2000) to 100% (2001-2005). In respect of municipalities from 50% (1996-2000) to 70% (2001-2006) and 100% (2005-2011). In respect of Town Panchayat it was to be 10%, 30% and 70% respectively. More information on this study may be seen in Volume III.

8.11 No separate estimates are available for other types of wastes. There is urgent need to institute a study to assess the quantities of the following categories of wastes to plan for their management.

i) Domestic and commercial waste – Compostable, recyclable

ii) Industrial waste – non-hazardous and hazardous

iii) Hospital/biomedical waste – non-hazardous and hazardous

iv) E-waste – recyclable and non-recyclable

v) Construction debris – reusable as building material

B. Policies and Strategies

8.12 a) The provisions of the Central Act relating to solid waste management and the MSW (Handling and Management) Rules, 2000 should be strictly enforced by the concerned agencies within CMA.

b) Environmental assessment has to be made for existing landfill sites and suitable measures have to be taken for their improvements.

c) Solid waste management is one area where citizens and private sector participation is crucial to ensure health and safety in cities. Awareness should be generated about the need for source segregation and differential disposal. Residents associations and NGOs have attempted to reduce the burden on the local bodies through local segregation of solid waste, composting and recycling but these have not made any sustained impact due to several reasons including little encouragement from local bodies.

d) Under the "Polluters Pay" principle, local bodies can collect a levy from bulk garbage generators such as hotels, marriage halls, markets and commercial complexes.

e) Mechanical handling of wastes using auto-tippers, tricycle and push carts can be encouraged to minimize human contact.

f) Since solid waste management is becoming complex, the technical and managerial skills including project formulation, financing and monitoring and supervision of personnel in the local bodies should be strengthened.

g) A separate solid waste management action plan will be required to be made with the principal stakeholders and including the citizens and private sector following the comprehensive ERM study.

C.The Plan

8.13 A comprehensive solid waste management Action Plan as a sequel to the ERM Master Plan has to prepared taking into account

i) The mechanisms to be introduced for segregation of wastes at the source

ii) Reducing extent of waste to be handled at landfill through local and neighbourhood level composting and recycling facilities.

iii) Establishing a number of decentralized sanitary landfill facilities to be shared with local bodies in the area.

iv) Establishing safe recycling facilities for e-waste and construction debris.

v) Instituting an education and awareness programme for children, youth and citizens on scientific solid waste management.

vi) Providing incentives to private sector to participate in the reduction, segregation, transport, recycling and final disposal of all types of solid wastes.

vii) The specific responsibility to be assigned to stakeholders in the implementation of the plan

8.14 The Plan identifies the existing landfill sites and the new sites proposed by municipal bodies and restrictions on development of residential, commercial activities in their neighbourhood.

8.15 The Plan recommends strict enforcement by TNPCB of the statutory rules relating to solid waste management, bio-medical waste and other wastes both hazardous and non-hazardous.

8.16 The Plan identifies the parameters to be adhered to with respect to aspects of solid waste management to be complied by new developments, houses, apartments, commercial complexes, and industries. These have been incorporated in the Development Regulations in Volume II.

8.17 The Plan recommends institution of decentralized waste to energy plants on the lines of the Bio-Methanation plant set up by CMDA in Koyambedu Market and other successful and well proven technologies available.

E. Monitoring and Review

8.18 A committee to be known as “Shelter and Infrastructure Committee” with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector including solid waste management and to initiate such studies and assemble such information as needed for the purpose. This committee will meet at least once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

8.19 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Chapter IX

Macro Drainage System in CMA

A. Current Situation

9.1 Chennai City and environs are very flat with contours ranging from 2m to 10 m above MSL with a few isolated hillocks in the southwest at St. Thomas Mount, Pallavaram and Tambaram. It is traversed by three major rivers namely Kosasthalaiyar River, Cooum River and Adyar River. The climate of the region is dominated by the monsoons, which are caused by thermal contrast between land and sea. Monsoon climates are characterized by clearly marked seasons with specific types of wind and weather. The South West monsoon dominates weather patterns in Tamil Nadu from July-September and is characterized by periods of sultry wet weather. Rain shadow effects limit rainfall in the East Coast in Tamil Nadu and it is light or intermittent during this season. This period is followed by North-East Monsoon, which brings cool cloudy weather, relatively free of rain over most of the monsoon-dominated land (India). The exception is South-East-India including Tamil Nadu where about 50% of the annual rainfall occurs at this time. The start of the heavy rains usually falls in October lasting up to December. Most of the rainfall is associated with clear synoptic systems of depressions and cyclones with night time rainfall most common. In CMA most of the rainfall occurs between October and December.

9.2 River Nagari which has a large catchment area in the Chittoor District (Andhra Pradesh) region and the Nandi River, which has catchment area in the Vellore District, join and enter Poondi Reservoir. Kosasthalaiyar River, which has its origin near Kaveripakkam, has a branch near Kesavaram Anicut and flows to the City as Cooum River and the main Kosasthalaiyar river flows to Poondi reservoir. From Poondi reservoir, Kosasthalaiyar River flows through the Tiruvallur District, enters CMA, and joins the Sea at Ennore.

9.3 Cooum River from the Kesavaram Anicut flows through the Kancheepuram District enters CMA and finally reaches Sea near Fort St. George. Adyar River having its catchment area in the Kancheepuram District and originating from the Pillaipakkam Tank Group and Kavanur Tank Group flows through the CMA enters the City and reaches Sea near Adyar. Sholavaram Tank, Red Hills Tank and Chembarambakkam Tank are the major water bodies in the CMA. Sholavaram Tank is the secondary storage tank receiving water from the Poondi Reservoir via Poondi Feeder Canal to supply Red Hills Tank. Red Hills Tank is the main source of water supply to the Chennai City and during storm events water is released to Red Hills

Surplus Channel, which enters the Kosasthalaiyar River and discharges into the Sea. Its maximum storage capacity is 3285 Mft^3 (9.3 Mm^3). Chembarambakkam Tank has recently been developed as one of the sources for water supply to Chennai City and has maximum storage capacity of 103 Million m^3.

9.4 In spite of the fact that the region has such large lengths of drainage (158 km) and extensive water storage systems of tanks and reservoirs the region especially the City suffers from regular annual flooding of developed and settled areas.

9.5 The last century records have shown that there were several catastrophic flooding in Chennai in 1943, 1978, 1985, 2002 and 2005 caused by heavy rain associated with cyclonic activity. These events of catastrophic flooding were found to be attributable to failure of the major rivers and other drainage systems. Flooding of less catastrophic nature occurs regularly in low-lying areas of the City and its suburbs because of inadequacy or inoperativeness of the local drainage infrastructure.

9.6 The floods in 1943 were historic and damaged Cooum river very badly. Based on the Er. A. R. Venkatachary's Report the Government had improved the Cooum river and provided a sand pump at the river mouth for removal of sand bar.

9.7 In 1976, there was catastrophic flooding in Chennai and this time it was the turn of the Adyar river. Er. P. Sivalingam Committee had given its recommendations for prevention for further damages from floods and recommended schemes to be implemented in the short and long terms.

9.8 The floods that occurred in 2005 were the worst in living memory. Although several ameliorating measures have been implemented they have failed to provide total relief to Chennai citizens.

9.9 The reasons for this state of affairs are three-fold. Most of the existing waterways are silted and their flow channels and banks are obstructed with encroachments and structures. Similar is the case with the reservoirs and tanks. Secondly several of the areas under tanks and their anicuts have been developed as residential neighbourhoods over the years. T. Nagar, Nungambakkam, Vyasarpadi are instances in this respect. The Taramani area has been developed as an institutional area. Thirdly the geological structure particularly in the south-west is not conducive to water infiltration.

9.10 The annual flooding of low-lying areas has besides causing loss of property, is disrupting the life of many slum dwellers through displacement and heavy expenditure on their relief, loss of manpower in industry and business and damage to infrastructure. More importantly it impinges on the health of the citizens through epidemics like dysentery, typhoid and cholera. Malarial as well as other types of mosquitoes have returned to Chennai in full force.

9.11 Several studies have been made to analyse the situation and find solutions to mitigate the problems of flooding and cleaning up of the environmentally degraded waterways particularly the Cooum, Buckingham Canal and Adyar. A map showing water bodies and flood plains is annexed**.** The more important studies made so far are listed below:

i) Er. P. Sivalingam Committee report, 1976
ii) PWD Nucleus Cell Report, 1980
iii) Madras Metro Flood Relief / Storm Water Drainage Master Plan Study, 1993
iv) Storm Water Drainage Master Plan for Madras City and Pre-feasibility Study for CMA,1994
v) EIA of the Drainage and Redevelopment Proposal For the Pallikkaranai Area, 1995
vi) Review of EIA by NEERI, 1998

Drainage study for Pallikkaranai

9.12 The Drainage study for Pallikkaranai was included as part of the MMFR/SWD master plan study. The aim of the study is to identify ways of providing protection to an area about 30 Sq.km. lying in and around Pallikkaranai. The area was earmarked for development and the development was to be promoted by a number of government and private bodies then. For the purpose of the study the area was referred as Pallikkaranai Drainage Area (PDA). The aim of the project was to protect an area of approximately 30 sq.km. from flooding. It could be achieved by a diversion of substantial portion of run-off from upstream catchments along a cut-off drain linking the existing surplus channel close to a village called Karanai with the Kovalam Backwaters. Northern boundaries of Pallikkaranai Drainage Area cuts off the centre of the existing swamp area at Pallikkaranai. The area to the north will continue to be subject to inundation as run-off enters the area from north and west. Protection to the area is to be provided by three interceptor drains, which carry overland flows from local catchment around the boundary of the PDA. An arterial drain has to be constructed along the centre of the PDA, which will pick up drainage flows within the area.

B.Principal Stakeholders

9.13 The principal stakeholders for managing the macro drainage system is the PWD with some transferred responsibility to Chennai Corporation and Metrowater. Revenue department is also an important stakeholder as it is in charge of the lands covered by waterways and reservoirs. The micro drainage – storm water drainage system is the responsibility of the Municipal Corporation, Municipalities and other Local Bodies.

C. Policies and Strategies

9.14 i) The most important policy would be to convert the present constraints in disposal of flood waters as an opportunity to manage and use the excess water for augmenting urban water supply through creation of additional storage capacity.

ii) Developing a network of open spaces to provide green environment would enable them to be used as flood moderators during critical months of the year.

iii) The PWD needs to be made the nodal agency for holistic planning and maintenance of existing water bodies by preventing encroachments and implementation of macro drainage systems.

iv) Micro drainage would be the responsibility of the local bodies and they would need to be fully and effectively integrated with the macro system.

D. The Plan

9.15 i) The CMDA's land use plan identifies all the important macro drainage features and prescribes the extent to which the conservation area extends. The lakes and water bodies need to be protected from encroachments and existing encroachments should be removed bringing the water bodies to their original state.

ii) The land use plan identifies the critical areas subject to annual flooding for taking up remediation measures by local bodies in collaboration with the PWD.

iii) The land use plan also identifies areas where developments other than those appropriate to use them as open spaces have to be prohibited or severely restricted. These include the Pallikkaranai swamp and the Redhills catchment area.

iv) The parameters for safeguarding waterways and water bodies from undesirable developments are incorporated in the Development Regulations.

v) The Plan recommends implementation of measures recommended in the MMFR/SWD Master Plan Study Report.

vi) For each local body, a micro drainage plan can be prepared by the local body concerned in consultation with PWD and implemented within a time frame.

E. Monitoring and Review

9.16 A committee to be known as "Shelter and Infrastructure Committee" with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector including macro drainage system and to initiate such studies and assemble such information as needed for the purpose. This committee will meet atleast once in three months or as many times as needed. It will draw up detailed Terms of Reference for its work in consultation with the concerned stakeholders.

9.17 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Chapter X

Disaster Management

A. Introduction

Natural disasters can neither be predicted nor prevented. The problem before us is how to cope with them, minimizing their impact. Tamil Nadu has witnessed havoc caused by cyclones and storm surge in the coastal regions, earthquakes, monsoon floods, landslides, and recently the Tsunami. Increase in urban population coupled with the construction of man-made structures often poorly built and maintained subject cities to greater levels of risk to life and property in the event of earthquakes and other natural hazards. One of the main objectives is to reduce the risk of loss of human life and property and to reduce costs to the society. We have to recognize that in such cases of natural disasters, we deal with phenomena of enormous magnitude that cannot be controlled by any direct means of human intervention. But what we try to do is to reduce the impact on human beings and property.

B. Current Scenario

10.2 Details of hazard-prone areas in Chennai Metropolitan Area are given below:

(i) Earth Quake-Prone Areas:

Chennai Metropolitan Area falls under Seismic Zone – III. The whole of Chennai Metropolitan Area falls in this zone.

(ii) Cyclone-Prone Areas:

In Chennai Metropolitan Area, it extends to a distance of 20 km. from the coast. In these areas, the risk is due to (a) cyclonic wind velocities combined with heavy storm, (b) flooding by seawater due to high waves and (c) flooding due to heavy storm.

(iii) Flood-Prone areas:

From the flood hazard map of India (mapped by meteorological department, New Delhi), it is seen that no area in Tamil Nadu falls in the risk zone. But within a local body area, particularly with reference to an area's proximity to a major drainage system like rivers, canals, and also water bodies like lakes, and further with reference to contour levels/low-lying areas, flood prone area mapping has to be done.

In Chennai Metropolitan Area, there are a few areas along the rivers and canals and low-lying areas, which are susceptible to flooding/inundation during heavy storms. Map showing the floodable areas [macro level]

identified in the Madras Metro Flood Relief / Storm Water Drainage Master plan is annexed. Existence of macro and micro drainage networks in Chennai Metropolitan Area facilitates draining of these areas within a reasonable time. Developments in such low lying areas are allowed only when a proposed development conforms to standards and after getting clearance from PWD on the measures to be taken to make it free from inundation.

(iv) Tsunami-Prone areas:

Mapping has to be done of the areas where the tsunami of December 2004 had directly hit and flooded the coastal areas in Chennai Metropolitan Area has to be done. These areas may have to be zoned as Tsunami prone areas. However this area within Chennai Metropolitan Area will fall within the CRZ area 500 metres from HTL along the coast.

10.3 Disaster Management Policy: Tamil Nadu has been having a Disaster Management policy since 2004-05. The thrust of this policy is more on pre-disaster activities of preparedness, prevention and mitigation than on post-disaster measures of relief, rehabilitation and reconstruction. The key components of this policy are the following:

(i) Convergence of disaster management and development planning

(ii) Formulation of disaster management plans at all levels taking into account the local conditions

(iii) Focusing on the reduction of vulnerability of communities instead of mere disaster relief

(iv) Fostering a culture of prevention among the community and various organs of Government through training and awareness campaigns

(v) Involving the community at all stages in disaster management activities and

(vi) Creating a trained and committed volunteer force on the line of home guards for disaster management.

C. Strategies

10.4 Development Control Rules for CMA provide for regulating the constructions with reference to zone, location, height, number of floors, size of buildings, setback spaces to be left around, and the use of the building and land. Building rules under the Local Bodies Acts provide for regulation of location of buildings, foundations, plinths, superstructures-walls, floors, and rooms, licensing of surveyors and inspection of municipal engineers at various stages of constructions, regulations on dead and superimposed loads, wind load/pressure, reinforced cement

concrete and framed structures, construction materials, etc. Structural safety and soundness are regulated under the building rules under the Local Body Acts. Hence early action should be taken to include Special Rules for Hazard Prone Areas in the Building Rules of the Local Bodies and effectively enforce the same.

10.5 Most of the components of the GOI-UNDP Urban Earthquake Vulnerability Reduction Programme are also applicable to other natural disasters viz. cyclones, landslides, floods and Tsunami. Hence the awareness generation, development of techno-legal regime, earthquake preparedness and response plans, training and capacity building should be done covering these natural hazards also and the State Nodal Agency may take appropriate action on these.

10.6 Even after the GOI-UNDP DRM programme period, the State Nodal Agency should continue these measures. Pre-disaster preparedness and pre-disaster management plans should be periodically reviewed and up dated.

D. Action Plans

10.7 (i) Early action to amend the building bye-laws of local bodies should be taken to include special provisions for hazard prone areas and enforce the same since the whole of Chennai Metropolitan Area falls in Seismic Zone-III now and it also includes cyclone-prone areas to a major extent.

(ii) The elected representatives of local bodies and Government functionaries should be trained to promote community based disaster risk management (CBDRM) and to integrate vulnerability and risk reduction components into all development programmes.

(iii) A volunteer force for every ward / village should be raised and they should be given all encouragement to take up disaster preparedness and mitigation activities.

(iv) Disaster management teams at wards/panchayats level from out of the volunteer force may be created and they may be trained in specific areas like early warning, immediate rescue, first-aid, food management, shelter management, water supply and sanitation, damage assessment, etc.

(v) The CBDRM planning should be participatory and the public should have a say in the formulation of programmes.

(vi) The needs of vulnerable sections of society must be addressed such as persons with disabilities, people with HIV AIDS and other socially marginalized sections.

(vii) Conducting regular skill up-gradation, strengthening of local coping mechanism and conducting mock drills should be important components of preparedness strategy.

E. Monitoring and review

10.8. Committee may be constituted under the Chairmanship of the Mayor of Chennai Corporation with representatives from other local bodies, representatives of community based organization and Non Governmental organizations, officials, etc. to monitor implementation of plans relating to disaster preparedness and mitigation.

Chapter XI
Environment

A. Introduction

Sustainable cities are fundamental to social and economic development. As stated in the tenth plan document of the National Planning Commission, sustainability is not an option but imperative. For a better world to live in, we need good air, pure water, nutritious food, healthy environment and greenery around us. Without sustainability, environmental deterioration and economic decline will be feeding on each other leading to poverty, pollution, poor health, political upheaval and unrest. The environment is not to be seen as a stand-alone concern. It cuts across all sectors of development. We have to improve our economic growth rate, provide basic minimum life support services to large section of our population and deal with the problems of poverty and unemployment. At the same time, we have to pay attention to conserving our natural resources and also improving the status of our environment.

11.2 Environmental deterioration is not a necessary or inescapable result of urbanization; what needs to be done is striking a right balance – in making development in such a way that they are more effectively attuned to environmental opportunities and constraints.

11.3 The metropolitan environment comprises mainly two components viz. (i) environment per se, and (ii) the habitat. The environment per se relates to natural features and resources including the air, noise, water and land (open spaces, forests etc.). The habitat is related to built environment and infrastructures such as water supply, sewerage, and solid waste disposal. The conservation of natural resources includes management of air, noise, water and land.

B. Current Scenario

11.4 One of the principal targets of Millennium Development Goal 7 is 'to ensure environmental sustainability". In the past few years under pressure of development environmental sustainability in CMA has received a heavy beating.

Pollution of Waterways

11.5 The most visible manifestation is the severe pollution of the six major waterways and drains, viz. Cooum, Adyar, Buckingham Canal, Captain Cotton Canal, Otteri Nallah and Mambalam drain. The sewage carried by them is of the order of 532 MLD, which is more than the quantity of sewage collected from the City for treatment by the Metro water treatment plants. The waterways of Chennai are not perennial in

nature and receive flood discharge only during monsoon season; in the rest of the year they act as carriers of wastewater from sewage treatment plants and sewage from defective storm water outlets.

11.6 TNPCB under the Monitoring of Indian National Aquatic Resources(MINARS) programme periodically monitors the water quality of the City waterways. Water samples are collected and analyses by TNPCB every month at Buckingham Canal (at north, central and south stretches), Otteri Nallah, Adyar River and Cooum River. According to TNPCB, all these water bodies in the City are polluted and not suitable for any designated uses (viz. drinking, bathing, propagation of wild life like animal husbandry and fisheries, industrial, cooking and washing and agriculture); level of contamination is relatively high in Buckingham Canal followed by Otteri Nallah and Cooum River.

11.7 The sludge disposal consultancy study conducted in 1994 by the consultant M/s. Mott MacDonald Inc. has revealed that contamination of waterways and anaerobic digestion of wastewater flowing in the waterways has led to the accumulation of sludge causing hindrance to the hydraulic functioning of the waterways and also causing contamination of waterways in the eco system.

Air Pollution

11.8 The invisible part yet the more dangerous one is the air pollution load. The major contribution is by the vehicular sector (71.28%) followed by industrial sector (19.70%). According to TNPCB at major traffic intersections the TSPM and RSPM values are exceeding the standard values. Pollution by industries is widely prevalent in the Manali industrial complex and surrounding areas. The annual average pollution load for industrial areas—sulphur-di-oxide, oxides of nitrogen, RSPM & TSPM are way above the acceptable levels.

Pollution by Urban Solid Waste

11.9 The disposal of wastes – solid waste, bio-medical waste, hazardous industrial wastes is a major problem and the municipal dumping yards at Kodungaiyur and Perungudi which are generators of green house gases and smoke due to burning have degraded the environment around them severely.

11.10 In the recent past, one of the major pollution problems identified is the one due to the non-degradable plastic wastes. The preventive, promotional and mitigative aspects considered to tackle this problem by the authorities concerned include source segregation of municipal wastes, raising consumer and public

awareness, specifying plastics suitable for recycling, penalties for littering and specifying minimum thickness of plastic carry bags.

Noise Pollution

11.11 The noise level survey conducted by the TNPCB reveals that noise level exceeded the limits mostly in commercial areas, mainly due to vehicular movement. During festive seasons in Chennai, the noise levels were noted high and particularly during Deepavali it exceeded 120 dB.

Environmental Hotspots

11.12 Chennai is blessed with diverse types of environmental areas natural as well as manmade, which is rare for urban areas. The long coastline, with wide sandy beaches, Marina being the foremost, wetlands and estuaries, hillocks with forest cover are the few. The Guindy National Park and the Vandalur zoo area are unique to urban areas. Manmade reservoirs designed for urban water supply and irrigation, patches of productive agricultural land, good aquifer recharge areas add to the value of CMA. The environs of CMA are equally well bestowed in this respect with the Pulicat Lake in the north, the Nagari hill range in the northwest and Muttukadu in the south. Many of these features are home to local and migrating birds, turtles and other wild life.

Green Cover:

11.13 Chennai City has only about 2% of the area as declared parks. In Chennai Metropolitan Area, the declared forest cover is about 24 sq. kms, which is about 2 percent of the CMA area. However, satellite imageries show that green cover over the City due to trees along roadside and within the sites is of considerable extent. There is ample scope for further development of this green cover within the City and also in the rest of CMA, particularly along roads, drains, riverbanks etc.

Climate Change

11.14 It is recognized now that climate change due to global warming is going to be an important threat to safety of millions of people not only living near the coastline but also in the interior because of its impact on changing rainfall patterns and cyclones.

11.15 Chennai is a flat coastal city subject to regular cyclonic storms and extensive inundation during the northeast monsoon period. Hence it is necessary to take into account ways and means of tackling the effects of climate change in a planned manner. Knowledge on this subject is only gaining ground in recent times. We need to absorb latest information and technology in this discipline not only to cut

down green house gas emissions from urban activities but also anticipate the effects of climate change on the economy and life of people to take timely remedial measures.

Cremation grounds

11.16 Chennai Corporation is maintaining 29 conventional burial and cremation grounds and 4 electrical crematoriums. The conventional burial and cremation grounds require more space and firewood to burn the bodies and conventional burning has the element of air pollution in the vicinity apart from adding to the depletion of tree cover.

CMDA's Programme

11.17 Following the implementation of Sustainable Chennai Project, CMDA has been promoting a Community Based Environmental Programme (CBED), which aims to achieve sustainable urban development with the active involvement of stakeholders particularly in identifying the local environmental problems, formulating workable proposals and providing monetary contributions. While CMDA gives 80% of the project cost as grant, the local body and the community have to contribute 10% each. Every local body can avail a maximum of Rs15 lakhs per year as grant under this programme.

C. Principal Stakeholders

11.18 Environment has strong intersectoral linkages and hence safeguarding the environment becomes the responsibility of almost all development agencies both Government and non-government besides the citizens residents and entrepreneurs irrespective of their occupation. The principal stakeholders are TNPCB, which is the standard setting and monitoring agency for pollution control and abatement, the local bodies, PWD, Department of Environment, Government of Tamil Nadu and CMDA itself.

D. Policies and Strategies

11.19 The emerging environmental problems related to land, air, noise and water have to be dealt with and the natural assets safeguarded through sound polices and effective action.

a) In view of the intersectoral linkages and existence of a large number of stakeholders TNPCB should be designated as the nodal agency responsible for all environment matters in the region.

b) A sustainable environmental policy for Chennai in line with the National Environment Policy incorporating resource efficiency, efficient, cost minimisation and 'polluter pays' principles should be formulated.

c) Environmental planning and development units in every department concerned in the development of CMA should be established.

d) A campaign to reduce emission from vehicles should be launched. This should be combined with stricter enforcement, increasing the share of public transport vis-à-vis private transport and encouraging fuels like CNG, LPG etc.,

e) Corporation of Chennai and other local bodies should construct adequate number of toilets in public places. Once this is completed, the obnoxious practice of defecating in the open should be strongly discouraged through effective action.

f) CRZ regulations should be strictly enforced.

g) All the development agencies within CMA and the local bodies should be required to prepare for their area of jurisdiction and sector a long term plan for environmental conservation and enhancement and implement it through annual plans and programmes.

h) Pollution levels should be reduced to acceptable standards in the waterways of Chennai in the next five years and establish a system to improve the quality of waterways to desirable standards progressively.

i) Grey water recycling / harvesting should be encouraged.

j) Government may examine the levy of congestion tax. At the same time, incentives for contribution to environmental improvement by way of tax concession may be examined.

k) To reduce noise pollution, measures such as traffic calming in residential areas and declaration of certain busy streets as pedestrian precincts in consultation with the business and local community can be considered.

l) TNPCB can conduct a detailed study and prepare an Environmental Management Plan (EMP) for Chennai Metropolitan Area identifying the problem areas, hotspots, and proposing solutions for improving environment by the concerned agencies.

m) To increase green cover local bodies concerned particularly in the rest of CMA have to plan and implement tree planting programmes not only along the public roads maintained by them but also within the public premises with local people's participation.

n) Maintenance of existing parks / playgrounds and provision of new parks and playgrounds in the rest of CMA requires attention. A database on the existing parks & playgrounds within CMA can be created which is required for planning and its development.

o) Water bodies should be developed as picnic spots, which would not only help in preservation but also generate revenue for better maintenance.

p) Conservation of heritage buildings and precincts should be promoted through incentives and the mechanism of Development Regulations.

E. The Plan

11.20 a) The plan identifies TNPCB as the nodal agency for the environment sector.

b) The plan identifies the environmentally sensitive areas for protection, conservation and environmental enhancement. A few of these sites such as Nanmangalam RF can be developed as nature appreciation parks for the environmental sensitization of people of all age groups.

c) The Plan has recommended specific actions in the sectors of economy, land-use, shelter, infrastructure particularly water supply, sanitation and drainage, traffic & transportation and waste management in the respective chapters.

d) The Plan incorporates regulations for land and building use development to achieve green building parameters and increasing greenery in all developments.

e) The Greening concept which includes development of greenery and tree planting in public and private spaces, protection of trees and enhancing biodiversity will be implemented through specific action plans.

f) The Plan provides for strengthening the community based environment improvement projects in the local body area.

g) The Plan provides for the conservation of natural assets like the coastal areas including beaches and the Pallikkaranai swamp.

A map showing eco sensitive and other conservation areas is annexed.

F. Monitoring and Review

11.21 A committee to be known, as "Land use and Environment Committee" with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector and to initiate such studies and assemble such information as needed for the purpose.

This committee will meet atleast once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

11.22 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Chapter XII

Spatial Strategy and Land Use Planning

A. Introduction

Location of various major urban activities and introduction of transport links since the establishment of Chennai in the 17th Century has had significant impact on the current urban form of the City. The urban form of Chennai Metropolitan Area has been dictated by developments along the major roads and rail links radiating from the center of Chennai. A detailed account of how the city developed over the last few centuries is given in volume III.

B. Current Situation

12.2 The main road corridors from north to south are the Kolkotta National Highway (NH 5), the Chennai Thiruvallur High Road (NH 205), the Poonamallee High Road (NH 4), the Arcot Road, the Mount-Poonamallee Road, the Grand Southern Trunk Road (NH 45), Rajiv Gandhi Salai (Old Mammallapuram Road) and the East Coast Road.

12.3 The rail corridors are the railway line to Gummidipoondi and beyond on the North, the railway line to Arakkonam on the west, the rail line to Chengalpattu on the south-west and the MRTS link along the Buckingham Canal to Velachery.

12.4 The stages of urban expansion between 1971 and 2006 are indicated in the map annexed. It can be seen from these maps that till now a urban form has developed in the shape of a half star with interspersed green wedges. These green wedges are getting filled up due to improved accessibility created through construction of ring roads during the last decade.

Activities Influencing Urban Form

12.5 The significant developments /decisions of the recent past, which would have far reaching influence on the future urban form and structure are

- New road infrastructure projects – Rajiv Gandhi Salai, extension of NH Bye-pass from Maduravoyal to Redhills and formation of outer ring road and other ring connections.
- Developments along IT corridor in the southern part of CMA along the Rajiv Gandhi Salai (Old Mammallapuram Road).
- Redevelopment for commercial and IT Parks and in residential and non-residential areas with multi-storeyed buildings.

- Conversion of manufacturing units especially in industrial estates at Guindy and Ambattur into IT industries.
- Strengthening of the suburban railway infrastructure to Gummidipoondi, Arakkonam and Chengalpattu and extension of MRTS.
- Proposed construction of Metro Rail from Beach to Airport and Washermanpet to St. Thomas Mount.
- Location of large scale manufacturing industries in the Orgadam-Sriperumbudur Corridor as well as on the GST Corridor.
- Location of the new Chennai Airport on the west.

12.6 These development actions are expected to modify the form from the half star mentioned earlier to concentric half circles engulfing the green wedges that had been left undeveloped earlier. The urban structure beyond the City limits is also expected to shift from a predominantly low-density low-rise development to medium density developments interspersed with high-rise buildings.

C. Principal Stakeholders

12.7 The evolution of the emerging structure is the result of intensified activities of infrastructure development departments of central as well as state governments. Real estate developers and private entrepreneurs are taking advantage of such infrastructure developments to spread urban development all over CMA. The principal stakeholders in each sector have already been indicated in the earlier part of the report. CMDA will be the main agency for ensuring orderly spatial developments.

D. Vision for Chennai

12.8 As explained earlier the Vision 2026 is to make Chennai a prime metropolis which will become more livable, economically vibrant, environmentally sustainable and with better assets for the future generations.

E. Objectives of the Spatial Plan

12.9 The objectives of the Spatial Plan for Chennai are to provide:

i) Optimum utilization of land by channalising the developments in the right directions and locations.

ii) The future land needs of the metropolitan area by recognizing the existing growth trends and strengthening the infrastructure links needed.
iii) Efficient transportation network integrating work, living, shopping and recreation areas to arrive at balanced developments.
iv) Wider scope for decentralized employment locations and economic development.
v) Preservation and conservation of ecologically sensitive areas and natural and built heritage.

F. Strategies

12.10 This metropolitan growth scenario based on the vision is proposed to be effected through the following strategies:

a) Encouraging growth outside the CMA on the main corridors.
b) Strengthening the potential for growth in the three satellite towns of Gummidipoondi, Thiruvallur and Maraimalai Nagar and creation of new ones near Tiruporur in the south and near Sriperumbudur in the west.
c) Creating urban foci in the amorphous developments in the City as well as in the outlying municipal towns incorporating commercial and environmental hubs, heritage precincts and buildings to develop interesting city images.
d) Providing opportunities for development of composite neighbourhoods on the outer ring road.
e) Demarcating areas of significant ecological and water resource values for preservation and conservation.
f) Instituting specific Area Development Projects for upgrading quality of life in City sectors and neighbourhoods.
g) Restructuring the zoning strategy to promote development.
h) The main problem of the CMA is excessive concentration of population and economic activities. The trend of migration for gainful employment is by and large towards the CMA, resulting in diseconomies of scale. This situation calls for channalisation of economic activities to the other major cities in Tamilnadu.

Land Use Zoning

12.11 The purpose of land use zoning is to segregate certain uses particularly hazardous and environmentally unsuitable uses from other urban uses of work, housing and recreation to reduce the effect of negative externalities, which the former have on the latter. By providing spatial segregation of highly conflicting uses it benefits some uses to find advantage in being grouped together with other similar uses. Thus separation of hazardous industries would enable provision of special infrastructure to safeguard environmental quality at the same

time providing reduction of costs in providing certain common public services. Because of zoning's vital role in planning, modern strategies encompass expanded objectives for supplying essential public amenities such as open spaces for recreation, conservation of prime agricultural land and protection of ecologically sensitive areas from unsustainable uses.

Mixed Land use Zone

12.12 The concept of mixed land use zone has been prevalent in Chennai since 1975 and is part of the First Master Plan itself. In the Indian context mixed land use zoning is gaining importance particularly because of the existence of a large informal sector. Based on the experience of the First Master Plan this Plan in addition to providing a range of uses that can possibly be permitted in the various zones has designated a new zone namely the urbanisable zone. This is in addition to the nine other designated zones namely Primary Residential, Mixed Residential, Commercial, Institutional, Industrial, Special & Hazardous Industrial, Open Space & Recreational, Non-urban and Agricultural use zones.

12.13 The purpose of creating an urbanisable zone is to eliminate the unnecessary freezing of land uses, which would normally happen if a particular use which may not find favour in locating in that area is specified in advance. This urbanisable zone facilitates most environmentally safe urban uses paving the way for demand driven developments to take place without affecting the quality of life in the neighbourhood.

12.14 As a part of the non-urban use zone natural environment to be protected from urbanization such as forests, streams and other water bodies including the numerous tanks and eries and swamps and other lands unsuitable for urban development are to be prevented for urban development such as water recharging and recovery areas have been zoned specifically for these purposes.

12.15 Employment generating activities have been zoned along the major transport corridors and are permissible in a limited way in the mixed residential and commercial zones.

12.16 The coastal areas being an important feature in terms of economy and environment of CMA the zoning along the coast has been carried out in accordance with CRZ regulations, II and III and incorporated appropriately in the land use plan.

12.17 Existing Land Use in 2006 and Proposed Land Use 2026 are given in the tables below.

Table No.12.1 Existing Land use 2006				
	Chennai City		Rest of CMA	
	Extent in Hectares	%	Extent in Hectares	%
Residential	9523	54.25	22877	21.87
Commercial	1245	7.09	390	0.37
Industrial	908	5.17	6563	6.28
Institutional	3243	18.48	3144	3.01
Open Space & Recreation	366	2.09	200	0.19
Agricultural	99	0.57	12470	11.92
Non Urban	82	0.47	2433	2.33
Others (Vacant, Forest, Hills, Low lying, Water bodies etc.,)	2087	11.89	56507	54.03

Table No.12.2 Proposed Land use 2026				
	Chennai City		Rest of CMA	
	Extent in Hectares	%	Extent in Hectares	%
Primary Residential use zone	5916.35	33.58%	32090.68	31.68%
Mixed Residential use zone	2426.90	13.78%	13503.10	13.34%
Commercial use zone	714.24	4.05%	880.35	0.86%
Institutional use zone	2868.97	16.28%	3888.85	3.83%
Industrial use zone	691.83	3.93%	7274.33	7.18%
Special and Hazardous Industrial use zone	130.67	0.74%	3416.08	3.38%
Open Space & Recreational use zone	1000.65	5.68%	392.86	0.38%
Agriculture use zone	------	-------	7295.81	7.20%
Non Urban	113.31	0.64%	2332.92	2.30%
Urbanisable			2075.89	2.05%
Others (Roads, water bodies, hills, Redhills catchments area, forests etc.,)	3754.79	21.31%	28147.55	27.79%
Total	17617.70	100.00%	101298.42	100.00%

12.18 It may be observed that while there is no great increase in extent of lands zoned for urban activities the intensity of development is likely to increase in sparsely developed and less developed areas to optimum levels thus increasing the efficiency of urban form. Restricting reclassification and open layout developments would prevent urban sprawl beyond the area zoned for urban development.

12.19 The land use plans are given in the map numbers MP-II/CMDA 1/2008 to Map No. MP-II/CMDA.15/2008, read with MP-II/City 1/2008 to MP-II City 42/2008 and MP-II/CMA 1/2008 to MP-II/CMA 250/2008(except no.7 and 173 for Thiruverkadu Municipality and Senneerkuppam village of Poonamallee Panchayat Union which are covered by approved DDP).

Density and FSI

12.20 Chennai within the City Corporation limits is one of the denser cities in India. As per 2001 census its density varies from 180 persons per ha. in Saidapet and Mylapore zones to 368 persons per ha. in Kodambakkam zone. The gross density for Chennai City is of the order of 247 persons per ha. As per the projected population demand the density of the City is anticipated to go up to 330 persons per ha. by 2026. During the same period the average densities in the outlying areas are expected to go up as noted below:

- Municipal Towns 149 persons per ha.
- Town Panchayats 78 persons per ha.
- Rest of Panchayat Union Areas 32 persons per ha.

12.21 Floor Space Index (FSI) would be one of the principal tools to regulate density of development with reference to infrastructure availability and provision. Density not only needs to be linked to carrying capacity of land and infrastructure but also to several sociological parameters particularly for low income communities. After examining the issues in detail appropriate FSI parameters have been incorporated in the Development Regulations.

Setting a Clear Hierarchy of Roads

12.22 Till now, the emergence of a desirable urban form for optimal use of urban lands has been constrained by the absence of a hierarchy of roads to provide adequate access for movement of people and goods. The growing travel demand in the metropolis has also made it imperative to increase the extent of road space. While the First Master Plan ensured enhancement of road space by provision of missing links, widening of roads, construction of underpasses and over-bridges and flyovers the actions in the Second Master Plan would besides consolidating the earlier efforts seek to establish a clear hierarchy of roads and expand

the road availability optimally. For this purpose it will ensure that a person can have access to an arterial road or sub-arterial road within a distance of 2.5 kms. or ten minutes of travel time by a private travel mode. This would ensure equity in mobility and good accessibility across the entire CMA.

Development Regulations

12.23 In the light of the foregoing strategies and actions the Development Control Rules have now been reviewed and recasted to conform to the zoning and urban structure proposed for CMA. The major revisions are:

i) Permitting multi-storeyed buildings in the rest of CMA also (excluding the Island Grounds, approved layout areas, Aquifer recharge area and Redhills catchment area)
ii) Redefining special buildings as the ones exceeding 6 dwelling units
iii) Permitting IT buildings and bio-informatics centers in Mixed Residential, Commercial, Institutional use zones
iv) Proposing higher FSI of 2.00 for special buildings and group developments with dwelling units not exceeding 75 sq.m. in floor area each in the MRTS influence area between Luz and Velachery
v) Defining IT corridor along the Rajiv Gandhi Salai (Old Mamallapuram Road)
vi) Accommodating working women's hostels and old age homes in Primary Residential areas
vii) Proposing transfer of development rights in cases of road widening, conservation of heritage buildings, slum redevelopments etc.
viii) Providing for restricted developments in Aquifer Recharge area
ix) Providing for conservation of heritage buildings
x) Rationalising the planning parameters for special buildings with reference to plot extent, number of dwellings, and number of floors
xi) Revising the parking standards totally based on the recommendations made in recent consultancy study on parking requirements
xii) Reducing plot extent or side setback requirements
xiii) Enlarging the areas of incidental structures that are exempted from FSI calculations
xiv) Including provisions for persons with disabilities
xv) Allowing Multi-storey Building (MSBs) along 12 m and 15 m wide roads with limitations on FSI and height
xvi) Reservation of 10% of land for EWS/LIG with dwelling sizes not exceeding 45 sq.m. in the case of special buildings, group developments, multi-storeyed

buildings on lands of extent exceeding 1 hectare either within the site proposed for the development or in a location within a radius of 2 kms from the site under reference.

xvii) Allowing additional FSI 0.25 in cases of special buildings and group developments with dwelling units each not exceeding 45 sq.km. in floor area.

12.24 Listing of Heritage buildings and its notification after consultation with the owners, conditions to be imposed, contents of the agreement to be executed with the heritage building owners who get TDR, and detailed guidelines for allowing premium FSI etc will be decided separately.

G. Area Development Plans

12.25 While this Master Plan lays down policies and strategies and programmes at the CMA level many of the actions for improving the quality of life would have to be translated at the area level namely neighbourhoods and city or town sectors under each local body including the City Corporation. While the Town Planning Act provides for the making of Detailed Development Plans (DDPs) for this purpose, elaborating the land use linkages in each area, the substantial investments that are now available for infrastructure such as roads, water and sewerage, drainage and civic amenities under the JNNURM and TNUDF programmes provide opportunities to attempt comprehensive Area Development Plans in a systematic way. While the initiative for developing appropriate Area Development Plans would be that of the local bodies the CMDA would facilitate establishing these DDPs with the participation of the parastatal agencies and departments of government. While preparing DDPs the requirements at local area level will be considered and reservation of space as may be required for facilities such as schools, playgrounds and formation of missing road links etc. will be made. These DDPs would form the basic units or building blocks for improving quality of life to the citizens of Chennai and at the same time promote sustainable development.

12.26 One of the important components of the Area Development Plans particularly in the outlying areas would be the integration of unapproved subdivisions and layouts that have come up by supplying the missing parts of development so as to make these areas fit for urban habitation. Evidently this will have to be carried out with the full cooperation and consent of the owners of land as well as the local bodies concerned with appropriate fees levied to finance the missing infrastructure.

12.27 As a follow up of the Master Plan CMDA will initiate actions to institute Area Development Plans in various critical areas of the City as well as the outlying areas as a time bound programme.

H. Monitoring and Review

12.28 A committee to be known, as "Land use and Environment Committee" with representation of Government and non-government stakeholders and experts will be constituted to monitor the implementation of policies and strategies in this sector and to initiate such studies and assemble such information as needed for the purpose. This committee will meet at least once in three months or as many times as needed. It will draw up detailed terms of reference for its work in consultation with the concerned stakeholders.

12.29 This committee may work through special working groups created for the purpose for the different sub-sectors under it.

Chapter - XIII

Development Regulations

In order to regulate developments, the areas within CMA have been designated as one of the 10 use zones listed in the Development Regulations (except for areas of specific use such as Water Body, Forests, Roads, Railways etc.). The developments in these use zones will be regulated in accordance with Development Regulations, which form part of the Second Master Plan. In each use zone certain uses will be permitted normally and certain other uses will be permitted with the special sanction of CMDA. The main purpose of the Development Regulation is to promote development in accordance with the land use zoning contained in this Master Plan.

13.2 The following are the land use zones designated in the Master Plan.

1	Primary Residential use zone
2	Mixed Residential use zone
3	Commercial use zone
4	Institutional use zone
5	Industrial use zone
6	Special and hazardous Industrial use zone
7	Open space & Recreational use zone
8	Agriculture use zone
9	Non Urban use zone
10	Urbanisable use zone

13.3 Further in CMA areas for buildings of special character such as multi storeyed building areas, continuous building areas, and economically weaker section areas are also designated in the plan. Ecologically sensitive areas zoned include CRZ areas, Aquifer recharge areas, and Red Hills catchment areas. MRTS influence areas; IT Corridor and areas around Airports are shown as areas of special character. Development prohibited area namely Pallikkaranai swamp area, area around Indian Air Force station are clearly demarcated and shown in the Plan.

13.4 Land Use plans are numbered as Map No. MP-II/CMDA.1/2008 to Map No. MP-II/CMDA.15/2008 read with MP-II/City 1/2008 to MP-II/City 42 /2008 and MP-II/ CMA 1 /2008 to MP-II/ CMA 250 /2008

13.5 The grant of Planning Permissions within CMA shall be regulated in accordance with the Development Regulations. Development Regulations forming part of this Second Master Plan for CMA are given in Volume-II.

Chapter XIV

Monitoring and Implementation of Master Plan

A. Achieving Outcomes

The Chennai Master Plan has a clear vision to achieve through its interventions in the Second Master Plan. The objective is to make Chennai more livable, sustainable, and economically vibrant and to equip it with better assets to make it a prime metropolis in which all sections of people will prosper. In this effort CMDA has to work with a wide range and large number of stakeholders in the government, private and non-governmental sectors and with different sections of citizens and groups. The Master Plan has therefore laid down policies and strategies and Action Plans for implementation by the various stakeholders. A very important role of CMDA is to evaluate on a regular basis the progress made towards achieving the vision, the objectives and the programme so as to effect appropriate and timely corrections during the period of the Master Plan. For this purpose it needs to identify measurable indicators in the several sectors to monitor the progress made by the stakeholders individually as well as collectively.

B. Livability Parameters

14.2 The levels of improvement in urban quality as reflected through amelioration of poverty and unemployment, reduction of slums and provision of affordable housing and prevention and remediation of environmental pollution and damage, strengthening of resources and infrastructure would be the visible signs which portray how the City is moving towards its vision.

C. Use of Urban Indicators

14.3 The use of urban indicators worldwide has become widespread based on the successful outcome of the recommendations from Agenda 21 of Rio Conference. Many cities have already established a system of indicators for assessing the quality of life as also levels of sustainability achieved in their City and comparing it with other cities.

D. Development of Indicators for Chennai

14.4 The Plan proposes to evolve its own set of indicators and facilitate the stakeholders to assemble the required information on a regular basis and make it available to all

(a) to raise public awareness in City improvements and

(b) to measure the progress made.

14.5 The indicators are proposed to be established in thirteen sectors as worked out by Asian Development Bank *(Urban Indicators for Managing the Cities, Edited by Matthew S. Westfall and Victoria A. de Villa, August 2001)* for managing the cities. These indicators, which have been worked out with wide consultations among various cities, would provide a basic framework for measuring the progress in Chennai also.

14.6 The indicators would be clustered under the following major heads:

- Population, migration and urbanization
- Income disparities, unemployment and poverty
- Health and education
- Urban productivity and competitiveness
- Technology and connectivity
- Urban land
- Housing
- Municipal services
- Urban environment
- Urban transport
- Culture
- Local Government finance and investments
- Urban governance

E. Mechanism for Identification of Indicators

14.7 The specific indictors under each sector would be identified by the Monitoring Committees proposed under the Master Plan in consultation with the parastatal organizations and departments of Government particularly the Metro water, The Housing and Slum Clearance Boards and Industrial and Labour Department, local bodies, private sector actors including industrialists and real estate promoters and builders and other civil society and citizen stakeholders.

F. Studies

14.8 The studies made earlier and the proceedings of the consultations and deliberations of the committees set up to examine the objections and suggestions made by the public have broadened the perceptions of problems and approaches needed to tackle them. CMDA through the monitoring and review committees

proposed will initiate fine tuning of the policies and strategies included in this Master Plan for effective implementation of the Master Plan.

14.9 The Monitoring Committees will also identify areas of further studies in the various sectors, which would need to strengthen benchmarking as well as providing the necessary data for assessing the progress made.

14.10 Some of the studies that will be initiated and/or facilitated by CMDA are already indicated in the relevant chapters. A few more studies in areas where information is lacking or inadequate may be necessary to strengthen policy formulation. In this effort the combined energies of departments of Government as well as academics and reputed research institutions in Chennai are proposed to be fully mobilized.

14.11 The suggested list of studies is given in the Annexure. II

G. Future investments in CMA

14.12 CMDA had earlier prepared CMDP for infrastructure improvements within CMA at an estimated cost of Rs. 18000 crores. It is being implemented as Annual Plans (prepared every year in consultation with the agencies / departments concerned) making Annual budgetary allocations under the concerned departments / agencies head of accounts. In the last 4 years (since 2003) an amount of Rs.3745 crores has been invested in infrastructure improvements in the sectors of transport, housing, municipal services, water supply, sewerage, drainage etc. In the development plan for CMA prepared for financial assistance under JNNURM infrastructure improvements to the tune of 44,780 crores has been proposed for implementation over a period of 7 years (2005-2012). The projects are implemented by accessing funds under JNNURM and other source by the departments / agencies concerned.

Based on the policies and strategies proposed in this Second Master Plan, detailed investments in each sector during this plan period upto 2026 have to be worked out. Project planning and implementation programmes have to be worked out by the concerned agencies and implemented. Long term investments / programmes by the local bodies and other agencies may be prepared in collaboration with the Metropolitan Planning Committee (MPC) when it is setup. It may be monitored and reviewed by a committee as may be decided by the government for effective implementation to achieve the goal.

Annexure -I

Suggested list of Monitoring and Review committees

Name of Committee	Main Topics included
1. Economy and employment committee	State Urban development policy, demography, economy, employment and skill training
2. Land use and environment committee	Land use zoning, Development Regulations, Urban design, Urban renewal, Heritage building conservations, Recreation, Environment, Greening, Disaster mitigation and management.
3. Traffic and Transportation committee	Traffic, Transportation including road and rail transport, Para transit
4. Shelter and infrastructure committee	Housing for all categories, water Supply, Sanitation, Drainage, Solid and liquid waste, Health, Electricity, Communication, Education and other social infrastructure.
5. Investment Planning and governance committee	Investment planning, Governance and GIS

Annexure -II

Suggested List of Studies

1. (a) Income and employment in formal and informal jobs – income distribution
   (b) Land needs for informal and small-scale enterprise
2. Rate of urban growth and level of investments in infrastructure
3. Primary health care and incidence of diseases – Malaria and other water and air borne diseases
4. School enrolment and vocational training needs
5. Land availability for affordable housing
6. (a) Slum growth, homelessness and housing stock generated
   (b) Slum resettlement assessment
7. (a) Quantity and quality of protected water supply to low income households
   (b) Practical ways of augmenting water resources locally
8. Levels and impact of households sewage disposal methods
9. (a) Generation of solid waste and quantity treated
   (b) Study on hazardous and e-waste management
10. (a) Water quality in rivers – Cooum, Adyar, Buckingham Canal etc. and temple tanks
    (b) Air quality monitoring study
11. (a) Modal split and travel time study
    (b) Maximizing walk and cycle facility
12. Citizen participation opportunities and levels in urban bodies
13. Public investments in infrastructure and outcomes
14. Extent of Urban sprawl and non-compliance with zoning
15. Parks and playgrounds – inventory of green areas and maintenance
16. Unauthorised construction and buildings not in compliance with planning norms
17. Study to develop prototype Area Development Plans for
    (a) A City zone
    (b) A Municipal ward
    (c) A Peri-urban Locality
18. Mapping study of urban land values
19. Housing outlays by government
20. Finance from banks and institutions for micro enterprises and low-income housing.

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Software used: Arc Info, ENVI, Auto Cad, Auto Cad Map 3D.

Aerial Data used: Ikonos 2001,2003 &2004 (1 metre resolution)
Cartosat 2005 (2.5 metre resolution)

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Support for certain data collection and Tamil translation was provided by various officials and staff working in different Divisions in CMDA.

Committees which examined objections / suggestions and made recommendations

1. Committee on Land Use

1. Thiru. N.V. Rakhunath	- Chief Planner, CMDA
2. Thiru. P. Thyagarajan	- Addl. Director, DTCP
3. Thiru. K. Rajamanickam	- Dy. Director, Commssionerate of Municipal Administration
4. Thiru. Durganand Balsovar	- Architect
5. Thiru. S. Ramaraj	- President, Institute of Architects (TN Chapter)
6. Tmt. S. Chithra	- Senior Planner, CMDA

2. Committee on Transport

1. Thiru. N. Dharmalingam	- Retd. Chief Planner,CMDA
2. Thiru. T.K. Shanmugasundaram	- Chief Engineer (Genl.), Highways Dept.
3. Dr. A.M. Thirumurthy	- Professor Anna University
4. Thiru. R. Balasubramanian	- Managing Director, MTC
5. Thiru. P.T. Krishnan	- Architect rep. Citizen Consumer and Civic Action Group, Chennai
6. Thiru. K. Kumar	- Senior Planner, CMDA

3. Committee on Development Regulations

1. Thiru. Md. Nasimuddin I.A.S.	- Member Secretary, CMDA
2. Tmt. Tara Murali	- Architect
3. Prof. Suresh Kuppusamy	- School of Architecture & Planning, Anna University
4. Thiru. P.T.G. Sundaram	- Representing Institution of Engineers (TN Chapter)
5. Thiru. M.K. Sundaram	- Vice Present, Builder's Association of India (TN Chapter)
6. Thiru. C. Palanivelu	- Chief Planner, CMDA

4. Committee on Water supply and Drainage

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